



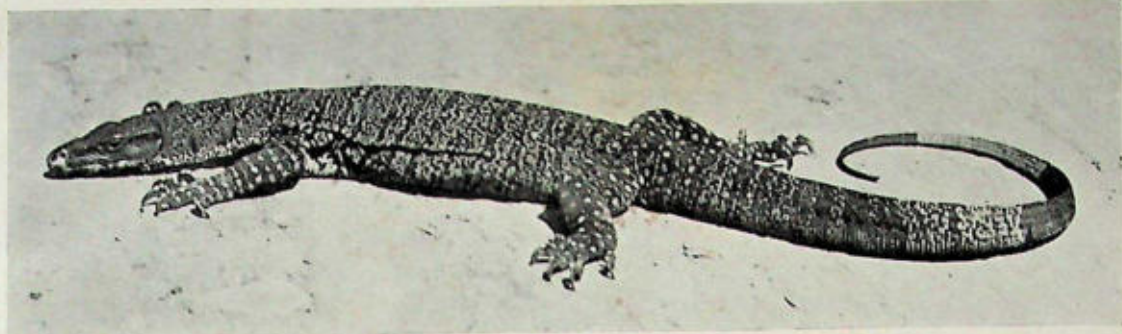
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ZOOLOGICAL SOCIETY BULLETIN

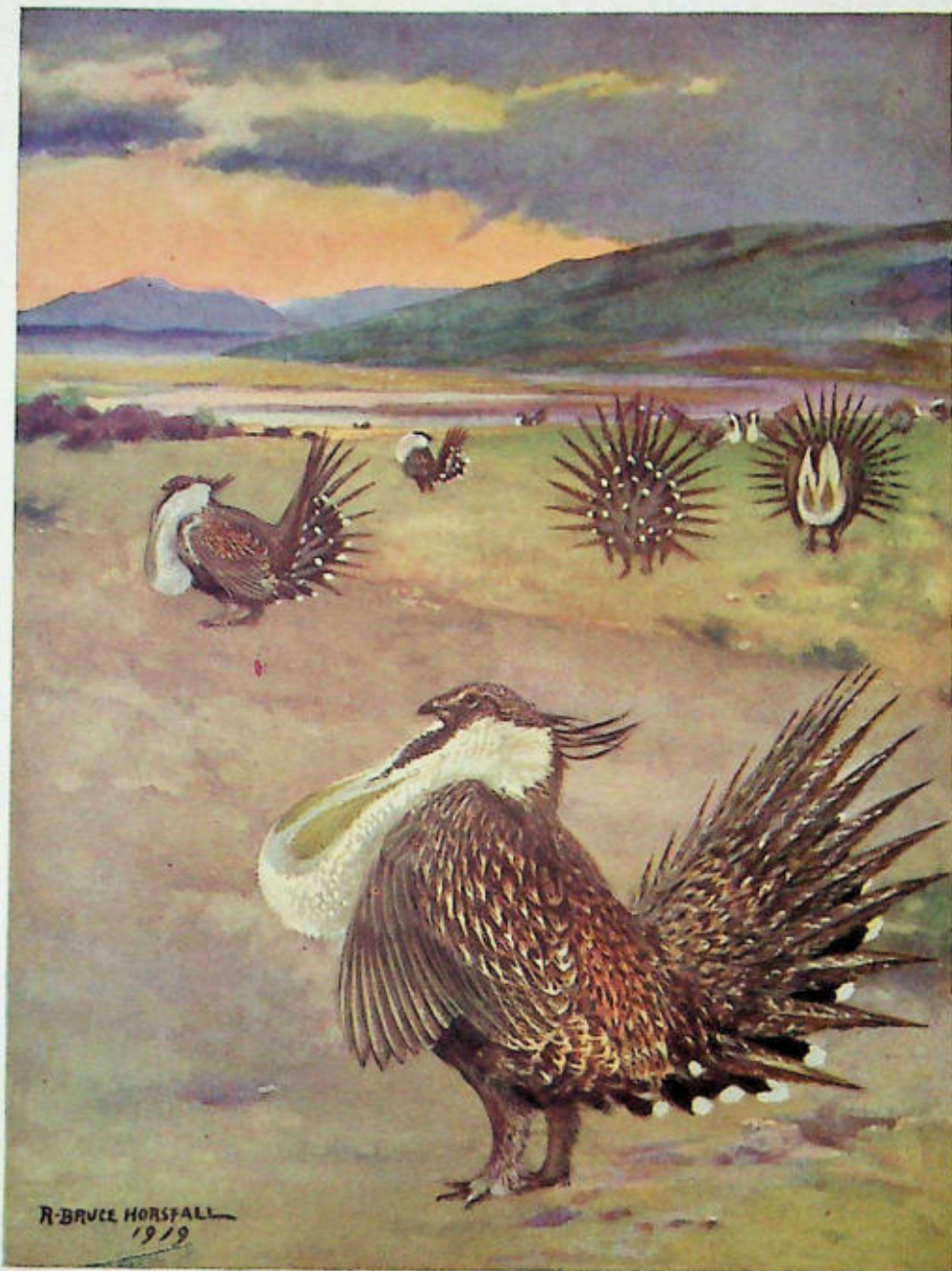
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SAGE GROUSE DISPLAYING AND STRUTTING AT SUNRISE
Painted from life by R. Bruce Horsfall,

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VOLUME XXIII

JANUARY, 1920

NUMBER 1

REMARKABLE HABITS OF THE SAGE GROUSE

AS OBSERVED IN SOUTHEASTERN OREGON IN MAY 1918

By R. BRUCE HORSFALL

With Illustrations Drawn from Life by the Author

STEALTHILY and carefully we picked our way along the mud-flat road to the high gate in the lava-rock ranch fence, and peered through the bars.

"There they are!" burst from our lips in an excited whisper, as we caught the glint of white spots a few hundred yards beyond.

Cautiously we clambered over the irregular loose rocks, and like Indians on the warpath crawled, squirmed and wriggled our way to a low outcropping of volcanic rock. From this vantage point we had an unobstructed view of the broad and bare flood-plain before us.

Cramped and strained in every muscle and bone, we remained hidden among those rocks till supper time, loath to leave the wonderful sight.

In the open at intervals of from twenty-five to fifty feet, were sixty magnificent sage cocks strutting around with puffed-out chests and tails spread like miniature turkey gobblers, making noises for all the world like the popping of corks on the pier at Atlantic City—a sound which took me back in memory to the hotel in Colombo, Ceylon, where a hundred guests were served with soda water at every meal, and the bottles were always opened at the tables.

Evidently these rocks had been favorite place for Indians in years gone by, for all about us in the sand were obsidian chips and charcoal, with bits of arrow and spear heads. We afterwards picked up many perfect specimens on the open flat.

Here the Klamath Indian had lurked at evening to secure, with his twanging bow and bits

of flying glass, a sage cock for the morrow's dinner, making arrow heads in the middle of the day when no birds were about. To the Indian a strutting sage cock was but an easy mark and a quick lunch. His stolid nature probably did not marvel at the wondrous performance, and no question entered his mind as to how and why.

To us, however, it was a sight which satisfied a great hunger; not the hunger of the body, but of the mind. We had spent days and nights in travel to see that phase of nature, to gain that scrap of knowledge; and we feasted to a great content, though many questions remained unsatisfied as to the how and the why.

The opportunity for these observations had come after two years delay, and we were accordingly appreciative to the utmost.

In the summer of 1915, we had been viewing the Klamath Lake pelican colonies with the game warden, Mr. J. J. Turber, and had gone on to Laird's Landing, at the foot of the lake, to remain over night. While we were there Mr. Laird told us of sage grouse coming down on the flat at the eastern end of the pasture every spring to do their courting, but at that date, May 31, they had stopped for the season.

It was now May 1917, and we were to have our opportunity to observe and picture the birds in action.

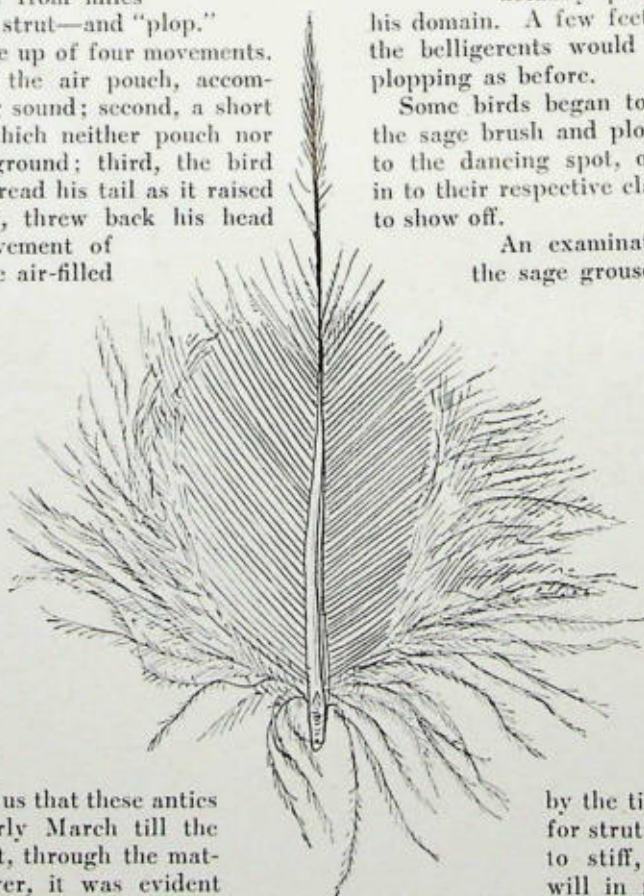
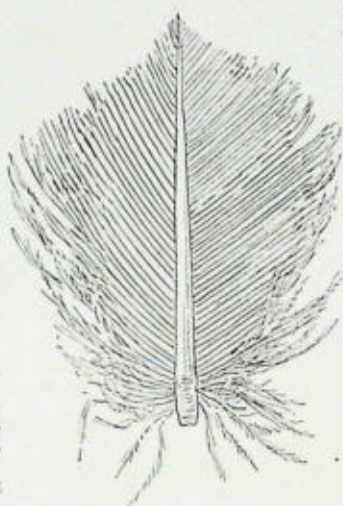
Mr. Turber had brought William L. Finley, Stanley G. Jewett and the writer from Klamath Falls to Mr. Laird's place. It was afternoon when we rounded the lower end of the lake, and a few grouse were on the open alkali flat.

We cached our camera and blind, and went on to the house to arrange for beds and board, leaving as soon as possible for our first close view of the birds. After supper that evening we set up our blind near a grassy slope reaching from the sage covered hill at the eastern side of "the wash."

The waters that had formed this flood plain came down from the forest-capped Van Brimmer mountain away off to the south. Westward of this wash lay hillocks and ridges of dark lava rock. About eight level acres, near the shore of the lake, were bare of vegetation, and it was there that the sage cocks came from miles around to dance and strut—and "plop."

The strut was made up of four movements. First, the filling of the air pouch, accompanied by a grunting sound; second, a short stiff-legged run in which neither pouch nor wings touched the ground; third, the bird stopped suddenly, spread his tail as it raised to the perpendicular, threw back his head with a forward movement of the wings, pushed the air-filled pouch well up on the chest; fourth, there was a sudden upward throw, followed by a more vigorous and snappy toss, and the tightened pouch came down again on the extended chest with a rubbery "plop." This plop was repeated three times then the bird eased down for another rumbling gurgle and another run.

Mr. Laird assured us that these antics take place from early March till the first of June; in fact, through the mating season. However, it was evident that this was not a courting action; because when in the course of the morning or evening performance, two or three hens meandered through the throng no notice whatever was taken of them. A real



SAGE GROUSE (MALE) NECK FEATHERS

September feather of loose structure which accounts for the wear on the spring feather. *Upper.* Taken from near bare spots on the pouch. *Lower.* Feather from breast beneath pouch.

courting performance of a different character may take place in the day time, far from the watering place, on the sage-covered hills.

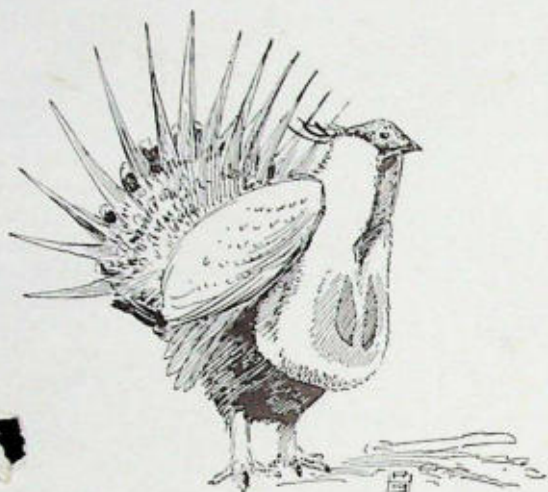
Each bird appeared to have a private spot on which no other dares to trespass. In reaching those proprietary spots, collisions sometimes occurred, and quiet cock-fights took place much after the manner of china pheasants. With rump feathers erect, lowered heads and tails, and dragging pouches, the birds sidled around and struck with their wings; all the while scolding in a trumpeting, gurgling grunt, as the owner actually pushed the intruder off

his domain. A few feet one way or another, the belligerents would separate and go on plopping as before.

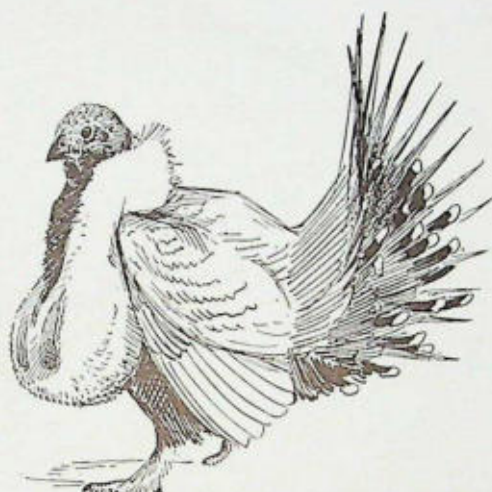
Some birds began to perform well up in the sage brush and plopped all the way out to the dancing spot, others walked quietly in to their respective claims before beginning to show off.

An examination of the pouch of the sage grouse disclosed a peculiar development. In front are two yellowish-green bare spots separated and surrounded by short stiff feathers, shortest and stiffest immediately surrounding the bare area. Probably it is these spots which make the sounding plop, after the manner of a wet drum-head. In the fall, when new, these feathers are soft and exceedingly pliable, and by the time the birds are ready for strutting, have broken away to stiff, sharp bristles which will in no way interfere with the vigor of the snap, as soft feathers would do.

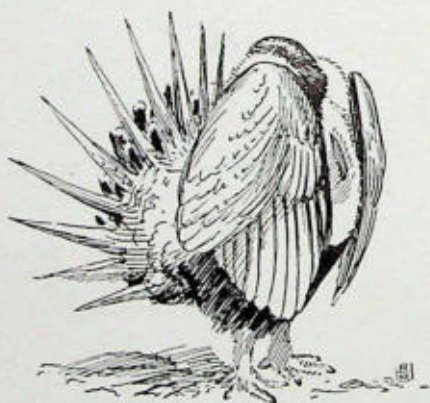
The morning after our arrival, the 11th of May, no birds came near enough to the blind for photographing. At nine o'clock it began to rain, and we



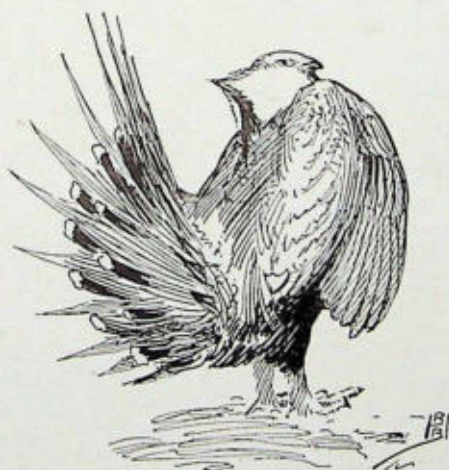
Filling pouch with air.



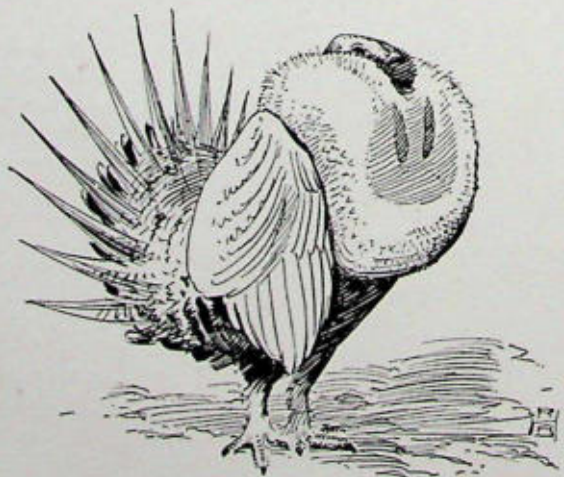
Stiff-legged run after filling the pouch.



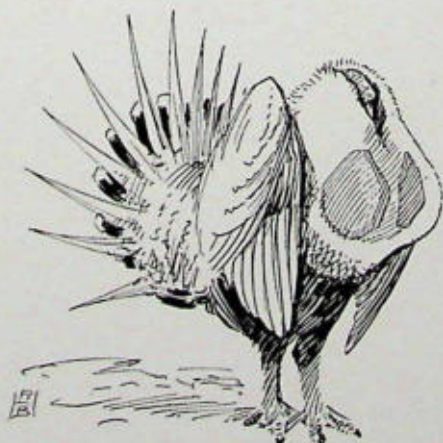
Lifting pouch with the wings



Side view of lift of the pouch.



Extreme of throw of the pouch.



Slap down of pouch on chest showing distended bare spots.

spent the remainder of the morning searching for nests on the adjacent hillside. We found two from which the young had hatched, and one that had been rifled of its contents, probably by a coyote. In the afternoon the birds came in too late for pictures.

On May 11, no birds came near the blind, so we moved it to another spot. The afternoon was windy and stormy, and only a few birds came in at four o'clock.

On the 13th of May we arose at three A.M. and after a hurried breakfast, stumbled and wobbled along the ruts of the road. No wind was stirring; which was a very unusual thing for this high plateau region. A heavy cloud hung over us, as only clouds in an arid region can hang, black as night, but the faint yellowish light of dawn was slowly brightening as we crept into the blind, at four o'clock. Dark as

it was, a few birds were already there, and by five-fifteen we were able to make the first exposure. As usual, there were about sixty birds in the field. Actual counts of birds within our range of vision at various times were 51, 52, 51 and 54. By seven o'clock all had left for the sage-brush hills; but we had had several birds within thirty feet of us most of the time.

We returned to the blind at 3 P.M. and the birds came in at about four, and plopped until dark.

On the 13th of May we were in the blind at 4:15 A.M. A few birds were on the shore when we arrived and by seven o'clock, the usual time for the birds to scatter, we had secured moving and still pictures of every action from birds within twenty-five feet of us.

As we left, a lone coyote yapped to us a long farewell.

DR. C. GORDON HEWITT

The Dominion of Canada has suffered a great loss, and the cause of wild life protection in North America has lost one of its foremost champions. Dr. C. Gordon Hewitt died of influenza and pneumonia at Ottawa on Sunday, February 29, in his 35th year.

Dr. Hewitt was the leading expert of Canada on wild life protection, and besides being Dominion Entomologist and the director of Canada's fight against crop-destroying insects, he was Consulting Zoologist of the Canadian Conservation Commission. He was born in Scotland on February 23, 1885, and obtained his degree of Sc.D. by graduation at the Manchester University. He entered the service of the Canadian Government in 1909.

His most conspicuous activities were in the promotion of the international treaty with the United States for the protection of migratory birds, in which he was so diligent and so successful that in 1918 the British Royal Society for the Protection of Birds awarded to him its gold medal for that service.

For four years Dr. Hewitt had been diligently engaged in the preparation of a very important book entitled "The Conservation of Wild Life in Canada" and doing justice to the fine enterprise of the Dominion in that field. It was finished and made ready for the printers only one month ago and it is safe to say that it will,

when published, prove a fitting monument to its justly distinguished and deeply regretted author.

HUNTING FOR THE "Zoo."—The Zoological Society of London have undertaken the restoration of their collection, for which the time is ripe. They are sending Mr. Wilfrid Frost, an experienced traveller for such objects, to the Malay Archipelago. His itinerary is enough to turn an adventurous boy all colors with envy. He goes to places like Sourabaya, Amboina, Celebes, and Ternate, whose very names are romantic. The names, in fact, are sometimes more romantic than the places themselves. Mr. Frost hopes to get specimens of wild pig, opossum, kangaroo, orang, cassowary, birds of paradise, and so on. Lovers of the "Zoo" wish him luck in his hunting—and, which is equally important, in his transport of the prey.—*London Times*.

ANIMALS ARE PROTECTED.—Butte, Montana.—That efforts on the part of the state game warden to protect fish, birds, and animals in Montana, according to the state laws, have been successful, is shown by a recent report issued by Warden J. L. de Hart, for the year ending November 30, 1919. Out of 250 arrests there were 237 convictions, and fines collected amounted to over \$6,000. Moose, mountain goats, mountain sheep and antelope are animals protected by the law the year round.—*Christian Science Monitor*.



NESTING LESSER SNOW GEESE
The first time in captivity ever recorded in America.

BREEDING THE SNOW GOOSE FIRST TIME IN AMERICA

By LEE S. CRANDALL, *Curator of Birds.*

DURING the few years that immediately preceded the outbreak of the war, the propagation of game birds in captivity gained many followers and finally became a well-defined movement. Since 1914, this work, like the work of many others of a similar nature, has been practically dormant, but in spite of all obstacles, a few enthusiasts have been able to continue in a small way, and although the results in most cases have not been particularly striking, in at least one instance, a record of unusual interest has been made. This is the breeding for the first time in America of the lesser snow goose, (*Chen hyperborea hyperborea*).

Naturally enough, the attentions of American game breeders have been centered on our native species. Success with upland game birds has not been great; the difficulties of breeding the bobwhite not being entirely overcome and the problems of rearing the ruffed grouse remaining almost untouched. Among waterfowl, much more has been accomplished. The Canada goose, the mallard duck and the wood duck now breed so freely that they might be considered as domestic birds. Besides these, there are well-authenticated records of the reproduction in captivity of the following North American

species: fulvous tree duck, black duck, gadwall, green-wing teal, blue-wing teal, pintail, shoveller, redhead and canvasback. Progress is being made with these and possibly other forms, and the sum of our knowledge concerning them is fast increasing.

While distinct progress is being made with ducks, it is a curious fact that the only North American goose that breeds freely is the Canada. At least fifty years ago, this bird was bred by Mr. A. W. Whealton, of Chincoteague, Virginia, and now nests in captivity the country over as regularly as domestic geese. But with the exception of the present instance of the lesser snow goose, there is no record of the breeding in captivity in this country of any other native goose.

The causes of this strange reluctance to reproduce are not fully known. White-fronted, greater and lesser snow, Ross, blue, cackling and Hutchins geese have been kept in the Zoological Park for periods of well over ten years, under all sorts of conditions, and while most of the birds mate in the spring, their interest invariably wanes when the nesting period is at hand. Many of them have been kept on Lake Agassiz, where they have the run of grasslands several acres in extent, with a clean, well-supplied lake of even larger size. Here they are wholly undisturbed, since our visitors can see them only at a distance, yet to our knowledge, none of them has ever laid an egg. Pairs have been



TROPICAL JUNGLE NEAR KARTABO

A view made in the forest near the Society's Tropical Research Station, by John Tee-Van.

kept in smaller enclosures, where grass and water were to be had in abundance, with equally discouraging results.

Mr. A. W. Whealton, of Chincoteague, Virginia, has experimented for many years with the greater snow goose, (*Chen hyperborea nivalis*) but his success has been only partial. Pairs of birds have nested and laid but the young were never reared. Snow geese mated with domestic geese of the white variety known as the Emden have brought up young and the hybrids have been paired with the pure snow gander with perfect success. Many of the birds containing a touch of the domestic blood are practically, indistinguishable from the snow goose, and breed regularly. Mr. Whealton hopes eventually to produce a goose which will be identical to the snow goose, but it is doubtful if the taint can ever be eradicated.

Yet in Europe the problem appears to present no such insurmountable difficulties. In England alone, blue, snow and Hutchins geese have been bred and it is probable that others have reared young on the Continent, particularly in Holland. In 1912, a pair of snow geese occupied a tiny paddock in the Zoological Gardens of London, and with them in December were three lusty goslings, which they had reared under seemingly impossible conditions. Hybrids between the blue and snow, of great zoological interest, have been produced repeatedly.

There seems but one solution of the mystery. It is unlikely that local weather and conditions have any great effect. The larger enclosures and greater freedom that captive geese in this country have enjoyed without result, would more than compensate for greater clemency in the weather of western Europe, if it exists. But game propagation in England greatly antedates the work in this country. More determined attempts, over a greater period of time, have produced results by sheer force of endeavor. Once any species was induced to breed, the young were carefully preserved, with the certainty that when they reached maturity they would nest much more readily than their parents. Thus strains of breeding birds were established, and there is no doubt of the existence of such families in Europe today.

Apparently no American game breeder has attempted to make use of this obvious means for establishing the birds in captivity in this country. Importation of judiciously selected birds from European breeders would give us a stock of captivity bred geese, which from a small beginning, should quickly grow to greater things.

But with the lesser snow goose, a step has been made without resort to this means. Mr. H. J. Jager, of Owatonna, Minnesota, has bred from a pair of wing-tipped birds long in his possession. If this success can be duplicated in future years, it is probable that a line of breeding geese can be established, tracing its ancestry to this one foundational pair.

Mr. Jager's geese were originally wild birds, wing-tipped by gunners in the vicinity of this home. For seven years they had the run of a ten-acre field, with two ponds, without showing an inclination to breed. But in the eighth year, a nest was built and six eggs laid. Five of these eggs were placed under a domestic hen that hatched them all but reared only one. The one egg left to the parents was hatched and the gosling brought to maturity.

When these geese attain breeding age, it will be possible to pair them with wild birds with every hope for success. If this can be accomplished, continued propagation will bring about the survival of another of America's hard-pressed game birds.

TROPICAL TADPOLES.

By JOHN TEE-VAN.

Artist, Tropical Research Station.

KARTABO offers an excellent field for the study of tadpoles and adult amphibians. Tadpoles are to be found in every suitable situation within the district; in the quiet side-pools of swift-running streams, in shallow jungle pools, in ponds swimming near the shore, and even in small, isolated, leaf-filled holes between the roots of the bamboos surrounding the Station. A few have been found along the shore of the river, probably accidental stragglers from some stream.

Their coloration varies considerably. Some are uniformly bluish-black, with no distinct pattern or shading. The most common colors are varying shades of dark green and brown. One species, whose life-history is now being worked upon, is strikingly different from all others I have ever seen. The front portion of the body is brilliant yellow tinged in places with dull orange. There is a black mark between the nostrils and two black spots near the eyes. The posterior portion of the body is black, changing into deep shining blue, whenever light shines upon it. The transitional stages in the life of these tadpoles have not been completed; in other



PYGMY HIPPOPOTAMUS IN THE ZOOLOGICAL PARK
The first Pygmy Hippopotamus ever born in captivity.

words we have no idea as yet as to what species of frog it will become. But the indications are that this early coloration will be entirely lost, and that they will become drab little jungle-lovers with no recollection of the brilliant harlequin dress of their infant days.

The bluish-black tadpoles were found at Camaria, near the first rapids of the Cuyuni River, five miles from the Research Station. They were first seen as a black mass with heads turned inward, slowly circling about an imaginary axis. Dipping a small net into the group, I drew up a wet, wriggling mass of potential frogs. The single catch resulted in less than half the group, and yet they numbered nearly two hundred and fifty. Strange to say, this disturbance of their aquatic dance did not change the circle, the remaining tadpoles closing up the gaps and continuing the round. After choosing about fifty typical individuals for study, I threw the remainder back into the pool. They immediately congregated in a single mass, and slowly started the old dance, slowly circling and then stopping for a while, then circling again. Now and then one would break away and come to the surface to gulp some air. But it always returned to its fellows. A metamorphosed specimen of this tadpole with the tail still present has changed into a beautiful pinkish-grey with myriad spots of black over all the upper surfaces,—a pattern as surprising as it is inexplicable at present, for it is one unknown as well to tadpoles as to any adult frog.

The teeth of tadpoles give to their mouths an absurdly shark-like appearance. These members are usually very valuable in helping to identify the species, but in the case of the Kar-

tabo tadpoles, the teeth as well as the rest of the little creatures are all new facts to science. The yellow and black tadpole is armed with nine rows of teeth, two rows in the upper series and seven in the lower, in addition to the horny beaks, of which each possesses a strong row. All of which the little creature finds necessary in his varied vegetable and animal diet. During the change from tadpole to frog, all of these teeth are lost, and the mouth becomes wider and more suitable for the more mature diet of insects and other living creatures.

Almost all of the tadpoles found at Kartabo lead normal lives, similar to those of our northern states, dependent upon themselves for the continuation of their existence from their hatching to their ultimate change into full grown frogs. Now and then a strange form appears. A specimen of the black marsh frog, (*Dendrobates trivittatus*) was brought into the Station carrying forty-three tadpoles attached to its body. During the seasons when dry weather threatens to evaporate the water in the nursery pools, the adults of this species allow the tadpoles to fasten themselves to the lower back. They are then conveyed to other pools where there is less possibility of drying up.

Another strange amphibian found within the district is the Surinam toad, (*Pipa americana*), a curious flattened creature, that carries its eggs in small depressions of the skin of the back. The tadpoles are hatched within the skin, and develop fully before they leap out of the cell as diminutive but perfectly formed toads of a new generation. With these and others still unknown that are awaiting discovery, little excuse is needed for greeting with real enthusiasm every new form of tadpole.

BIRTH OF A PYGMY HIPPOPOTAMUS

By WILLIAM T. HORNADAY

IN JULY 1912 three Pygmy Hippopotami arrived at the Zoological Park. They were purchased (for \$15,000) from Carl Hagenbeck, whose exploring collector caught five in all, in Liberia.

At that particular juncture the zoological garden directors of all Germany were industriously engaged in boycotting Mr. Hagenbeck, the best and foremost of all dealers in wild animals, and were keeping the oath they had sworn to buy nothing from him. This generous

and kind "gentleman's agreement" was entered into and kept because Mr. Hagenbeck had had the temerity to build at Hamburg a private zoological garden so spectacular and attractive that it made the old Hamburg Zoo look obsolete and uninteresting.

It was because of that boycott that the New York Zoological Society was enabled to buy three out of the five pygmy hippos captured by Hans Schomburgk. Had it been otherwise only one of these rare beasts would have been offered to

us. Just what finally became of the other two we do not know. In our BULLETIN for July 1912, there appears a very interesting narrative by Schomburgk entitled "On the Trail of the Pygmy Hippo."

Never since we began to worry over the idiosyncrasies and troubles of wild animals have we had any more satisfactory animals than those pygmy hippos. In appetite, health and general deportment they must be marked 100 per cent. No one of the trio ever has been sick for so much as one day, or missed a meal. They eat their rations—cheerfully, gratefully and copiously. The large and fully mature male came living alone, and he has lived so ever since, at the east end of the Elephant House. The other two, male and female, were slightly under the age and size of maturity, and being happily paired we built a tank for them at the west end of the Elephant House, and they have always lived together.

The adult pygmy hippo is provided with long and sharp hog-like tusks set in the lower jaw, and he can bite savagely and effectively if crossed. Just how those formidable weapons five or six inches long are chambered in the muzzle when the mouth is closed is Dame Nature's private affair, but when the mouth is widely and truculently open, it reminds us of the coiled-rattlesnake flag bearing the warning "Don't tread on me!"

During the past four years, or ever since the female hippo attained her majority, we have closely and carefully watched for the birth of offspring. The perfect vigor of both animals three years ago led to mating, but the signs of offspring that Keeper Walter Thuman thought were observable each time proved barren of results. By means of hot water pipes the bath-water in the tank was kept at a temperature all around 80 degrees. The fat and always rotund condition of the female was so pronounced that the usual signs of maternity were negligible.

Finally, on the morning of December 23, like a bolt falling from a clear sky, the female gave birth to a male baby at 10:30 A.M.

Dr. Blair was on the spot within five minutes. He found the male greatly excited by the event, and making considerable trouble, but the animal was promptly isolated. The labor lasted about twenty minutes, and was entirely successful. When the writer reached the scene the full delivery had just been accomplished, the umbilical cord had been cut, and the wet and helpless

infant was floundering on the bare concrete floor, trying to rise.

Realizing that contact with the cold floor would in all probability produce pneumonia, the struggling infant was lifted and held in a pail of milk-warm water while the keepers hurriedly emptied and cleaned the tank, and ran into it enough warm water to cover the bottom to a depth of three inches. The temperature of this water was carefully maintained, to prevent pneumonia and promote vigor.

It was at that point that our real trouble began. Owing to a fatal non-development of the gluteus major and the biceps, or flexor muscles at the rear of thigh (very effectively shown in the photograph of the infant hippo), the hind legs of the infant were half-way powerless, and unable to support the body, or to walk. While the fore-quarters stood well erect, the hind legs floundered helplessly and were dragged along.

That muscular defect proved fatal to natural nursing. All the resources of the Park finally proved unable to control conditions sufficiently to render it possible for the baby hippo to nurse. The mother was passive toward the men as long as they did not attempt to handle her offspring, but whenever they attempted to handle it, she would threaten them so savagely that they were quite thwarted in their friendly and very persistent attempts to hold the baby in a position to nurse.

Realizing from the outset that about ninety per cent of the baby's chances to survive lay in being nourished by its mother, for twenty-four hours all efforts were bent upon accomplishing that result. It seemed as if with all our resources we surely could devise some means by which that result could be achieved.

But the pygmy hippo mother was not made by Nature at all right for suckling weak babies who are wholly unable to stand or to walk. Her fat round body is shaped like a barrel, and the two small and conical teats, flattened in order to function in a very narrow space, are most difficult for any baby hippo to attain. The problem was like a big sack of wheat endeavoring to suckle a sack of salt.

The mother was from the first fully conscious of the status of her offspring, and anxious to be a good mother to it. The baby was well aware of the necessity of nursing and anxious to promote that result. Scores of times the infant struggled violently to get upon its feet, and failing that, to drag itself to its mother.

For twenty hours, with all the human help that could be rendered, that struggle to nourish and be nourished continued in the quiet seclusion of that warm tank—both with and without water on the bottom. The animals were attended constantly throughout the night. Finally, at 6 o'clock in the cold gray dawn of December 24 the baby nursed vigorously for ten minutes. Bravo! Perhaps we would win after all. It was accomplished by the mother lying upon her left side and holding her right hind leg up in the air at an angle of forty degrees.

Ordinarily in lying down the mother simply sinks straight down, back erect, and stomach flatly pressed upon the floor; and in such a position even the strongest infant could not reach the udder.

In order to miss no chances of success, and be provided for the worst event, Dr. Blair and Mr. Ditmars procured a milch goat and installed it in the hippo's cage in the forenoon of the 24th of December.

The nursing efforts continued, but absolutely without further success.

At eleven o'clock an effort was made to induce the baby to nurse the goat; but the teats were too large, and the effort ended in failure. Then some warm goat's milk was placed in the last resort of foster parents—a nursing bottle—and about two ounces of the milk were taken. Later on, other efforts were made at artificial feeding, but the now weakened infant did not respond to them. It died at 7 o'clock, about thirty-two hours after it was born.

Dr. Blair's measurements of this specimen are as follows:

Length of head and body, 19 inches; tail, $2\frac{1}{2}$ inches; height at the shoulders, 16 inches; circumference of chest, 19 inches; weight $9\frac{1}{2}$ pounds.

Of course the skin was quite hairless. The skin color was light Vandyke brown, quite uniform in tone. The iris was dark, blackish brown. The toes were extra long and spread widely, like those of a capybara. In life the little animal frequently twitched its little triangular and sharp-pointed ears a dozen times in very rapid succession, quite like adult pygmy hippos.

The infant was posed artificially after death and photographed, as shown herewith. Its remains were at once taken in hand by the Society's Prosector, Dr. George S. Huntington, Director of the New York College of Physicians and Surgeons, and they will be scientifically developed to the utmost. The skin and skeleton

were given to the American Museum of Natural History, where both will be prepared for exhibition.

Thus was born and died the first pygmy hippopotamus that ever was bred in captivity. The causes of death were precisely two: (1) the non-development of the flexor muscles of the hind legs with the consequent loss of ability to stand or to walk, and (2) the structural handicaps imposed by the form of the mother upon the nourishing of newly-born offspring. The female pygmy's maternal factor of safety is entirely too small.

THE COCK-OF-THE-ROCK

A RARE NEW ARRIVAL FROM BRITISH GUIANA.

CONTRARY to our expectations, the end of the war has brought little betterment to the live animal collecting industry. The great demand for shipping space and generally unsettled conditions the world over, have militated against the improvement for which we had hoped. Present indications are that the trade on which the Zoological Park must depend for most of its specimens will not resume normal proportions before next summer.

This being the case, arrivals of all sorts are eagerly welcomed and when the newcomer happens to be both rare and beautiful, the event is almost epochal. So far this year, acquisitions in this category have been few. On August 12th, however, we received from the Society's Tropical Research Station in British Guiana, a consignment of specimens that included, besides several other interesting birds, a fine cock-of-the-rock, (*Rupicola rupicola*). The bird is an adult male in full plumage, and is the second of its species to be exhibited in the Zoological Park.

Our first bird, the arrival of which was recorded in the BULLETIN for July 1916, also came from the Research Station. It was a strong, healthy individual and thrived for more than a year, when a between-season break in our supply of small fruits brought its career to a sudden end.

There is no doubt of the delicacy of this rare bird in confinement. Dr. P. Chalmers Mitchell gives the average longevity of eight specimens in the Zoological Gardens of London, as eight and one-half months, with a maximum of twenty months. However, it seems equally certain that with a plentiful supply of fresh fruits, especially grapes and cherries, that the life of this rare bird in captivity can be considerably prolonged.

[L. S. C.]

ZOOLOGICAL SOCIETY BULLETIN

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ELWIN R. SANBORN, *Editor*

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JANUARY 1920

THE WILD-ANIMAL FAMINE

When an Asker of Foolish Questions saw the Wild Man of Borneo, he promptly inquired, "What makes you wild?"

"The fool questions that people ask me," was the answer.

If the same man should put the same question to us, we would answer—The famine in wild animals.

Daily, weekly, monthly, the situation steadily is growing more serious. Until recently, England and Canada had been open to us for hoofed animals, but in December 1919, when we applied for a permit to import a rare African antelope from England, we found that even that country now is under the grand taboo. It is because of foot-and-mouth disease.

Really, unless the Bureau of Animal Industry will loosen up, and place some real reliance upon the quarantine conditions of every well-kept zoological garden, ALL collections of foreign antelopes, goats, markhorns, ibexes, sheep, wild cattle, deer, giraffes and wild swine very soon will be obliterated. The remnants of the stocks on hand in 1914 rapidly are dying of old age and leaving empty cages behind them.

We think that in many cases the regulations are too sweeping, and unnecessarily severe on wild animals that never have the diseases of domestic species.

INVALID SOLDIERS AT PARK

Surely it will give all members of the Zoological Society a thrill of pleasure to learn from the reading of the accompanying letter how the

Zoological Park has been enjoyed by wounded soldiers in New York hospitals. The gratitude so generously expressed is in no sense due to the director of the Park, but to those who have made the Park what it is. [H. T. H.]

127 West 58th Street, New York.
December 11, 1919.

Dear Dr. Hornaday:

As the member of the American Red Cross Motor Corps who has taken a large number of wounded soldiers to visit the Zoological Park, I want to thank you on behalf of the boys for the great privileges which you have extended to them.

I was attached last winter to Debarkation Hospital No. 3, known to us as "Greenhut's" on special duty to take out badly wounded soldiers, and our visits to the Park were of the greatest benefit and the greatest pleasure. Our Ward Surgeon stated it helped materially in their recovery and morale. This outing was always so popular and so much discussed that there were more boys ready to go than there were automobiles available.

The kindness and courtesy of Mr. Toomey, Mr. Spicer and Mr. Schwartz were unfailing, but the chief thanks are due to you, under whose instructions they acted.

The woodland beauty and interest of the animals was much appreciated by the fine out-door Westerners and Southerners. It was the rule not to take local boys.

I know the fame of the Park is carried all over the United States. This winter these outings are still continuing from the Polyclinic Hospital, now under the War Risk Insurance. Many of the cases of these discharged men are very sad, but they eagerly look forward to the visits to the Park. I wish you could see the enthusiasm when a "Zoo party" is planned.

I feel it my duty to express to you my appreciation of your kindness, and beg to remain,

Yours very sincerely,

ISABEL VICKERS.

ZOOLOGICAL PARK FOR ILLINOIS

A NEW ZOOLOGICAL PARK UNIT IN COOK
COUNTY, ADJACENT TO CHICAGO

The Chicago *Daily Tribune* of the issue January 1, 1920, printed the following information:

"The plan committee of the Forest Preserve voted unanimously yesterday to accept Mrs. Harold F. McCormick's gift of a \$300,000 site for a huge country zoological garden. The site is a tract of about 200 acres on the west bank of the Desplaines River, near Riverside, and will be added to the Forest Preserve's 1,500 acres.

"Mrs. McCormick has intimated through H. O. Stone, her agent, that she has no preference for a name for the new zoo, but it was tentatively agreed by the committee to name it the 'McCormick Zoological Gardens.'

"Mrs. McCormick's stipulation that the land be used to establish a zoo representative of American wild animals was accepted."

THINGS WE HAVE MISSED

*"All hits are history.
All misses, mystery!"*

Successful men talk little of their failures. We all feel what women call "sensitive" about the dreams that didn't come true. But after all, are we not entitled to some credit marks for the desirable things that we vainly attempted to do for the greatest good of the greatest number?

For example:

In 1901 we sent a vigorous young naturalist-explorer, J. Alden Loring, to Alaska, to catch for us living lambs of the beautiful white mountain sheep. Both the exploration and the catching were conspicuously successful. The plans were good, the execution was perfect, and not one mistake was made. Two lambs were safely brought to the base camp, but the excitement of the capture and the carry down from the summits quickly threw the delicate little creatures into an ailment impossible to cure, and from which they presently died. Since that day we have never heard of a white mountain sheep in captivity.

In 1912 we tried for the great and elusive white rhinoceros. We made an engagement with Newland, Tarleton & Co. of Nairobi, for two specimens at a large price, and they sent Explorer Grogan to the Lado District to do the work. The necessary permit from the Uganda Government was granted, but it did not reach the explorer until the grass had grown so high, and the baby rhino of that year's crop had grown so large, that captures had become impossible.

We have tried and tried for the giant panda of western China, often called the parti-colored bear (*Eluopus*), but it cometh not.

Mr. Herbert Lang's vigorous and finally successful effort to procure a live okapi for us, and its subsequent death from lack of milk, already has been described in the BULLETIN.

Our first effort for a gorilla was a total failure; our second was only a partial success, but our third venture was everything that we hoped for, and more. "Dinah" broke all records for gorilla longevity in captivity, save one.

At this moment we are guessing whether a great adventure in the widest wilds of South

America is going to be "history" or "mystery." We are after giant otter and giant armadillo; and but for the unspeakable ocean shipping situation we would have scored long ere this with the otters. The giant armadillos are a well-nigh impossible species, because of the obstacles presented by their food requirements.

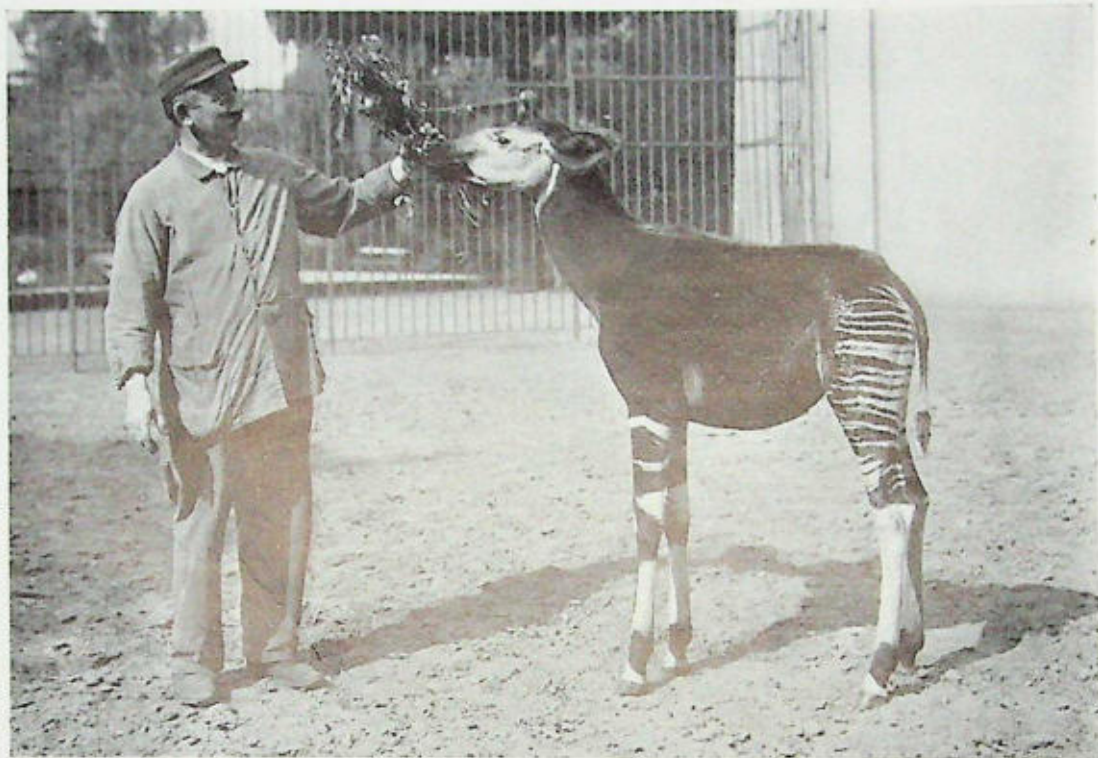
We are also "gunning" for Indian rhinoceros, markhor, Uganda and reticulated giraffe, pigmy African elephant and the inland white bear, (*Ursus kermodei*). And these are by no means all. [W. T. H.]

THE RUFFED GROUSE.—My snowshoes making no sound on the fluffy floor of woodland paths, I felt that I might stalk invisible and unheeded in the wilderness world.

A ruffed grouse was the first woodland creature not to see me. I stalked around a white corner almost upon him and stood poised while he continued to weave his starry necklaces of footprints in festoons about the butts of scrubby oaks and wild-cherry shrubs. He too was barred from the denser tangle which he might wish to penetrate. He did not seem to be seeking food. Seemingly there was nothing under the scrub oaks that he could get. It was more as if, having breakfasted well, he now walked in meditation for a little before starting in on the serious business of the day. He also was wearing his snowshoes, and they held him up in the soft snow fully as well as mine supported me. His feet that had been bare in autumn now had grown quills which helped to support his weight but did not take away from the clean-cut, star-shaped impression of the toes. Rather they made lesser points between these four greater ones, and added to the star-like impression of the tracks. The demure placing of star after star in that necklace trail was broken by a little fantastic passepoul, from which he dropped suddenly on both feet, vaulted into the air, and whirled away down arcades of snowy whiteness and vanished.—Winthrop Packard.—*Christian Science Monitor*.

CANADIANS TO GRAZE REINDEER.—In Canada the North American Reindeer Company, capitalized at \$750,000, has obtained a concession of 75,850 square miles of land north of the Churchill River to graze caribou and reindeer.

This amounts to 48,000,000 acres, for which the government charges the nominal sum of 4 cents an acre a year. The herds are being gathered by the company's agents.—*Tribune*; New York.



OKAPI IN THE ANTWERP ZOOLOGICAL GARDENS
The young Okapi arrived in Antwerp from Buta, in the Uele, Congo in August 1919.

AN OKAPI IN THE ANTWERP ZOOLOGICAL GARDEN

AT last a fine and perfect living specimen of the rare and elusive okapi has been brought out of Africa, and landed safely in a zoological garden for public exhibition.*

On August 10, a female specimen fourteen months old, arrived at the Antwerp Zoological Garden, direct from Buta, in the Uele country, in the great rain belt of the Upper Congo. It is the specimen described in the article by Mr. Lang in the July, 1919, issue of the *BULLETIN*. This okapi was reared through the skill and enterprise of Mrs. Landeghem, wife of the Belgian Commissioner at Buta, in Uele, Belgian Congo. It was planned in Buta, before the animal departed for Europe, that it should be taken to Antwerp by Mr. Lebrun, an official of the British government and himself a great lover of animals. No doubt that plan was carried into effect.

Readers of the *BULLETIN* are reminded of the great illustrated article in the May 1918, issue, by the famous explorer in Equatorial Africa for the American Museum of Natural History, Mr. Herbert Lang. Its title was "In Quest of

the Okapi," and the illustrations are surpassingly fine.

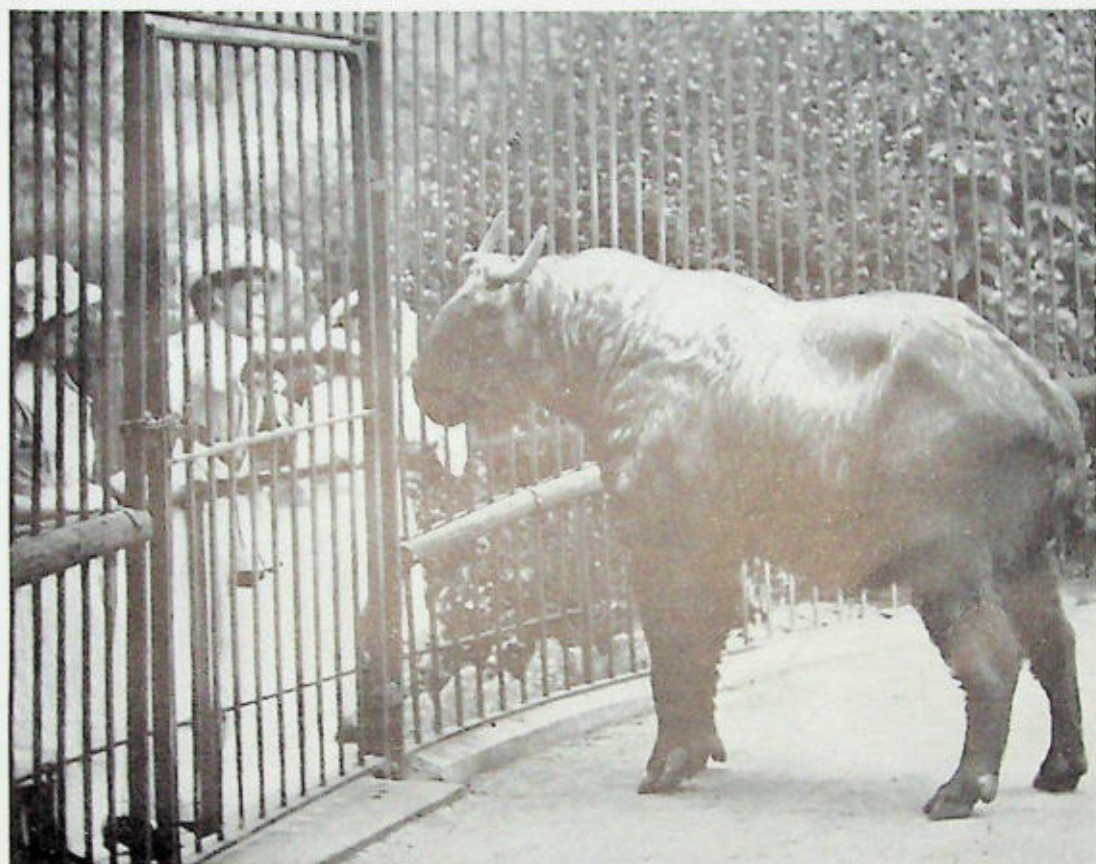
FEATHERED MARAUDERS.

OWLS PREY ON BIRD HOUSE OCCUPANTS.

SUBURBAN aviculturists expect to encounter pests in the form of feral vermin, and endure their depredations with a philosophic spirit, as part of the game. But an urban institution partially surrounded by crowded apartment houses, might naturally hope to have only the parasitic animals of civilization, such as cats and rats, to contend with. Unfortunately, we are beset by both groups. Rats and cats we have with us always, although usually not for long, since their partial extermination has been well systematized. But for combatting the piratical visitors that periodically descend upon us from the wooded areas to the north, we are less well equipped.

Raccoons, opossums and even foxes, enter the Park at surprisingly frequent intervals, and always take their toll of our birds before they can be captured. Hawks visit us in numbers during each migration. Screech owls are permanent residents in the Park and each winter re-

*The young okapi did not survive in captivity very long, dying September 20, 1919.—Editor.



TAKIN IN THE LONDON ZOOLOGICAL GARDENS

This specimen which was the only one in captivity has died recently. The Society possesses a mounted specimen of the Chinese Takin, the entire skin, skull and horns of which were presented to the Heads and Horns Collection by Hon. Mason Mitchell at that time Consul at Chung King, China. An interesting account of this occurrence appears in the BULLETIN of September, 1910.

From a photograph by O. W. Barrett

cords one or two transient barred owls. Early last spring, two screech owls acquired the habit of entering the Bird House through the ventilators that necessarily were left open at night. No doubt their original purpose was the laudable pursuit of mice, but soon they found that the cages contained game much easier to capture. After several birds had been mutilated through the wire of their cages, we managed to put an end to the visits.

About the middle of last winter, we found that some nocturnal creature was disturbing the waterfowl, and later we missed some of the smaller ducks. Investigation led to the belief that the marauder was a large and powerful owl. Keeper George Snyder volunteered for the role of executioner, but after several night-long vigils without result, was becoming disheartened. His determination revived, however, when we made the discovery that a valuable blue goose, a bird supposedly beyond the strength of an owl, had been killed while watching was actu-

ally in progress. Stimulated with fresh resolve, Keeper Snyder resumed his nocturnal post. That very night, as he was passing the Pheasant Aviary, he noticed two glowing eyes shining distinctly in the darkness from a point about two feet above the cage. There was no time to waste in speculation, and he promptly let go with a single-barreled shot-gun, straight at the points of the light. After the smoke had cleared, a search with a lighted match revealed a really tremendous horned owl in his last struggles.

No horned owl has previously been recorded in the Park, although a locality that has been visited by a bald eagle, an American egret and evening grosbeaks, might easily include the horned owl in its avifauna. This particular owl was of unusual size; its wings from tip to tip, measuring fifty-five inches. Its weight, determined at the American Museum of Natural History, where the bird was sent, was found to be four and one-half pounds. [L. S. C.]

THE SEVENTEEN-YEAR LOCUST

By RAYMOND L. DITMARS, Curator of Reptiles.

(Illustrated by enlargements from motion pictures prepared by the author.)



BY THE time that this article appears, a great event will have passed, and billions of the shrivelled bodies of a marvelous insect, the seventeen-year cicada, will have returned as debris to the soil.

Despite the scepticism of scientific writers, certain

popular names mean much to amateur observers and the species figuring in this article will ever be known as the periodical locust—though locust he is not. That popular term should apply only to the members of a family known technically as the Locustidae, but more commonly termed the grasshoppers. The principal of this *resumé* is a member of the great race of suctorial insects, embraced within the orders scientifically designated as Hemipter and Homoptera. The generic name of the marvel to be described is *Cicada*—and having gone thus far, the writer feels that this is sufficient technical detail.

The interest of the *Cicada* centers about its life history and the right domination of it by a natural law or force apparently as inflexible as that governing the movement in their orbits of the celestial bodies.

Like the prediction of astronomers, announcing the expected appearance of some heavenly body, the government officials in the Bureau of Entomology, at Washington issued a warning early the past spring. It was to the effect that a great swarm of the seventeen-year cicada (officially designated as brood x) was due to appear over a considerable portion of eastern and central United States, extending in a belt from New York and Pennsylvania, inclining southwestward through Maryland, Virginia and West Virginia and embracing the western portion of North and South Carolina and northern Georgia; curving sharply northwestward, through Tennessee, Kentucky, Ohio, Indiana, Illinois and Michigan. Bordering all the margin of this area of superabundance were

localities where the locusts were to appear in fair numbers.

The government chart indicated that they were to appear in twenty states. Over this area, and exactly on time, after a lapse of seventeen years, the swarms appeared at a moment as mathematically correct as an eclipse of the sun or the moon. And one of the strangest things about these legions of newcomers, with their alert red eyes, glistening wings and joy in the air and sunshine, after years of toil in total darkness, underground, and as lowly, grub-like forms is, that their emancipation and freedom is limited to a few weeks and assailed from all sides by numerous enemies.

To review the life history of the seventeen-year locust or—more properly—cicada, we must go to the beginning and note that the egg is strangely deposited. The female possesses an auger-like appendage beneath the body and with this drills holes in tender stems. With each boring she deposits one to two eggs. Skillfully concealed from harm, the eggs hatch within a few weeks and the young cicadas, pure white and in form like microscopic crustaceans, crawl from the boring and without hesitation launch themselves with utter abandon into space. Falling into a jungle of grass-blades and weeds, their one thought is to reach the soil and after a hasty scurrying for spots where their enlarged forelimbs may push aside the particles, they begin working their way downward. Progress at first is slow, but frost is a long way off. With their sharp proboscis they begin sucking the juices from thread-like roots and their growth is rapid. Before many weeks have passed they are strong enough to push aside the soil with the shovel-like limbs and move ahead, downward. Thus they mine and toil from root to root, imbedding the sharp beak to obtain nourishment, existing for a period of seventeen years in the utter darkness of underground.

In travels underground, in search of root juices, the progress is always ahead as the use of the forelimbs seems to be zealously restricted to forcing the earth particles backward and restricted in opposite motion for a supreme engineering feat that may be necessary in years to come—during the construction of an underwater caisson.



Female Cicada selecting a repository for the eggs.

During this almost eternal night, the toiler sheds its outer covering four times, and with the fourth moult technically changes from the larval to the nymph form. There is not much difference in form and none in habits, but capelike flaps on the sides of the body indicate a development beneath of the wings that will be used in years to come. The final larval moult takes place in the thirteenth year.

It is at the end of its sixteenth year that the most marvelous of events transpires. To say marvellous, is to use a weak term, even with the assertion that here is a manifestation of instinct—if instinct it is—that is more amazing than the fulfillment of the most spectacular of astronomical prophecies. The latter are along mathematical lines and must transpire if the planets continue to move, but with the cicada we have billions of lowly forms, scattered over every type of soil where storms have raged on one and droughts have burned another, where cold "waves" have rendered the soil as hard as granite to a yard in depth, or a belt of southern country that has been bathed in mild winter sun—no matter how varying the conditions—throughout the seventeen years if embraced within the area of the swarm, the toiling multi-

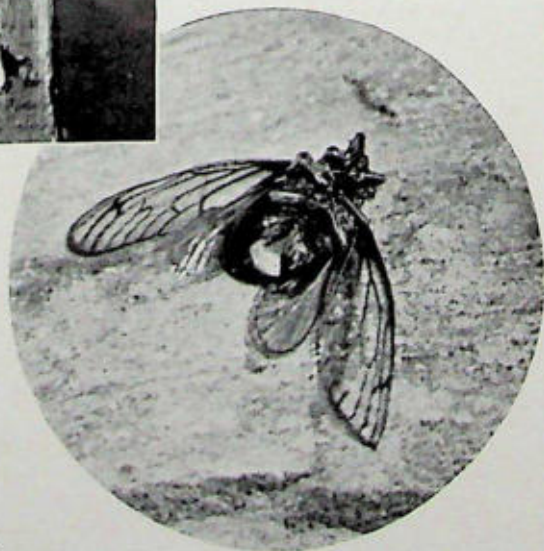
The life cycle terminates in the Cicada's death.

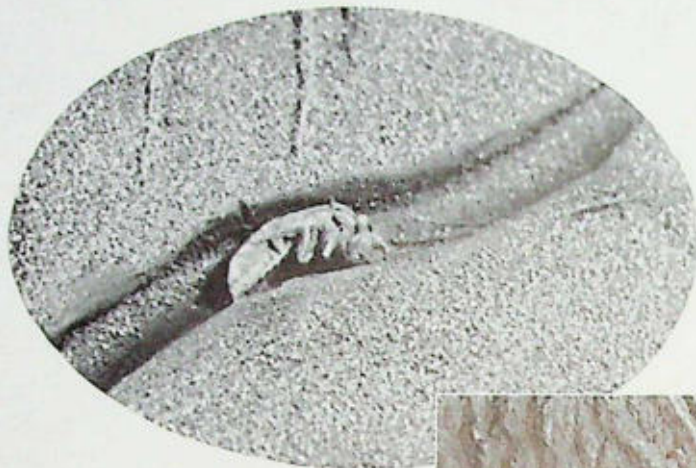
tudes will appear from the earth on time—the last of May—just seventeen years from the time their former generation was emancipated from subterranean darkness.

In emerging on schedule time through varying conditions of soil, they overcome such obstacles as cinder roads and even flooded ground. Nothing daunts them. The powerful fore-limbs tunnel and dig, always thrusting the earth backward and the wingless creature emerges, from a hole as round and clean as though a projectile from a rifle had pierced the ground. The earth is honeycombed with the tunnels of the emerging legions. The toilers bore their way through hard paths where man has trod or rolled cinders and ashes for year after year. Myriad holes appear along the edges of cement boulevards—on time with the rest—and this has involved frenzied labor in horizontal tunneling when the surface was found unyielding. But most wonderful of all is the ingenuity displayed when the upward journey has met such grave obstacles as swampy ground and shallow water.

A horizontal detour would be impossible—too long to complete the journey of emergence on schedule time. Preparations are at once made to meet this difficulty. The crea-

Cicada eggs deposited in a perforated twig.





Tunneling to the surface.

ture begins the construction of a waterproof caisson. Feverishly thrusting the wet earth *forward*—the only condition under which it does this—a cylinder of cement-like mud rises to a height of from three to five inches, the height apparently calculated to allow a margin of safety should the



swamp be flooded by rain. And from the roofs of these turrets the builders emerge at the same time the more fortunate members of the great swarm issue from the loamy ground of the adjacent country.

Where there are trees, the emerging creatures crawl a short distance up the trunk and pause. It is their last step as a crawling, toiling being. The back splits open and from the earth-stained shell the

Cicada caissons elevated above water level.

locust slowly emerges. For a time the soft and whitish body is pendant. Then feeble limbs grasp the bark and the creature drags its way a short distance and rests. Two crumpled bundles are slowly unfurled and assume the outlines of glistening wings. A surge of dark hue flares over the body, which is soon black, with ruddy markings. The eyes are brilliant red.

Where the tunnels end in soft ground.



It is not many hours after the transformation of the myriads that the woodlands resound with the strangest of insect songs. The continuous drone seems far away yet if the observer stops and listens intently one realizes that it is everywhere. This sound is produced only by the male cicada and is the song of the insect's brief

Tunneling openings in a hard cinder path.





Like mummy cases, the cast shells adorn the twigs.

courtship; for death is but a few weeks distant. Beneath the body of the male are two organs covered with protective flaps that are best described as miniature kettle drums. Covered with tightly-stretched membrane they are vibrated by an almost microscopic air valve. After about a week of the droning love song, the female cicada becomes of considerable interest to mankind.

Though both sexes of the cicada are provided with a beak for sucking plant juices, they do little feeding in the imago stage. They have little time for feeding, in fact, as courtship is too short and death too near. The female is provided with an auger-like appendage beneath the abdomen. This boring instrument is used in imbedding the eggs in slender branches. And here occurs the only harm that comes with the locust swarms. With this phase of the cicada's life, we complete the cycle of this creature's existence through its seventeen years of life and return to a phase explained in an early paragraph in this strange story, where the eggs are noted to rest snugly within a twig. But it is of interest to explain how the female employs the ovipositor.

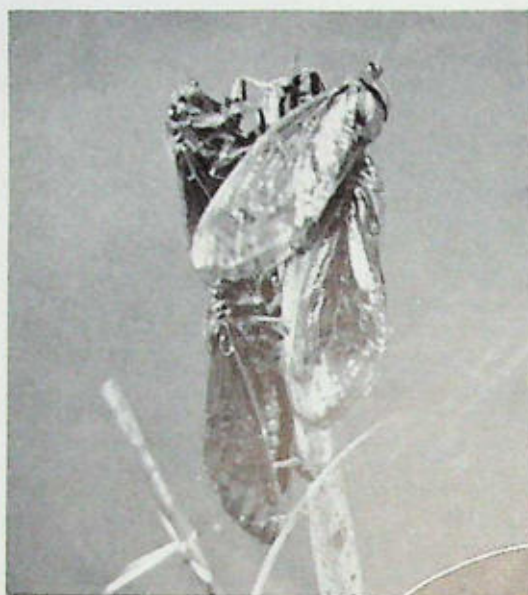
The trunks of the trees festooned with dried casts.

Selecting terminal stems, where the bark is soft and green, she literally drills a hole with the sharp instrument at an oblique angle to the pithy center of the twig. By an expanding process at the tip—the ovipositor enlarges the cavity at the bottom and from one to two eggs are secreted. Crawling up the stem, she makes a slit in the bark for a fraction of an inch, then drills for another insertion of eggs. After about a dozen perforations, she flies to another branch. The attacked twig looks as though a large pin had been sunken at regular intervals and heavily dragged between the perforations. Throughout the woodlands, innumerable branches are to be seen thus attacked. Masses of injured stems even can be detected at a considerable distance owing to the uniform injury and protruding fibers of the injured surface. A considerable

portion of the injured twigs wither and die and the woods are soon spotted with sprays of dead, brown leaves, imparting to the forests an aspect of scarring from a fire. This is the only material damage done by the cicada swarms. Its effect upon the forests is superficial, but serious if orchards are involved. Fruit trees occasionally are attacked, but seldom to a serious extent if wood-

A cast shell showing split through which the cicada emerged.





Preparing for the first flight of their brief life.

land is nearby.

The writer very thoroughly investigated the cicada visitation at several points of the great area of occurrence—both in Georgia and Long Island. In both areas there was little damage to fruit trees—the great majority of the eggs being deposited in nearby forest growth. At Massapequa, Long Island, a thicket of young birches showed the stems to be absolutely riddled and a nearby orchard of young peach trees to be practically without damage. A few scars were noted in nearby apple trees, but the birch thicket, and groups of young oaks had halted the cicadas from the fruit trees.

Seventeen years is a long period of time through which to remember a former menace, but fruit growers would do well to be ready for a coming visitation—about which they are always warned by the government. The critical time to make ready is several years before the occurrence of the swarm and the process of preparation should be the actual cultivation of young and natural tree growth where the locusts are expected. The more profuse the growth, the better, and particularly as regards the development of sucker branches to attract the female

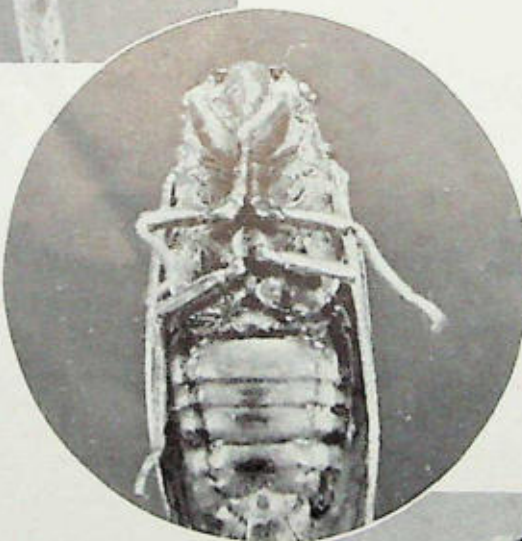
The perfect insect now ready for flight.

cicadas away from neighboring fruit trees. Most important of all should be the provisions to guard against brush-fires the year before the cicadas are due to emerge. They appear late in May and the preceding fall is the time to be on guard. It is then that the brush and young growth that is to entice the cicadas is imbedded in dry leaves that will quickly flare and spread a withering fire.

Within a month after the ground has been riddled by the emerging myriads, the droning courtship song has reverberated all day and suddenly ceased each night, the eggs have been snugly encased and the cicadas have completed their task and also their lease of life. It is during the third or fourth week of their joyous flight and fast that one another becomes less sure in flight and footing and drops to the ground during the late afternoon journeys

through the foliage. Stunned for the moment, these individuals crawl slowly over the ground, but are overtaken by the chill of dew and condensation. They are dead by morning and others whose impoverished bodies have been attacked by a fast growing fungus are rapidly falling to swell their numbers. The droning song quickly grows fainter day by day and

The folded arms of the male Cicada cover the singing organs.



with rapid disintegration all signs of the swarm—except the damaged stems—disappear to human eyes.

The student of these strange creatures realizes, however, that a few weeks later, other legions will appear. They are too minute to attract attention and emerge from the imbedded eggs, thence through the orifice drilled by a deceased parent to assure their safety. Without hesitation they launch their frail bodies into space and after their aerial journey begin their tunnelling which is to last for seventeen years of time.

In a former paragraph the writer referred to the visitation described as Brood X. Strangely enough the government officials of the Bureau of Entomology at Washington, have charted seventeen distinct broods of the seventeen-year cicada. Brood XI is due to occur next year in Connecticut and Rhode Island. Practically every year sees the emergence of one of these broods in some part of the United States. Brood X is the most extensive of them all, but in 1923 a great swarm will appear to represent Brood XIV. This will extend southward and westward from New England and has been noted in history from our early colonial days.

LEBANON CEDARS VANISH

SACRED TREES ALMOST EXTINCT

THE cedars of Lebanon have almost disappeared from their native mountains of Palestine, and yet one hears no great protest. Trees 2,000 years old, that passed through their infancy a hundred years before the Christian era, were cut to supply fuel for military locomotives during the war.

The wholesale destruction of wonderful works of art during the war brought forth groans that were heard around the world, but the wood-chopper, without a murmur being heard outside, has destroyed this living thing that for centuries has been used as a symbol of physical strength by nations forgotten except in the pages of history.

These beautiful giants thrived best in their native home in the mountains of Lebanon in Palestine, just south of Beirut. Their wood is so durable that Pliny, the Roman historian, said it was everlasting. The Arabs regarded the trees as endowed with the principle of continual existence, and when the great age of some individual specimens is considered they had very good reason for holding this belief.

Timbers unearthed by excavators in the ruins of the ancient Assyrian cities were found to be practically unchanged after passing through 2,000 years of vicissitudes.

The cedar forests, which were historic when the armies of Sennacherib laid them waste in 608 B. C. as recorded in the Bible and mentioned in the Psalms of David, have now been ravaged by the Turks to feed their locomotives that drew trains between the military station at Beirut and the ancient capital at Damascus. The conquerors of the Turks continued the practice.

The cedars of Lebanon have the reputation of being particularly fragrant, and in ancient times the oil of this tree was thought to have curative properties and as such was applied to the body of those suffering from leprosy. The Romans used the oil for the preservation of their manuscripts.

The great size of individual trees produced a profound impression upon the beholder. The trunk often attained a girth of forty-two feet, and a height of ninety feet was common. With this is to be considered the fact that the spread of the tree's branches exceeded its height; an unusual feature in an evergreen tree.—*Argonaut*; San Francisco.

WILD ANIMALS CHILLED.—Warren, Pa., Feb. 11.—Deep snow throughout this entire section is driving the deer from the forests to seek food and shelter with domestic cattle in adjoining farms. One herd of thirteen has been seen a number of times in the vicinity of Kane.

Foxes and other wild animals close to civilization have taken to the mines for shelter.—*Sun*; New York.

BIRD LOVERS INDIGNANT.—Bird lovers of Riverton, N. J., are criticising the proposed campaign of the federal and state boards of agriculture for the extensive use of poison sprays on hundreds of miles of highway foliage in the fight against the Japanese beetle next spring. Representatives of Audubon societies, it is said, have been asked to look into the programme by farmers who believe the poisons will kill insectivorous birds that are of more value in combatting the beetle pest than are the direct poisons.—*Evening Sun*; New York.

Grand Chenier Bird Refuge cost the Rockefeller Foundation \$7,872 for taxes and expenses in 1918.—*Sun*; New York.

A Notable Event for Bird Lovers
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TEMMINCK'S TRAGOPAN, *Tragopan temminckii* (J. E. Gray)
(Specimen color-plate from volume one)

A MONOGRAPH OF THE PHEASANTS

By WILLIAM BEERE

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YOUNG BULL YAK BORN IN THE ZOOLOGICAL PARK

One specimen from the Society's collection was presented to the Zoological Gardens, Antwerp.
From a photograph by Elwin R. Sanborn.

ZOOLOGICAL SOCIETY BULLETIN

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NUMBER 3

SILVER PHEASANTS IN THEIR WILD HOME

By WILLIAM BEEBE

Illustrations from photographs by the Author



SILVER Pheasants are almost the commonest species of the family in captivity. They are hardy and prolific, and the hens will incubate their own eggs and rear the young birds, when domestic fowls are not used as foster mothers. They are not so successful as

introduced game birds on preserves, because of their tendency to remain in the vicinity of homes and farm lands. It is disconcerting to go out after Silver Pheasants and have a pair come into full view, look at you, and then walk in your direction. Shooting under such circumstances has all the thrills of hunting in a barnyard.

They are beautiful birds and for once the scientist who named them used real imagination, and their specific designation of *nycthemerus* or *day-and-night*, does poetic justice to their sharply contrasted colors of white and black.

Although so common in captivity, yet the Silver Pheasant is almost unknown in a wild state, no one has ever seen a nest or egg of feral birds. It ranges across Southern China, almost from the sea-coast in Fokien, to the border of Burma, where it interbreeds with the darker birds of the Himalayas.

Standing on the high divide which shunts its eastern waters into China and its western into

the great rivers of Burma, a great tumbled, irregular mass of mountains and valleys is seen on the Burma side. All are forest clad with bamboo, oak and other hard woods and it was here, hidden beneath that vast extent of many-tinted foliage, that I found pheasants which, from the point of view of their origin, were the most remarkable of their family.

Elephants and mules were the commonest means of transport and I found it necessary to take an escort of six Gurkhas. The Kachin tribes hereabouts are nominally safe, but the individual components of these tribes are uncertain quantities. As still-hunting was my method of finding and observing these pheasants and as I always carried a .303 rifle cartridge in the third barrel of my gun, I worried little about human enemies and only twice was even threatened with any molestation. A few miles to the north, however, the wild tribes are wholly independent and work their pleasure upon strangers.

I spent many delightful days in the study of these birds, glorying in the wonderful scenery and magnificent climate after many months of hot, steaming, tropical jungles. The early November mornings were keen and clear, and every valley and depression was always filled to overflowing with a calm, waveless lake of cloud.

The farthest Tibetan and Yunnan peaks were a deeper purple than ever painter dared put to canvas. The sweetness of the chorus of bulbuls was the major theme at this hour, with a minor accompaniment of distant cooing doves.

But pheasants were difficult to find in the morning and one might wander about for hours with never a glimpse.



BY ELEPHANT THROUGH NORTH-
ERN YUNNAN AND BURMA

About three o'clock in the afternoon of one of my first days in this region when the sun still held back the sting of the coming night air, I left camp and turned down one of the old, native trails. The ground was littered with dried leaves and the southing wind through the bamboo leaves gave an added hint of autumn even thus near the equator. The rains were just over and the foliage was bright and clean. I crept as quietly as possible down, down to the very bottom of a deep ravine which the sun's rays had already left. I knew that the Pheasants

were certain, sooner or later, to come down to this level for their evening drink. Near the mossy bank of the rivulet I seated myself and began to vigil. For an hour I sat quietly, making certain that the birds had not yet come down. Through the curtain of lofty ginger stalks overhead I could see Drongas darting here and there after insects. Small fly-catchers and babblers passed in flocks, drinking and flitting upward again. Mosquitos rose in clouds and pestered me sorely. Once the low tree ferns on the opposite bank were shaken and through the deeper shade of their fronds I saw a small tiger cat passing, slowly, sinuously. He, too, sensed that pheasants come here to drink.

Knowing from the silence that they were not yet among the bamboos above, I crept on up the valley. Tree-vines had hung their great masses of bloom overhead, and graceful wisteria-shaped flowers light-



SILVER AND KALEEGE PHEASANT COUNTRY, BURMA AND YUNNAN

ened the gloom with their pink and salmon petals, and spread far their musky odor—that of *Hemiptera*. Some four-footed creature dashed from my path and marking its fright, left another sharp stratum of musk upon the air.

I came upon a maze of footprints, where pheasants had that morning crossed the muddy rim of the pools, and here I turned upward. I know of no more difficult feat than attempting to climb noiselessly up a steep bank through clumps of bamboo, the ground covered with the driest of sheaths and leaves. Finally, I passed the grave of a Kachin chief, covered by an oval thatched hut and a curious ornament of dyed bamboo. Just beyond, I reached the mule trail which at this point cut into the bank of the upper slope. Still hearing nothing I climbed half-way to the summit of the ridge; here an open growth of oaks, when suddenly a shift in the breeze brought to my ears a loud scratching and rustling among the fallen leaves beyond the summit. I was exposed to full view, so with all possible speed I backed down the slope on hands and knees, crossed the trail and ensconced myself in a small thicket, which gave me full view of the oak slope which I had just left.

For half an hour I heard nothing, then a leaf flew upward from a tangle of vines and a sturdy form leaped high over a log into view. It was not a pheasant, but a big black-gorgeted laughing thrush. Another and another leaped down the slope, now hidden by tree trunks or bushes, now standing out in full silhouette. There were sixteen in all spread out in a segment of a circle, and chuckling low to themselves at every succulent morsel. They are splendid sturdy birds, jay-like from beak to claw, now holding a wormy acorn and pounding away as hard as a woodpecker, then, ant-thrush-like, picking up leaves and throwing them far over their backs. I was absorbed in watching their gradual approach, when a jungle-fowl crowded loudly in the valley beyond the ridge and brought my mind sharply back to pheasants. I was keenly disappointed at having apparently missed my birds and half rose to go. At my first motion a laughing thrush set up a truly jay-like yell and fifteen throats answered, but with guffaws and peals of loud laughter which no jay could ever produce. When I sat quiet and their alarm passed, they began to sail overhead down the valley. Not being certain at this time of the species I fired and secured one.

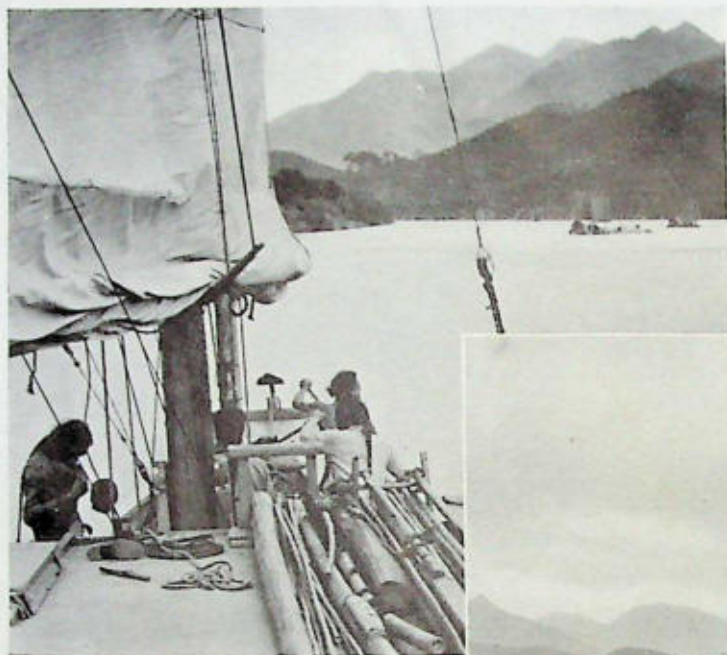
I waited five minutes and heard not a sound, save the calls of the laughing thrushes far down below me. Rising stiffly and slowly moving out into the trail I began to reload, when half-way

up the slope, a black head and neck shot up and the warning or suspicion cry of a kaleege pheasant rang out sharp and shrill.

I dropped flat upon the trail and wriggled back over the edge into my thicket again. Not a cluck or call came from the slope above, but little by little a low murmur of rustling leaves and in ten minutes the ground over which the laughing thrushes had passed was being quartered by eleven splendid pheasants. With my balanced glasses I could see every feather. Four were adult cocks, four more were hens, while the other three were nearly grown young males. Without doubt four of them comprised a still united family of the present year, while five others seemed to represent another. To my surprise I could easily distinguish between three of the male birds. A solitary cock was the lightest of all, apparently a full-blooded Silver Pheasant, one of the young males appeared as dark as a black-breasted kaleege, while its brother was lightly vermiculated. I watched the dainty birds, stepping high like thoroughbreds, snatching an insect or leaping at some morsel on a leaf overhead, or picking up an acorn; ever alert and watchful. I remained as still as the tree-trunk at my back and the birds descended half way down the slope toward me.

Then two Kachin women with silver and tassels in their ears and great baskets on their backs came along, chattering loudly. They halted when they saw me and despite all my motions, stood stupidly gaping at me for several minutes, before they plodded on their way. The pheasants had of course retreated to cover and when, twenty minutes later, they returned they were spread out more irregularly. I secured the light colored old male and two young black ones which came within range and the others passed me on either hand, together with a junglecock, which in bearing and gait was not to be compared with the far more elegant and graceful pheasants. Except for a short, sharp alarm note and five minutes of silence, the rest of the flock paid no attention to the roar of the gun. As I had occasion to notice on many other occasions, if one shoots from a thicket and makes no movement after firing, the birds seem to have no sense of direction of the danger and are but little affected by the sight of their dead companion. When headed down toward water I have never known a flock to be turned back by shots fired in this way, and have secured as many as four from the same ambush.

The following day the same route was followed by both laughing thrushes and pheasants and on each of the succeeding six days, when my observations ceased. In no fewer than eight



HOUSE BOATING ON THE MIN RIVER

From Foochow in quest of Silver Pheasants.

other flocks, or more properly families, of pheasants in the hills farther to the east I found the same interesting relation between the two different groups of birds.



SILVER PHEASANT COUNTRY

Well up from the coast.

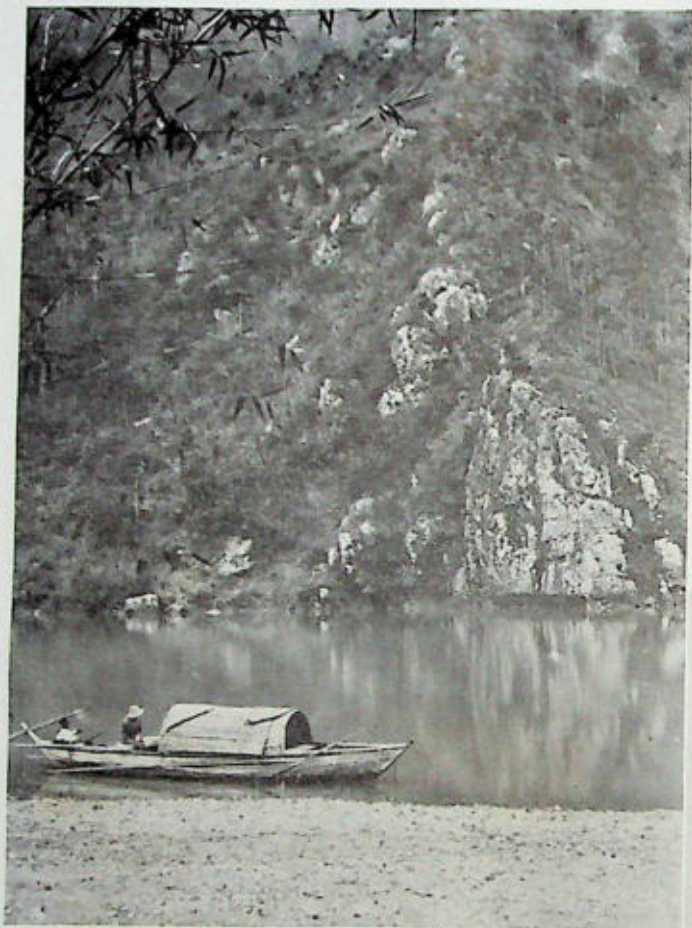


MATTING SAILS NEAR FOOCHOW

The vegetation here has been trimmed for centuries for fuel.

Early in the morning the birds worked up hill toward the higher, warmer ridges rather irregular and at no special time, early or as late as nine o'clock as the fancy or abundance of food influenced them. At this time they kept together in small family parties, uniting with others only when starting down for the

evening drink. Mid-day was spent in dense bamboo thickets or tangles of thorn palms where observation of them was almost impossible. I once watched three birds apparently picking ticks from one another's heads and even from under the uplifted wings, at full noon in the dense shade of some fallen vines. Toward two in the afternoon of a partly cloudy day or about three if the sun shone warmly and uninterruptedly, the pheasants began calling to one another in undertones—sweet notes which much resemble the voice of our own bluebird, without, however, the plaintive tremolo. The young birds—nearly in adult plumage as



A SAMPAN ON THE MIN RIVER
Here the water was too shallow for the
houseboat.

they were—now and then voiced these sweeter notes chick-like *seeps!* and *peeps!*

Gradually working together, with the laughing thrushes drifting along like scattered leaves or bounding with high, strong leaps over the low bushes and logs, all united in a loose flock and began feeding slowly downward, usually over a southern slope. The greater activity of the thrushes usually carried them several yards in advance before they had gone far, but many times I watched the birds at a distance and saw them keep together for a thousand feet or more of descent. In such a case I would locate the flock as it crossed an

open space well up on the mountain, and making a detour and concealing myself far below in the line of their descent, I would be almost certain to intercept them before they reached water. The thrushes are almost wholly insectivorous, while the pheasants choose animal and vegetable food in equal quantities.

Whether the relation is mutually helpful in any way or not, it certainly exists. And, as I have said elsewhere, while the association may be due solely to the social love of birds, it is certainly true that the laughing thrushes many times give the pheasants warning of danger visible from trees, which the latter on the



SILVER PHEASANT COUNTRY

The birds come down here through the scrubby pines to drink.



CHINESE HEADMAN

The headman of the village of Sin-ma-how showing where the Silver Pheasants could be found.



KACHIN BOY

He is armed with a cross-bow of wood with trigger of elephant ivory that shoots poisoned arrows. By his side is his great sword-knife

ground could never detect until too late; and again I have repeatedly seen several thrushes stand around while the pheasants scratched or pecked to pieces some fallen log, now and then springing into the air to seize an insect that had escaped by flight from the larger birds.

Two species of laughing thrushes are thus found in intimate association with the pheasants, the black-gorgeted and the black-throated. These were usually in separate flocks of from six to eighteen individuals, but now and then I observed both species feeding together. When a bare patch of ground or a wide trail is encountered, the pheasants cross it by a quick dash, the laughing thrushes by a single scaling flight.

After drinking at the rivulet or pools in the ravine bottoms, by which time it is almost dusk, the birds fly up into trees to roost for the night. I have never actually seen this, being defeated either by the sudden descent of darkness or the wary scouting of the birds before they retire. But again and again I have heard the heavy hollow beating against air and leaves as the

birds reach a first and often a second branch before they settle down, after mumbling a few smothered, low notes. By aid of the strong moonlight I have seen them sound asleep, seldom above, but two or three close together, a few feet from the trunk, heads under wings.

The few crickets whose chirps were not yet silenced by the chill of the autumn night still shrilled faintly; small owls hawked about after droning beetles; a podargus fanned my cheek like a ghost of a bird, and far off in the blackness toward the wild Chinese mountains, came the moan of a leopard. As I turned homeward, a wind—first prophet of the morrow's storm—rattled the bamboos, drawing forth weird sounds which seemed to verify the Kachin's belief in the spirit *nats* which wander along every trail at night searching for evil to do. For this reason these wild hillmen will never travel at night, and as I trudged toward camp from the sleeping pheasants I knew that whatever dangers the darkness hid at that hour, it was from animal and not human foes.

A VICTORY FOR AVICULTURE

THE PENGUINS OF MACQUARIE ISLAND

From the Avicultural Magazine

WE HAVE received the following from the London correspondent of the *North Queensland Register*:—

"At the Brisbane congress of the Royal Australian Ornithologists' Union, Mr. C. Lord (Tasmania) emphasized the necessity for Macquarie Island being made a sanctuary for the preservation of the Penguin. Captain White (South Australia) moved that this Union is of the opinion that Macquarie Island should be declared a sanctuary for the perpetuation of the fauna of the Antarctic. He said that the Federal Government proposed to buy the island from Tasmania, which asked £15,000 for it. This was rather high, seeing that the island was leased for forty a year for private exploitation. Dr. Mawson had said there would very soon be a dash into Antarctica to secure its furs and oils, and it was very desirable that the Federal Government should step in and make a sanctuary on Macquarie Island. Mr. Lord seconded the motion, which was carried, and the Council was empowered to take action even to the expenditure of funds to secure the object of the motion."

Our sister association, the Royal Society for the Protection of Birds, now reports as follows in *Bird Notes and News*:—

"The long-continued efforts of the Society on behalf of the persecuted Penguins of Macquarie Island have at last borne the fruit desired. It is announced that the Government of Tasmania has refused to renew the lease of the island to Mr. Joseph Hatch and his oil company, which for years has been massacring the birds at the rate of a million and a half a year for the sole purpose of boiling them down for their oil. It may be remembered that as long ago as 1905 a resolution, carried at the International Ornithological Congress at the instigation of the Society, was cabled to the Tasmanian Government protesting against the business; but unhappily the lease was later on renewed. Letters of remonstrance and appeal have since been addressed by the R. S. P. B. to the New Zealand and Tasmanian Governments, and to the Prime Minister of the Commonwealth. The subject was again brought forward last March at the Annual Meeting of the R. S. P. B.; Mr. Mattingley, the Society's representative in Australia, offered to go over and investigate the facts; Mr. Pycraft ventilated the matter in the press; Mr. H. G. Wells made it the subject of a powerful passage in "The Undying Fire"; Sir

Douglas Mawson spoke strongly upon it before the Zoological Society of London; Mr. Cherry-Gerrard roused public opinion through the *Times* and the *Spectator*. At last the hideous slaughter is brought to an end.

"We venture to hope," says the *Times* (December 29, 1919), 'that a further step will be taken, and that means will be found to make Macquarie Island an inviolable sanctuary for Antarctic life.'"

EXTERMINATING THE AMERICAN
EAGLE*Editorial, New York Sun-Herald*

Are the American people to exterminate the American eagle? The bald eagle, national emblem of the United States since June 20, 1782, is in such danger that it may have a fate like that of the passenger pigeon. There are men who recall the great nestings of these pigeons, in which the birds gathered in numbers which broke limbs from trees. The pigeons were so plentiful they sold at the killing place for half a cent each. To-day not a single passenger pigeon remains alive.

One way to exterminate a species is to put a price on the heads of its members. That is what Alaska is doing to-day with the golden eagle and the bald eagle, the latter so called from its white head, which at a distance gives the impression of baldness. The Legislature of Alaska in 1917 passed a law which authorized the killing of eagles and fixed a bounty of 50 cents a head on them. The figures from April, 1917, to April, 1920, are not in yet, but the record for two years shows that 5,600 eagles were killed in that period.

The bounty was offered for the eagle on the ground that it destroyed fish and game. Whether eagles are eating more fish and game now than they did a century ago or two centuries ago has not been considered. Perhaps the reason for the enactment of the law may be found in the commercial fox farming on the islands off the Alaskan coast. Surely from no other source until 1917 was there complaint of the destruction eagles do by eating dead fish they find along the shore or the fish they take through their own efforts.

Eagles are long lived birds, sometimes reaching the century mark. They live singly or in pairs in the wilder places. The bird of freedom appealed to the Indians of North America, who held it in superstitious and appreciative regard.

Should not the Americans of to-day have sufficient respect for the bird they have dignified as

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ELWIN R. SANBORN, *Editor*

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MAY 1920

the national emblem not to wipe the species from the face of the earth? Congress could not do better than to come to the rescue of the bird that "grasps the crag with hooked hands."

HANDLIST OF BIRDS OF EGYPT

From the Zoological Service of the Egyptian Government's Ministry of Public Works we have received, as Publication No. 29, Mr. M. J. Nicoll's "Handlist of the Birds of Egypt." On this work its author has been engaged for thirteen years, and it is the first publication of its kind since 1872.

So far as human knowledge extends, it is a complete and well annotated list of the birds of Egypt, it is illustrated and adorned by twenty-five colored figures of birds and many half-tones of bird skins, and the volume is highly creditable to the Government Press of Cairo. It contains a good map, 120 pages of text, and its price is 15 Turkish piastres.

WILLIAM DUTCHER

On Friday, July 2, at his son's home, Chevy Chase, Md., at the age of seventy-four years, William Dutcher, ornithologist and defender of American birds, passed over the great divide. Stricken with almost complete paralysis ten years ago, his actual work ended at that time, but the foundation that he laid, and the structure that he erected upon it previous to that time, will endure forever.

The National Association of Audubon Societies which he founded in 1902 is a monument to his executive ability, his love of birds, his love of fair play, his love of mankind, his abhorrence of cruelty and waste, and to one-man power. Albert Wilcox saw Mr. Dutcher, approved him and his methods, and left his fortune of \$322,000 as an endowment fund for the National Audubon Association.



To Mr. Dutcher his years of labor in the cause of bird protection represented a great burden of extra work, wholly without compensation save in the form of satisfaction in having rendered valuable service to his country. He lived to see and to enjoy the splendid fruits of his labors, of which even disease and death could not rob him.

A brave, clean and gallant spirit has passed away. The world is better because he lived. Wherever American birds fly between the poles, the name of William Dutcher deserves to be known and gratefully remembered.

"I drink to him, he is not here,

Yet I would guard his glory.

A knight without reproach or fear,

Should live in song and story."

W. T. H.

PROTECTING THE PRONG-HORNED ANTELOPE

The occasions wherein the Zoological Society has entered into the field of law enforcement have been few indeed; but circumstances alter cases.

Last summer while touring through eastern Oregon Mr. Madison Grant touched the sphere of influence of the last bands of prong-horned antelope now remaining in that state. They are in Lake County, south by east of the Warner Lakes, and their country is crossed by the Oregon Military Road. They inhabit a region of sterile lava, wholly impossible for agriculture, and only slightly useful for stock grazing.

In that region Mr. M. S. Garretson, Secretary of the American Bison Society, and Dr. Geo. W. Field of the U. S. Biological Survey, say there are probably 300 antelope. Their figures have some value, because they are based upon investigations made on the spot.

The Warner Lake region was the theatre of the remarkable sage grouse observations that were made last year by William L. Finley and R. Bruce Horsfall, and graphically described and pictured by the latter in the *Zoological Society BULLETIN* for January 1920.

It is the desire of many American zoologists that the sage grouse region in Lake County, Oregon, should be made a federal bird reservation, and at the same time provide a sanctuary for the prong-horned antelope remnant still living there.

Mr. Grant's attention was fixed by stories of the illegal killing of antelope; and these accounts were abundantly confirmed by Dr. Field and Mr. Garretson, who found the carcass of an antelope actually in use as wolf bait, beside which Mr. Garretson was caught in two wolf traps!

Finding that no proper officers of the game laws were located within easy striking distance of the antelope range, and that unusual efforts were called for in the punishment of antelope killers, Mr. Grant informally stated that the Zoological Society would be asked to offer a reward of \$200 for the arrest and conviction of any men guilty of killing antelopes.

From that moment onward certain events moved swiftly. It seems that the reward was regarded as fair compensation for the labor involved in journeying to the seat of war, making an arrest and carrying the case through the court to a verdict.

Before the award had been formally posted by the Oregon Game Commission, and also before it had been really authorized by the Zoological Society, another antelope killing occurred, and was reported to the Game Commissioners at Salem. The case was placed in the hands of two competent men: George Tonkin, U. S. Game Warden, of Boise, Idaho, and E. E. Woodcock, Sheriff of Fairview, Oregon. Forthwith those two officers foregathered, outfitted themselves for a long field trip, and took the road. They traveled over the desert 130 miles from Lakeview, and Warden Tonkin thus writes of the camp experiences of the trip:

"The sheriff once was a cowboy, and he can turn off about as good a meal as I ever ate in a camp. He has a regular pantry and kitchen

attached to his Ford. The evenings spent with him by the campfire have left with me a pleasing and lasting impression. The revolver and rifle practice during the day on the coyotes, the mirages in the dry lake valleys, the herds of antelopes and flocks of sage hens and the night music by the coyotes' desert choir were only a few of the incidents that make such a trip indescribable."

The real business of the trip was consummated in the arrest of Arthur Thomas, of Lakeview, Oregon, one hundred and fifty miles from Lakeview, and James Baldwin, also of Lakeview. They had been trapping coyotes and killing antelopes for food and for wolf bait.

The accused men were taken to Lakeview, tried before Judge H. J. Angstead, found guilty, and each one was fined \$200.

It is the expectation of all the game protectors concerned that this demonstration of the workability of the antelope law will tend to discourage further killing of Oregon antelope.

Concerning the payment of the reward, which was gratefully acknowledged by Game Warden Tonkin and Sheriff Woodcock, the following letter tells the Zoological Society's part of the story:

May 20, 1920.

Mr. George Tonkin,

Game Warden, Boise, Idaho.

Dear Sir:

At a meeting of the Executive Committee of the New York Zoological Society held on May 13, 1920, it was resolved that the reward of \$200 offered by the Society on December 11, 1919, should be paid as follows:

\$100 to George Tonkin, U. S. Game Warden, Box 1531, Boise, Idaho.

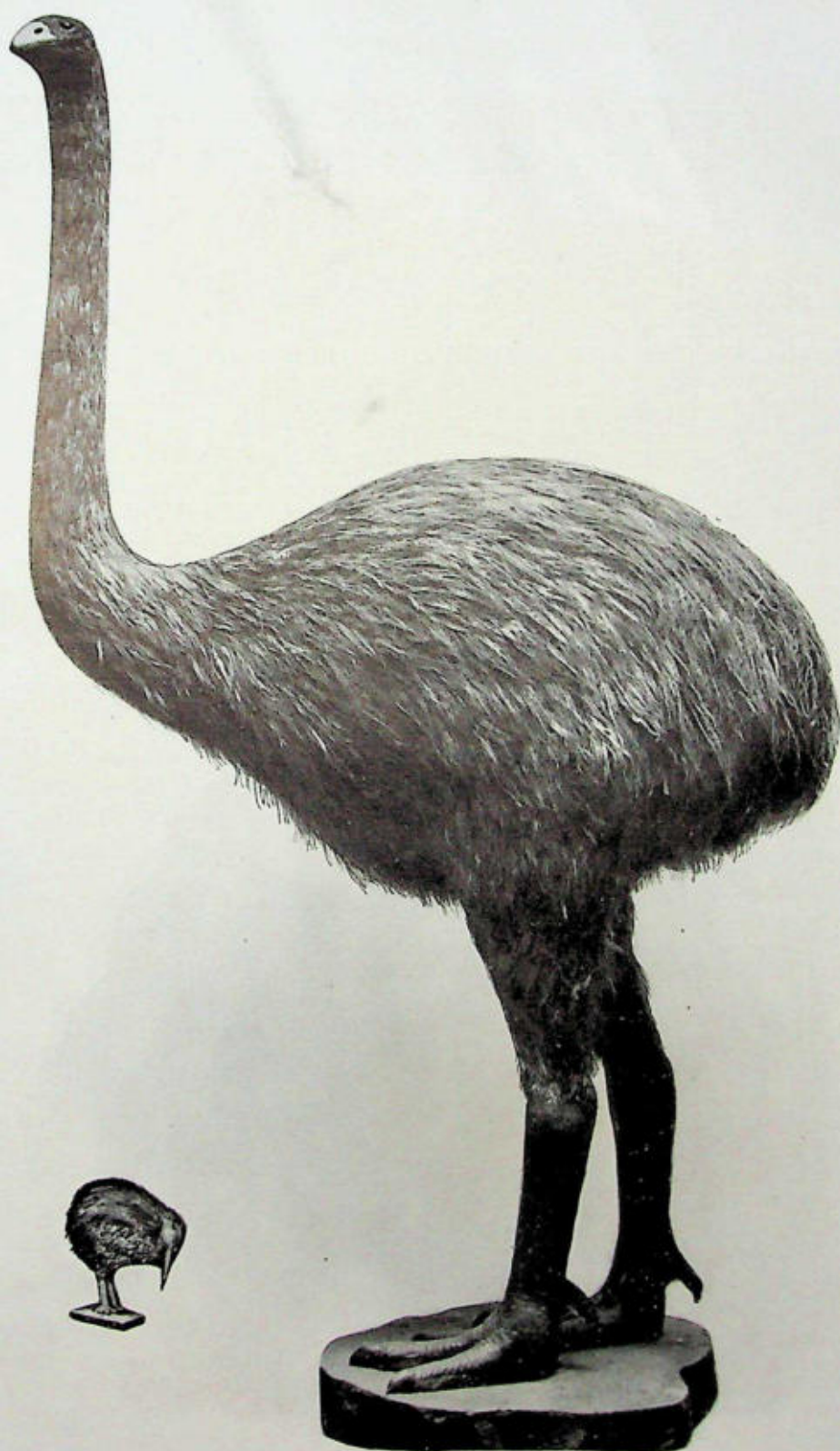
\$100 to Sheriff E. E. Woodcock, Lakeview, Oregon.

The Society in doing this has waived the failure of the Oregon Fish and Game Commission to comply with the requirements in posting notices and also has waived the fact that the arrest and conviction took place before the reward was authorized.

The Treasurer of the Society has been directed to forward a cheque to you, which will probably be sent from here in the course of the next two weeks.

Very truly yours,

MADISON GRANT,
Chairman



LIFE SIZE RESTORATION OF A MOA
Executed by Rowland Ward, Ltd.
A mounted Apteryx is shown for comparison.



EYRA CAT

From a photograph by Elwin R. Sanborn.

THE GIANT MOA, RESTORED

WE MUST confess to a strong liking for good restorations of particularly interesting mammals and birds of the past. The image of the colossal restoration of the Siberian mammoth that was at Ward's Natural Science Establishment in 1876 should be fresh in the memories of at least half a million of the visitors to the Chicago Exposition.

And now another Wardian restoration appears in the form of a life-size moa of New Zealand, executed by Rowland Ward, Ltd., of London, for the museum of Lord Rothschild at Tring. The height of the restoration has not been stated, but it is safe to assume, from the diminutive proportions of an apteryx shown on the same scale, that it is not far from *nine feet*! Although some of the moa species were small, the giants of the Family attained a height of *eleven feet*.

The moas were cousins of the apteryx, or kiwi, and in size far surpassed the largest ostriches of today. Their extinction is not to be laid at the door of civilized man, for they were dead and gone long before white men occupied New Zealand. However, their remains in bones, eggs, feathers and other items brought them down to a comparatively recent date, and supplied much good material to zoological museums. It is de-

clared by Rowland Ward that the beak, feet and legs of their restoration are actual casts from original remains.

In addition to the specimen executed for the Tring Museum, another was produced for the British Museum of Natural History at South Kensington.

The feathers of the restoration seem to have come from the emu, which closely resemble the shaggy coat of the apteryx. On the whole, the restoration seems to us quite an acceptable representation of the living bird as it "might have been seen" several hundred years ago. W. T. H.

OUR EDUCATIONAL SIDE AS OTHERS
SEE IT

Editorial Special Chicago Tribune, May 9, 1920.

By EYE WITNESS

OVER the Lincoln park cage of one of the finest specimens of tiger in captivity appear the two words:

Siberian Tiger

That, and nothing more.

Well, Siberia is a pretty big place—more than 3,000 miles across—and the two-word label



SIBERIAN TIGER IN THE ZOOLOGICAL PARK

He is charging the photographer. Concealed in the pool, visible just at the rear, he waited until the cameraman seemed to be off guard, then leaped out and rushed for his quarry. He always was very serious in his attempts. From a photograph by Elwin R. Sanborn.

leaves the uninformed beholder with a wide field of territory and ignorance to range in.

No guide book or printed catalogue of the 2,700 creatures inhabiting our zoo supplements that label, because the Lincoln park commission does not issue one. It says it can't afford it.

NEW YORK SYSTEM DIFFERENT

In front of the three acres of inclosed land and water where the beavers build and play in the Bronx zoo stands an ample signboard painted green—green so that it won't clash with the foliage of the park—and lettered in black with these words:

American Beaver

(*Castor canadensis fondator.*)

The beaver now exists only in widely separated fragments of its former habitat. Found in Maine, the Colorado River delta, the Adirondacks (by restoration), and a few other localities. Plentiful only in the Algonquin Park region of Canada and a few other localities.

Remarkable for its constructive ability in the building of canals and dams, the cutting of trees, and the construction of winter houses. The original stock of this colony came from Algonquin National Park, Ontario, Canada. Received May, 1912.

Supplementing that label are a couple of pages of entertaining narrative—not mere routine data—about beavers, their wonderful ways, and their unconquerable shyness—in a 200 page guide book prepared for the big public.

EASY TEST FOR CHILDREN

In the "Wild Animal Stamp Primer," prepared by the authorities of the Bronx zoo for children, are two more pages about beavers, written, not in namby-pamby, but in graceful language, readily comprehended by a child.

The print is large. At the top of the first page about the beavers is an indicated space, where the child may paste an authentic 2x3 inch beaver picture in colors after he has searched it out in an oil paper packet of fifty animal pictures attached to the back cover of the book.

Both books are written in a singularly ingratiating, friendly style, and are packed with information. If an adult visitor thoroughly assimilated the contents of the larger guide book he would be a pretty decently informed zoologist. As for the primer for children, it is fascinating. I puttered away a whole evening pasting up one of them, and by the time I had finished felt as learned as a Buffon.

NOTED SCIENTIST IN CHARGE

When I reached Dr. Hornaday's office on my

way through the Bronx zoo, and there congratulated him on his system of labels—which is almost the first thing that captivates you in this wonderland, that is at the same time a school—he said:

"We have made a specialty of our labels. We tell all we can on them and are sorry we can't tell more."

When I confessed to him that we had no guidebook to our zoo, he looked up startled—and sort of irritated, too—and said, "That's too absurd!"—adding, "Inexcusable!"

You see, Hornaday, the director and general curator of the Bronx zoo, is a man of science and an educator as well as a provider of public entertainment, and such an omission as ours in an institution on which we spend \$75,000 a year irks him to the soul on the ground that it deprives the public of all the instruction and a large part of the entertainment.

He knows, as every instructor knows, that an object concerning which the beholder possesses not one iota of exact knowledge, takes but a feeble hold on either his imagination or his memory. So he spreads information unobtrusively, but everywhere through the park.

EASY WAY TO LEARN

As you are standing in front of the capacious rhinoceros your eyes wander involuntarily to a bright hued map that tells in a few bold colors where in the world the rhinoceros flourishes. You glance above the map and there is a sheet about the size of a *Tribune* page which tells you in vigorous black lines how many kinds of rhinoceros there are, and what are their habitats, and how it is found in America only as fossil remains, and how it lives well in captivity, and so on.

After that you feel as if you had got on a certain basis with the box-headed and friendly creature in front of you.

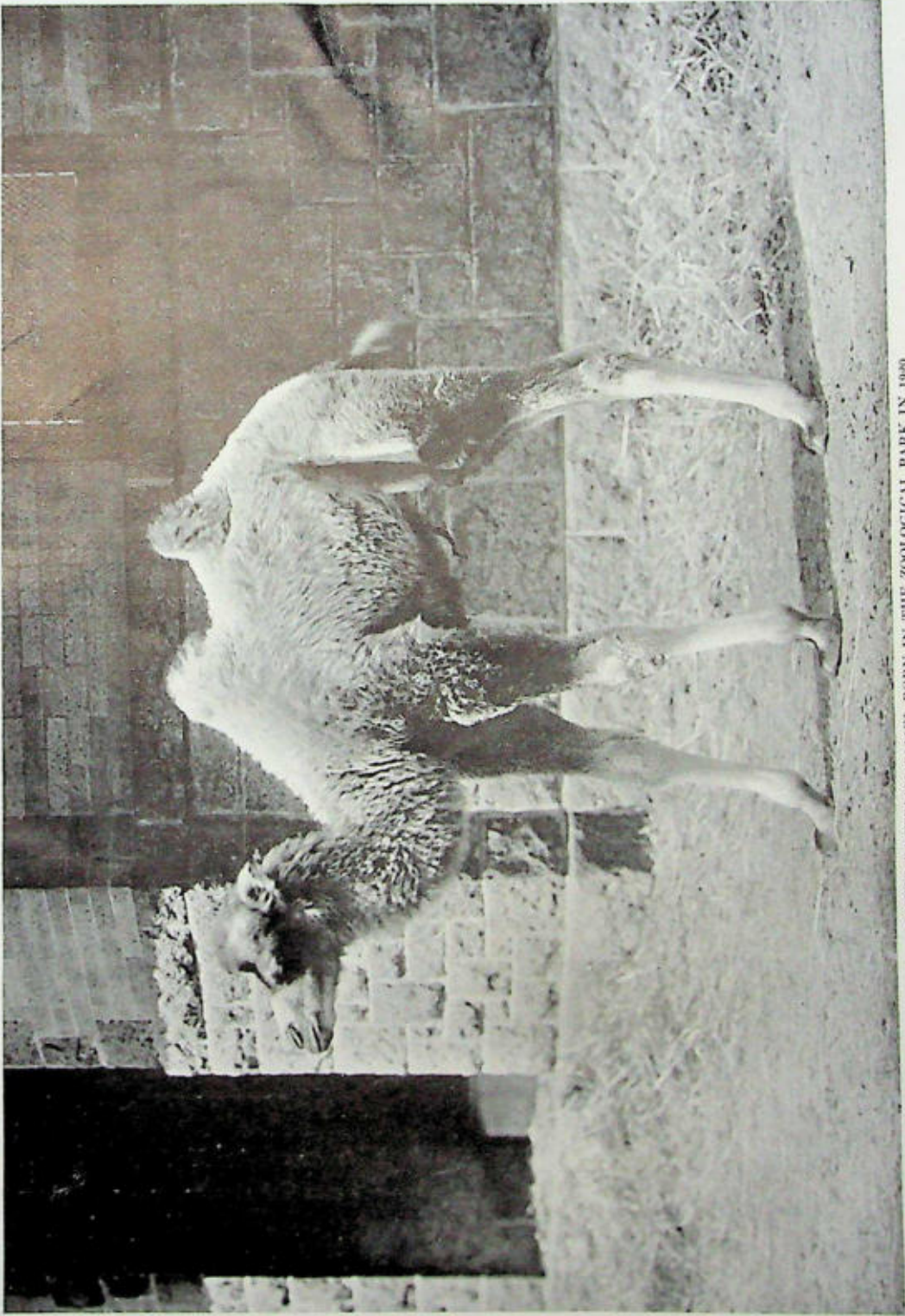
The information has not been rubbed in. You just happened on it.

DESTRUCTION OF WILD LIFE IN AFRICA, ITALY AND FRANCE

EYE-WITNESS TESTIMONY OF AN AMERICAN TRAVELER

A Letter from COL. HENRY W. SHOEMAKER,
Member of the New York Zoological Society.

"I HAVE returned from a 3,000 mile trip through Morocco and Algeria, principally to study forestry matters, but have kept a close eye on game, asking questions everywhere.



YOUNG BACTRIAN CAMEL BORN IN THE ZOOLOGICAL PARK IN 1920

The Society now possesses four camels of this species; which is quite fortunate as there are but few to be purchased.
This young animal was named *Sophia Smith* after the founder of Smith College.
From a photograph by Elwin R. Sanborn.

Excellent game laws prevail, but the great number of hunters has made wild life as scarce in French North Africa as in the western states at home.

Of the larger mammals the lion is gone, and even as a tradition is barely remembered. I visited the grave of Jules Gerard at Bouira, who to my surprise I found survived down to our time, dying in 1911, in his 89th year! The panther is extinct in all except two localities. Judging from the number of women wearing jackal furs, a terrible slaughter has been meted out to these animals. The hyena is very rare.

The mouflon is gone from all sections of Algeria but one, and is scarce in Morocco. Formerly at Biskra horns of the mouflon, addax, gazelle, etc., were on sale everywhere. This time I found only one very old pair of mouflon horns, a few very inferior gazelle horns, no addax, and no panther skins. From forty to fifty English sportsmen hunting each year for forty years (all observing the game laws), have wiped out the mouflon at El Kantara. At Bougie, where panther claws were sold as charms at five francs apiece, none are now to be had at any price, "none being killed" the reason.

In the Sahara, Mahomet Szahir, a character famous at Biskra, says: "The game is all gone. Occasionally, one sees an old skin, that is all. No ostriches have been seen for several years." The bubal hartebeest (*Bubalis boselaphus*), is gone, even as a memory. The Barbary partridge is almost gone. On our trip we actually saw three; and one squirrel, two foxes, two jackals and a tame young wild boar.

Game laws are mere "scraps of paper" in the face of an army of well-armed and indefatigable hunters! *Unless hunters can content themselves with small kills, there will be no game in the future, anywhere!*

When I was here in 1913, the leopard was considered in no danger of extinction. Now it is practically gone. The gazelle is far from plentiful. This winter English and American sportsmen have made big bags, and they will have it all gone by 1925. The wild boar will last the longest, as it haunts the deep forest covers. The decrease in bird life is most noticeable. Many birds which we class as insectivorous, and try to protect, are subject to open seasons here. Apart from the loss to sport and agriculture by the destruction of these interesting forms of wild life, it is a sad fact that much of the picturesque charm of these countries is gone from them by their passing."

Before leaving Algiers, Edouard Arnaud, the best known guide of American and English

hunting parties for mouflon and gazelle, said:

"In the Sahara desert about Biskra and Tugurt the gazelle will last probably three more seasons. It is very scarce now, and thirty to fifty parties of English and Americans go out after it each winter, to say nothing of local and native hunters all of whom make big kills. The mouflon has been completely exterminated in the mountains about El Kantara. The gazelles have been all killed off since the war in the Little Sahara at Bou-Saida. In Morocco, since the French occupation, the gazelles are disappearing fast in the plains about Marrakesh. I know of only one place in Algeria where the mouflon and gazelle can be found in favorable numbers, and that is because it is too difficult for tourists to get in to them."

In the Cevennes Mountains wolves are still to be found, and wild boars are so numerous that one hunter near Anduze killed five in one month. Since the wolves have been destroyed over the greater part of France the boars have increased enormously, and now they can be killed at any time, and in any way. In some sections there is a bounty of fifty francs for mature boars, and smaller premiums for younger ones.

In Italy we found bird life at a low ebb, and an awful slaughter going on at all times. I spent some time with a taxidermist in Turin, watching boys and men coming in with beautiful insectivorous birds, in their nesting season, to be mounted. The taxidermist said:

"Apart from birds, wild life still exists in the Italian Alps. The ibex is still protected as royal game, and though the heads are deteriorating owing to the easy life which these animals lead since their natural enemies the wolves and lammergeiers have been killed, they still exist in fair numbers. The chamois still is to be found, also a few deer; and wolves and bears are sometimes met with; also the wild cat. Game birds have been shot and trapped steadily, as have all other birds, and there seems to be no way to create a public sentiment to save them. In Sardinia the mouflon is fast disappearing, owing to the demands for its horns."

In France bird life is much in need of assistance, due to years of non-protection, though all French scientists are anxious to have something done.* The only bird we saw in an extensive tour of the country was the pie, or magpie, and now there is talk of putting a bounty of five francs on it to get it out of the way. We saw a hawk kill a magpie in the open road near Arles, so they have their natural enemies also. The French sporting papers are deploring the absence of birds and game, and so are the leading

avicultural journals. They advocate bounties to bring back the game, a thing which never happened since the world began. The vanished species must be restocked by man. Vanished dead birds never come back themselves.

In Paris a few *pigeon ramier* still are to be noted in the parks and gardens, but not one where there were ten before the war.

In conclusion, I do not think that the war has changed the condition of wild life either forward or backward. A steady decrease of everything has been and is going on, due to the vast army of hunters with improved firearms, who make game laws a joke by the immense volume of their lawful slaughter. Nature's balance has been upset everywhere by the destruction of predatory animals and birds, hence bounties are placed on the animals or birds which these creatures formerly preyed on. This means the wiping out of species formerly overlooked by the hunters. For example, in Algeria (in the Kabylie country) since the forest rangers have well-nigh exterminated the leopards, wild boars have greatly increased, and they can now be killed at all seasons. One native has killed sixty boars this winter, hunting them with dogs; and such slaughter soon will wipe them out. It is all very doleful to those who love wild life, and desire to see it perpetuated for future generations.

* Immediately following the end of the war, the French National League for the Protection of Birds began to reassemble its scattered forces for new and vigorous campaigns for the protection and increase of the birds of France. In a short time this new movement will be in evidence, all over France, and practical results may confidently be expected.—W. T. H.

ITEMS OF INTEREST

ANCIENT BEARING OLIVE TREES.—There are few trees that bear edible fruit which are good for more than half a century, the olive tree standing alone with its long period of usefulness to mankind. Some of these trees are extremely long lived. There are some in Syria which are known to be more than 400 years old; and not only are they in a flourishing condition but they bid fair to bear fruit for another century or two.

The Syrians have learned much about caring for trees from Europeans. Formerly their olive trees were not expected to produce fruit oftener than once in three years, but with improved methods of culture they now bear abundantly each season. In ancient times the olives

were thrashed from the trees with sticks, but now the Syrians pick them by hand, thereby preserving their trees and also improving the quality of the fruit.—*Evening Post*; New York.

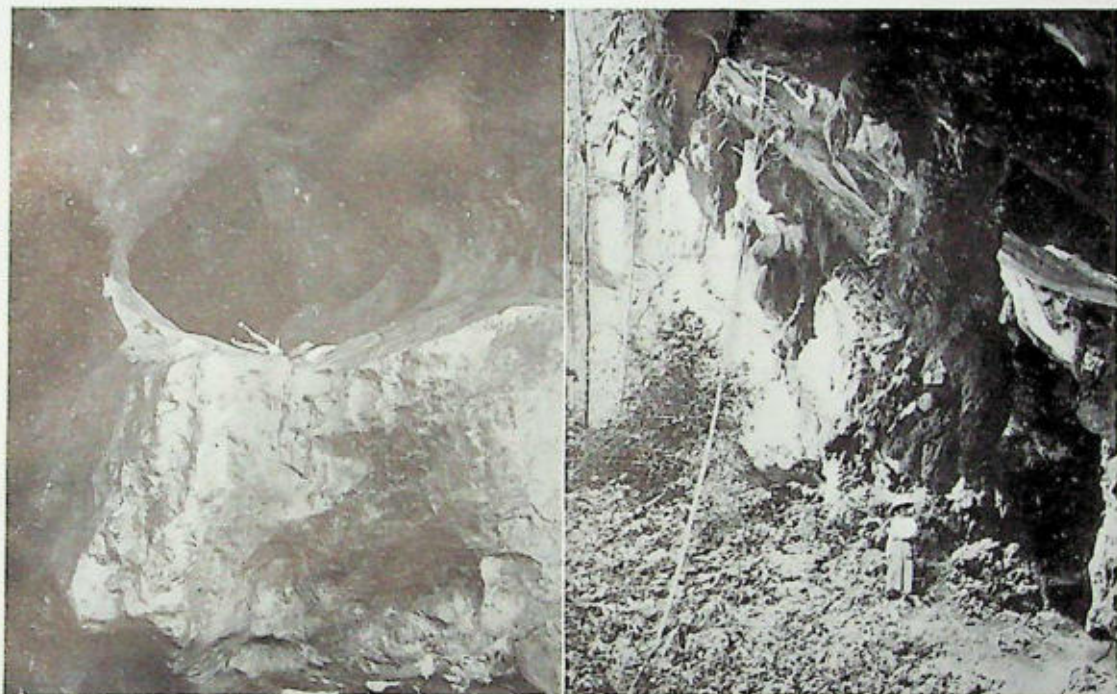
SEALS INCREASING.—Juneau, Alaska, April 7. —Residents of Sitka say that the herds of seal migrating northward toward Bering Sea this spring are greater than they have seen in years and that the migration is three weeks ahead of its usual time. Countless thousands of the seal have been passing Sitka. Government officials say the great size of the migratory herd is evidence that the government's protective measures have been effective—

Messenger, St. Albans, Vt.

THE BATU CAVES.—The Batu Caves, Pahang, in the Malay Peninsula are natural palaces and cathedrals, limestone Alhambras and Notre Dames, carven, dissolved, precipitated, etched within the great mountain chain which extends from Siam to the southern sea. The great stalactites and stalagmites are like milky opals, and near the entrance the vines from the jungle drape the cliffs and send skeins of green foliage as far in as the light of day can reach.

A herd of elephants spent several nights there during my visit, and a tiger slept out the days in a small side cavern, with bones of wild boars scattered about the openings to his lair. Monkeys clambered down the jungle ratlines and looked fearfully into the dark depths; while wild monkey-like Sakai men, tied bundles of bones left from meals high up among the stalactite rafters, for superstition's sake. Besides fear and superstition, these great earth caverns exert an even stranger fascination, and strange beings have deserted the warmth and light of the mountain jungles, and, drawn by some inconceivable desire or need have become accustomed in sense and body to the unchangeable night—such are innumerable bats, hosts of pale yellow roaches, and a few blind snakes. Just outside, venturing only to the portals I found, and studied and shot splendid fire-backed pheasants, and while the flash of my gun was drowned in the blaze of tropical sunshine, the sound found echoes deep in the black caverns, where no ray of light ever came.—William Beebe.

THE HEATH HEN IS INCREASING.—An attempt was made in late April to take the annual census of the heath hen, but the cold storm that occurred at that time so affected the birds that they kept silent for the most part, and no complete count could be made. Reports received from many people on Marthas Vineyard indicated that the number of the species on the is-



THE WONDERFUL BATU CAVES AT PAHANG

The photographs of these great caverns on the Malay Peninsula were made by our Mr. Beebe in his world quest of pheasants.

land had increased considerably since April, 1918, and that probably there were at least 165 birds then on the island. A letter from Mr. Allan Keniston, superintendent of the reservation, received December 8, indicates that the birds are now frequently seen over the greater part of the island, and that in some sections they are approaching the numbers seen before the great fire of 1916, which threatened them with extinction. So much rain fell during the past summer that there was little fire danger, and the unusual precipitation favored the production of much wild fruit and many acorns and other vegetation on which the birds feed. There are no goshawks about and thus far the winter seems favorable, with plenty of food in sight.—From the Annual Report for 1919 of E. H. Forbush, State Ornithologist, Massachusetts.

THE BEAVER AS A MENACE.—From the Walla Walla valley, state of Washington, comes the news that the wild beavers of that locality are disturbing the peace by their depredations. We like the beaver, and we admire him, too; but if beavers were to cut down for us forty bearing prune trees, we would seek lawful relief.

It is estimated that in the Walla Walla valley beavers have done \$3,500 worth of damage, but

the animals are protected by laws both federal and state, and at present can not be touched.

This news reminds us that in the Adirondacks some of the beavers have had the bad taste to cut down many valuable trees on camp sites, and much trouble has been occasioned thereby.

Every state and every province and territory should have a law similar to the wild-animal-nuisance law of New York, which provides that the Conservation Commission may take effective measures to abate any unbearable nuisance that may be created by any wild species, either of birds or mammals.

FLORIDA CROCODILES ARE SCARCE.—As late as the autumn of 1915, we saw at the San Francisco Exposition a great array of living Florida crocodiles, to the number of twenty or more, in one show. They were of good size, and their number bespoke abundance on the home grounds.

Today, it is proving a difficult matter to procure even one specimen seven feet long. On finding that there is not one obtainable in Palm Beach, we appealed to Mr. John R. Bradley for assistance. Hearing of no 'crocks, he appealed to Mr. Joe L. Earman, Editor of the *Daily Palm*



OUR NEW OTTER

Like many of the fur bearing animals, the otter is becoming rare in zoological collections, and the Society is afforded much satisfaction in possessing this specimen for exhibition. The otter is a dainty feeder, and obtaining a supply of fresh live fish, which is essential to its welfare, has occasioned much difficulty in the commissary department.

From a photograph by Elwin R. Sanborn.

Beach Post, who in his turn appealed to his readers through display advertising.

At least one reader responded, with a declaration that within a month or so he could find and capture a specimen 'crock of the required dimensions; and with him Mr. Bradley promptly signed a contract.

All this indicates a scarcity in Florida crocodiles where formerly there was an abundance. We fear that tourists, and "Alligator Joe" and his heirs and assigns have between them caught and consumed well nigh the whole available supply. And Florida sans crocodiles will not be the romantic Florida that we used to know and love.

CURATOR CRANDALL GOES TO EUROPE.—Despite sailing difficulties, the Zoological Society had dispatched Bird Curator Lee S. Crandall to western Europe, in quest of rare East Indian birds and mammals that do not seem able to cross the Atlantic under their own steam. Accompanied by Mrs. Crandall, he will briefly

visit England, Holland, Belgium and France, gathering as he goes, and finally will take his departure from London.

Although our bird collections are now well stocked, it is nothing but sleepless diligence in collecting that can keep them so.

ANNOUNCEMENT

Through the courtesy of the American Museum of Natural History, which sent to Africa the great Lang-Chapin zoological collecting expedition, we are enabled to publish in the July number of the Zoological Society BULLETIN a surpassingly fine contribution to knowledge. It will consist of a notable article, by HERBERT LANG, F.Z.S., on "THE WHITE RHINOCEROS of the BELGIAN CONGO," and it will be superbly illustrated by photographs never before published.

The July BULLETIN will be a special "Rhinceros Number," wholly devoted to the article. It will, of course, be sent free to all members of the Society. Copies for the public, twenty-five cents each.

THE WHITE RHINOCEROS OF THE BELGIAN CONGO

TEXT AND ILLUSTRATIONS
By HERBERT LANG



IN THE FIELD

The author, with one of the prizes collected by the American Museum of Natural History Congo-Expedition (1909-1913), of which he was the leader.

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RECORD BULL WHITE RHINOCEROS FROM THE UELE DISTRICT, BELGIAN CONGO

The forty-two inch front horn, and the unusually long rear one, together weigh nearly forty pounds. They set as a fender in thrusting aside obstructions in the jungle. From snout to tip of tail the animal measured fifteen feet five inches. The standing height at the shoulder was five feet eight inches. It is now mounted and on exhibition in the American Museum of Natural History. No white rhinoceros has yet been exhibited alive.

ZOOLOGICAL SOCIETY BULLETIN

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VOLUME XXIII

JULY, 1920

NUMBER 4

THE WHITE RHINOCEROS OF THE BELGIAN CONGO*

By HERBERT LANG

Assistant Curator of Mammalogy, American Museum of Natural History; F.N.Y.Z.S.; Chairman Subcommittee on Life Histories of Exotic Mammals, American Society of Mammalogists

Illustrations from Photographs by the Author

LATE in May, 1909, at the Foreign Office in Brussels, diplomatic attention, strange to say, was focused upon the subject of white rhinoceroses. The pending question involved the conditions under which the Congo Expedition, sent by the American Museum of Natural History to the Belgian Congo could gather material for a habitat group of these rare and legally protected animals. The Colonial Administration had pledged itself not to grant any one the privilege of disturbing the only herd of white rhinoceroses then officially known, until Colonel Roosevelt had completed his visit to the eastern border of Belgian territory.

His Excellency the Minister of Colonies was then in Africa to second the efforts of the present King Albert, who as heir to the throne was anxious to acquire first-hand information about the great Central African domain. Secretary General H. Droogmans and Director General A. Kervyn, in charge of such matters, frankly informed us of the queer turn of circumstances. Could we perhaps suggest a satisfactory solution?

Fortunately Mr. James P. Chapin and the writer were able to inform our hosts that Professor Henry Fairfield Osborn, President of the American Museum, and Colonel Roosevelt already had arranged that the two American expeditions might unite their efforts to realize more easily the great project of presenting to visitors of the New York Museum a realistic bit of the greatness

and fascination of the African jungles. This discussion about white rhinoceroses also suggested further cooperation for the benefit of the Colonial Museum in Tervueren, Belgium, and the final solution of the difficulty presently afforded an opportunity for hearty congratulations.

Our progress from Banana, at the mouth of the Congo River, across the western half of Africa consumed a great deal of time and the gathering of material for a habitat group of the rare okapi so delayed the Congo Expedition that we had to forego the pleasure of meeting Colonel Roosevelt in the haunts of the white rhinoceros. When we arrived in the northern Uele district we found, contrary to all rumors, that the far-famed beasts were fairly numerous. We were spared the trouble of asking the Sirdar of Egypt for the privilege of proceeding to the Lado Enclave, which, after the demise of King Leopold, had reverted to the British crown. Furthermore, on account of sleeping sickness this territory had been closed to caravan traffic, and access to the Nile was impossible without special permission. Fortunately at Niangara the Honorable Charles Smets, who knew more than any one else about the white rhinoceroses in that region, kindly offered his expert advice, and later his devoted friendship contributed much to the success of the Congo Expedition.

Zoological Status of the White Rhinoceros

Formerly the white or square-lipped rhinoceros (*Ceratotherium simum simum*) was considered common only in South Africa. In years gone by thousands were wantonly slaughtered there, and today

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PLAY-GROUNDS AND FEEDING GROUNDS OF THE WHITE RHINOCEROS

Vast stretches of rolling grassland dotted with scattered bushes and trees are their ideal haunts. In April, the vegetation is low, and then many trails are clearly visible. The bare, smooth hillocks in the picture are termite structures, against which the rhinoceroses delight to rub themselves after their frequent mud baths.

but a few mounted specimens, skeletons, and skulls are all that is preserved in the museums of the world. A very few still are alive in the Umfolosi reserve in Zululand. These being supposedly the last of their race, considerable surprise was aroused by the discovery of a northern form (*Ceratotherium simum cottoni*) by Major Gibbons when he stopped in 1900 at Lado, just west of the Nile. Since then Powell-Cotton, Solvay, Winston Churchill, Selous, de la Kethulle, Colonel Roosevelt, and the Congo Expedition (1909-1915) have established the fact of their relatively extended northern range. My companion, Mr. James P. Chapin, and I had the privilege of studying them thoroughly during our exploration in the northeastern Uele, throughout a period of over two years, and the writer's previous experience with black or hook-lipped rhinoceroses (*Diceros bicornis*) during the Tjader East African Expedition also proved valuable by way of comparison.

Habitat The habitat of the white rhinoceros in the north is essentially similar in environmental and climatic conditions to that in the south. Though situated only a few degrees north of the moist equatorial regions, various factors, especially the proximity of the most extensive desert in the world, have helped to stamp upon it all the characteristic features of the African savannah, well scattered with scrub. As the haunts of the rare okapi are restricted to the northeastern Rain Forest, so the habitat of these white rhinoceros lies in the northeastern savannah of the Belgian Congo, and beyond it to the Nile.

In general the country is fairly arid, especially the large expanses of higher-lying brush country, and the rolling savannah, where one seldom can find a waterhole. In many places granular, brownish-red limonite is so predominant as to form great boulder fields, in some features resembling those of volcanic origin. In lower-lying tracts, however, swamps are numerous, as may be expected in a territory representing a portion of the Congo-Nile divide. The most typical swamps are overgrown with papyrus twelve feet high, and at a distance look like an uninterrupted stretch of grass country. The deepest portions are thus brought to an even level with the surrounding areas. Usually some clear water runs through the dense mass of stalks, but below the dirty scum-laden surface it is often lost in a mere brownish fluid. Near the more open places, where the crossings of rhinoceroses, elephants, buffaloes, and even giraffes are found, tropical luxuriance runs riot, marantaceous plants of a glossy dark green

cover small tracts; blue, yellow, and whitish flowers of water-lilies being common. Clusters of graceful *Phoenix* palms there tower above all other vegetation.

To the north and northeast some of the swamps forming the sources of the affluents of the Congo and the Nile are separated by only low undulations, in some places no more than fifteen feet wide. In years of extra heavy rainfall, the two river systems may thus be connected, especially as here the rise of the waters is often surprisingly rapid. As a result there are a large number of species of fishes common to both watercourses.

**The
Uele
District**

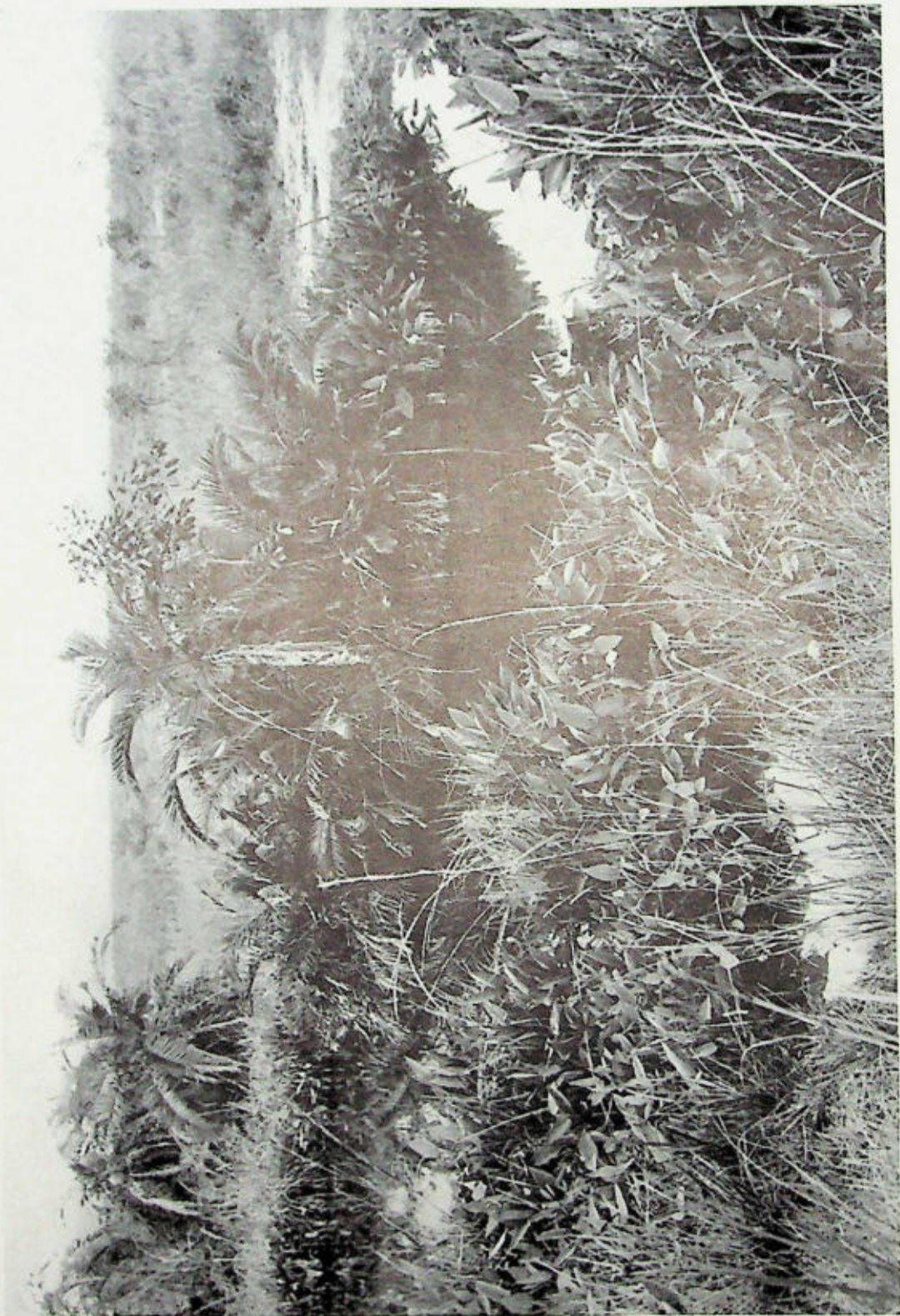
In the Uele district, typical mountains are unknown and even the highest elevations, which reach an altitude of 3000 feet above sea-level, look rather like rounded hills. Many of these are merely enormous granite boulders or grass-covered ridges. About Aba, especially to the south, such hills are fairly barren, and from one of the highest a panorama including seventy others may be enjoyed. Some of them, however, are covered with vegetation, most often in the ravines, and even one of the greatest, Gaima, is crowned with trees.

**Seasons
and
Vegetation**

In the northeastern Uele and southern Bahr-el-Ghazal we find the striking contrasts of dry and rainy seasons typical of savannah regions, with grass ten to fifteen feet in height, and low bushes and trees. The wet period starts towards April, with heavy rains from June to October, or further north to November. The terrific rains and the fury of the storms beat down the tall grass and entangle it still further. The vegetation becomes more impenetrable, the swamps are full of water, the brooks and rivers often impassable, and the highways few. The cutting blades of grass lacerate the natives' skin, and are a serious check to travel. Hunting is fraught with dangers, for the height of the jungle cuts off the view and one is exposed to unexpected encounters. The country now bears all the marks of devastation from the continued passage of the big game. Bushes and trees take on true autumnal colors and all that relieves the general monotony of the scene are a few groups of flowering bushes and plants.

**Savannah
Fires**

With the early part of the dry season, stretch after stretch of the minor forms of vegetation in this immense area is slowly consumed by the crackling and roaring fires set everywhere by natives. Hundreds of kites, other birds of



ACROSS LUXURIANT SWAMPS

In these crossings, they habitually quench their thirst, cool their hide and wallow in the mud. Here, between the monotonous reaches of the savanna, graceful baskets of Phoenix palms tower above the tall sedges and sprays of violet flowers amidst a maze of spear-headed leaves. Often white, yellow and blue water-lilies emerge between their frilled pods, completing the tropical setting.

prey, even vultures, and bee-eaters, rollers, swallows, and swifts busily snap up, amidst clouds of smoke, the escaping insects, some of which are carried high by the currents of heated air. Right after the fires have passed, white-necked storks and marabouts may be seen searching the blackened ground for the large grasshoppers, reptiles, and lesser animals that have been injured or killed.

During the conflagration game stands without fear in close proximity to fire, and in certain places may even walk across the fire line. With unexpected rapidity the tender grass commences to spring up and the bright green blankets attract the game, most of which again form herds, larger than at any other time.

As soon as the smoke-laden atmosphere clears and the burned particles carried by the wind cease to fall, trees and bushes show some green again. In a few weeks springtime seems to have arrived. Gorgeous blooms often grace the bushes and trees, and a delightful fragrance may fill the air. Scattered flowers appear, but fields washed in a single bright tone are unknown. Orchids emerging from the parched soil, or even from the ashes, with their delicate form and color, mostly white, violet, yellow and rose, are an agreeable surprise.

Best Time for Hunting

The season from January to June is the ideal hunting period, but success depends upon a thorough knowledge of the country. In the northeastern Uele district, game at all times is scarce as compared with its abundance in British East Africa. Some sections then are alive with natives, for with them it is the most propitious time for laying in their annual supplies of meat. They often make use of grass fires to drive their prey to certain places where companions with nets, spears, and arrows are ready to slaughter all they can.

Sometimes whole fields are covered with the heavier charred stalks that have been left standing by the flames. These obstruct the view and make hunting difficult. Many of the swamps are dry, and the river-beds nearly empty, forcing game to travel great distances in search of water. During the rainy season much of the savannah proper is traversed by sluggish rivers winding their way between low banks, as in newly dug channels. It seems strange that even then in spite of the proximity of water there is not the slightest trace of greater luxuriance in those sections, the typical scrubby vegetation leading down to the water's edge without change.

Neighbors of the White Rhinoceros

Occasionally widely different aspects are offered in other parts of this region, where wooded strips mark from afar the sites of swamps, or meandering watercourses. These forest galleries show many of the features characteristic of the equatorial Rain Forest, and strange contrasts are naturally unavoidable. Indeed, here one may listen to the calls of the chimpanzee as they mingle with the roaring of the lion, the howl of the hyena, and the yelping of the jackal. The serval and the leopard, the civet and prairie cat all find their living here. The sylvan red colobus, and the black-and-white guereza, so typical of these forested galleries, both jump noisily from tree to tree. The forest-loving red river-hog, and the wart-hog of the plains may wallow in the very swamps that elephants and square-lipped rhinoceroses have used a few days before, and the cane-rat (*Thryonomys*) cuts its runways through the high grass. The same termite hills may here be visited by the scaly ant-eater (*Manis*) and the armadillo (*Orycteropus*), and without taking a step one may observe both the large forest squirrels (*Protoxerus*) and the fossorial ground squirrel (*Euxerus*) of the savannah.

Daily Habits

To paint a vivid picture of the northern white rhinoceroses in their leisure, frolics and unrest is no easy task, for the obscurity of night enshrouds their most active phases. One can no more hope to succeed in wresting life's secrets from these two-horned monsters during the short span of the blazing sun than to observe native customs during the long hours of the moon. In the heat of the day, rhinoceroses merely rest, wherever they may be, in open or dense thickets, in shade or scorching sun. In the early morning they may continue to wallow, or like nomads take delight in roving, or they may be seen while standing still to doze off the effects of late hours. When violently disturbed in their light slumbers they, like most other gigantic creatures, rush either to safety or attack. Most of their assailants unfortunately have greater interest in them when dead than alive, and refer to them either as cowards or heroes. These are the regions wherein distance counts for naught, and the eyes have to scan each minute sign in trails and tracks. From them alone one reads the facts supplied so seldom by face to face encounters.



BLACK OR HOOK-LIPPED RHINOCEROS

The triangular, prehensile process of the upper lip, responsible for the name "hook-lipped," helps this browser gather leaves and twigs. The anterior horn is roundish and usually longer than the posterior one, but both may vary considerably in form. In this case the tiny third horn between the usual pair is abnormal. Both photographs from a bull shot by the late Mr. Richard Tjader at Solai, during the first of his three expeditions to British East Africa. The right hand picture is reproduced by courtesy of D. Appleton and Company from Mr. Tjader's book "The Big Game of Africa," (New York, 1910.)

Color

The "white" rhinoceros, whose hide is naturally dark slate gray, belongs, like the elephant, hippopotamus and giraffe, to those groups of gigantic land mammals which flourished millions of years ago. At present it is impossible to state with any reasonable degree of precision which is the largest of the five species of rhinoceros still living in India, Malaysia and Africa. Huge dead mammals are so difficult to handle that accuracy in measurements, made in so many different ways, cannot be expected. When taken from mounted skins and skeletons they are liable to introduce even greater errors. Unfortunately the natives' and sportsmen's hecatombs of these giants never have furnished to any museum a sufficient number of adult specimens by which to settle all questions of size. Perhaps the white rhinoceros surpasses in bulk the great Indian species, but we are not sure of it. The latter, like the lighter built Javan species, has only one horn, in contrast with the smaller, hairier, two-horned Sumatran, and the only other African species, the black rhinoceros.

The names "square-lipped," "square-nosed," and "square-mouthed" for the white rhinoceros are traceable to the broad and truncated snout, with wide-open nostrils. The term "hook-lipped" is equally applicable to the triangular, pointed and prehensile median process of the upper lip of the African black rhinoceros. In-

cidentally, this broad snout and heavy underlip are facial features that may, as in horses, express moods of great excitement, though two other signs help to announce this,—the tail held high or knotted in "pig-tail" fashion, and the cocked-up ears.

The South African Race

The subspecific differences between the South African and the Nile-Congo races of white rhinoceroses are slight. Heller* considers the great concavity in the dorsal outline of the skull of the southern form (*C. s. simum*) as the only valid difference. But even this character is subject to doubt, for the material collected by the Congo Expedition shows the same amount of individual variation that seems to be common among all large mammals. The white rhinoceros differs from the black in the following external characters: Greater average size; longer head; fleshy hump in front of shoulder; truncated snout; straight lips, the lower one with horny edge; relatively heavier horns, the anterior with squarish base and flattened front; bigger soles for the feet.

Bulk and Gait

The huge bulk of the white rhinoceros standing erect and alert, with its unwieldy head and cocked ears turned in the direction of danger, presents an impressive sight. The

* Smithsonian Misc. Coll., LXI, No. 1, 1913, pp. 1-77, Pls. I-LXXXI.



WHITE OR SQUARE-LIPPED RHINOCEROS

The broad, square mouth and especially the horny edge of the lower lip, facilitates the cropping of grass, its only food. In the picture at the left, this ridge, usually covered by the bulky snout, may be distinctly seen. The head of this species is much longer than that of the common black rhinoceros. From contact with vegetation near the ground the anterior horn is worn off in front, and its base squarish. The variation in size and shape of horns is very extensive.

menacing horns suggest painful possibilities, and they would be formidable weapons of aggression were it not that the peaceful grazing habits of their owner have relegated them to an eminently practical use. In these regions of high grass, except during a few months after the annual grass fires, progress through the tangled mass of vegetation demands intense muscular exertion. The fending action of the horns, carried close to the ground, clears the way for the short, pillar-like front legs and barrel-shaped body as the animal slowly passes across country, or grazes with constantly nodding head. Imagine nearly forty pounds of horns on top of a long, wedge-like nose, swung about with astonishing ease, while tearing through the jungle. Quite naturally this abrading use accounts for their general smoothness. To this incidental friction, and not to a supposed special grinding action against stones or the ground, nor to digging, must be ascribed the flattening in front and the wear directly above the base of the anterior horn, as well as the posterior edge and often spatulate form of the rear horn.

Physical Features

The factors giving the long, weighty head such remarkable facility of movement are the highly efficient ball and socket joint hinging the head to the neck and the enormous band of sinewy nuchal muscles extending from the rear of the skull to the high processes of the verte-

bral column. A huge mass of muscles on either side of this "rubber band" are responsible for the distinctive hump in front of the shoulder. At every sway of the head they exert an enormous pull on the upper corners of the skull, which perhaps has brought about its curious V-shaped dorsal outline in the rear.

Horns

There are always two horns, except in young calves, where the posterior one is merely a slight hump. Far from being set directly upon the skull they rest upon the heavy hide, which runs beneath them without interruption. After two days of decay they easily can be pulled off the skin, to which they are attached only by small fibres sunk into innumerable tiny pits, but if haste is necessary they can be severed at once with a knife. In adults there is a roughened, granular area upon the naso-frontal bones beneath each horn. The slightly thickened patch of skin between horn and bone certainly forms an ideal cushion to absorb the shock of heavy blows. No doubt this is also an important function of the hide, which in some places is about two inches thick. It is toughest on shoulder, belly, and other parts exposed to abrasion in passing through the jungle.

Under normal circumstances, the front horn is much the longer of the two. In contrast with the roundish base of the horn in the black species, that of the white rhinoceros is rather square. Individual variation in size and form



EFFECT OF THE RAZOR-LIKE EDGES OF GRASS

The author's shoes, before and after a nineteen days march through the haunts of the white rhinoceros. The tips, filed away by the grasses, were nailed down again with brass tacks, and the other holes were mended with wire. Imagine what such friction does to the horns of rhinoceroses fending their way through the cutting grass of the jungle.

is considerable. The heavier development of the nasal boss in males allows for relatively larger and heavier horns. The one in front may be perfectly straight, as in exceptional female specimens, or curved slightly forward, or bent so far backward as almost to describe a semicircle. With advancing age, the part immediately above the base is worn away gradually and the outstanding lower portion shows well their bristly makeup of vertical, strongly agglutinated hollow fibres.

The posterior horn is directly behind the other, and it may be at a little distance from it, as in young specimens. As a rule it is considerably shorter, roundish, or laterally compressed. Exceptionally fine horns are not dependent on great age, but are carried by individuals in the prime of life, those of very old specimens generally being inferior.

Charge of the White Rhinoceros
However seldom these rhinoceroses charge their living enemies, at times bushes, trees, and even boulders may receive the tremendous impact of their weight and violence. Often in such reckless plunges, instead of crushing an imaginary foe, they splinter their front horns. In the Uele district at least, this is not so rare an occurrence, for among sixty waiting at a post to be exported to Egypt, half a dozen had been injured in this manner. Of two that we obtained from our own freshly killed specimens, one anterior horn was a mere stub and the other only a little higher than the posterior horn. Those of younger animals are too short and solid to be broken; only the worn-off, slender horns of adults are subject to such damage. The splintered portion is gradually polished

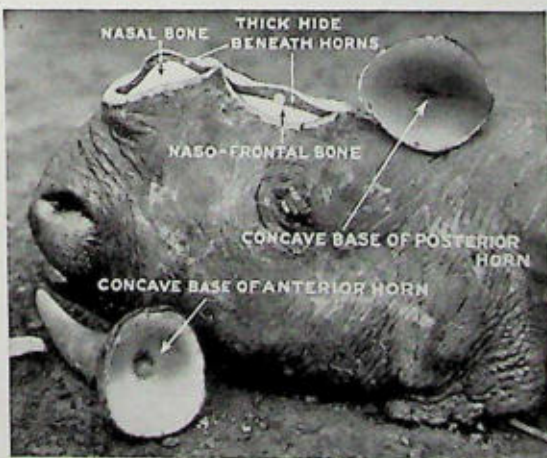
off, but the stumps left probably never change much in form.

Measurements

From South Africa a single remarkably slim front horn of sixty-two and one-half inches, and probably from a female, credited to Colonel W. Gordon Cumming, breaks all records for length. In open plains horns may grow uninjured, but they cannot escape the gradual wear from the razor-like blades of common grasses, which is the most probable way of accounting for their slenderness. Perhaps the density of the brush and roughness of the ground in the haunts of the white rhinoceros west of the Nile do not permit such excessively long-horn development. We were fortunate, however, in obtaining there the two largest complete specimens of white rhinoceros ever collected, the photographs of which are reproduced herewith for the first time. One, the bull, had a total length of fifteen feet five inches in a straight line from snout to tip of the tail, which itself measured thirty-two and one-half inches. His standing height at the shoulders was five feet eight inches, but at the nuchal hump, by raising the neck and pulling the forelimb eighteen inches more might have been added.

Height of a Bull

While the length of horns previously known from that region does not exceed three feet, this male from Faradje, in the Uele, constitutes a record for the northern form (*C. s. cottoni*), with a forty-two inch front and twenty-two and one-half inch rear horn. The female is an equally remarkable partner, her front horn measuring thirty-six and a quarter



TWO DAYS AFTER BEING SPEARED BY NATIVES

Decomposition has loosened the mass of minute fibres fastening the horns to the skin, which runs without interruption beneath the horns. Here a part of the skin one inch thick, has been cut out to show the naso-frontal bones below.



RECORD COW WHITE RHINOCEROS

A fit partner to the bull figured in the frontispiece. Her size can be judged by comparison with the standing native. The front horn measured thirty-six and one quarter inches, and the rear one twenty-two and one half inches. A side view is shown on p. 73.

inches and rear one twenty-one and one-half inches. The great development of both rear horns is unusual.

Those two huge rhinoceroses, together with a young specimen, now are in the American Museum and long since have been imbued with lifelike appearances. Indeed the artistic skill of Messrs. Carl Akeley and J. L. Clark in modeling the group arouses the admiration of all visitors who behold these huge dark monsters. Many ask: "Why do they call them white?" The story is a simple one:

Causes of Color Names Formerly the two kinds of African rhinoceroses, the black and the white, were fairly common in certain regions of South Africa. Their habits being vitally different, it is probable that in the same regions they looked different. The white rhinoceroses depend to a great extent on wallowing places, and a mud bath is an absolute necessity. Though their rough hide normally is dark gray, after every plunge their "coat of armor" gradually changes to the color that the mud assumes when dry. The bulk of the dirt is rubbed off at once

against bushes and tree trunks, or when the rhinoceros rolls about on the ground. The body temperature dries out the rest and the blaze of the tropical sun often adds a glare to the white, or fire to the red tones, and also deeper shadows to the darker hues of loam. But after only a few hours, every trace has been shaken off.

The color of these rhinoceroses therefore depends at times on the reddish-brown, black, blue or whitish mud of the mires in which they have wallowed. In South Africa those who originally coined the name "white rhinoceros" may thus have seen them as they were self-painted by "white" earth. I have even observed one a dark green, still covered with the scum of algae from a pond near a papyrus swamp. Others were jet black from passing across a portion of the veldt recently swept by grass fires. Perhaps the charred, cork-like bark of certain trees had helped to make them such terrible looking monsters. In addition, hundreds of well-scoured places on the veldt, often near waterholes, testify how fond they are of taking dust baths, which may contribute to a still different aspect.

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ELWIN R. SANBORN, *Editor*

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Habits Affect Distribution

The distribution of the two species of rhinoceroses, "black" and "white," has been greatly influenced by certain peculiarities of structure, feeding, and other habits. The browsing black rhinoceroses strip leaves and twigs from bushes with the triangular, prehensile process of the upper lip, and are found in a great variety of places. Though the rolling portions of the savannah are preferred sites, they may live in forests, where I have seen them on the slopes of the Rift Valley and foothills of Mt. Kenia. Yet they also find a livelihood in really arid tracts where no white rhinoceros could live, subsisting mainly on the xerophilous scrub, which, with its green, succulent aspect, seems to belie the general parched conditions vouched for by the many thorny elements. They of course care little for wallowing places.

The grazing white rhinoceroses feed on nothing but common grasses. Grassy plains and an abundance of pasture are an absolute necessity in their habitat. The horny edge of the lower lip (see photograph, p. 73), usually hidden by the overhanging snout, seems to have escaped the notice of all previous observers. As no incisors are present this ridge greatly facilitates the cropping of fodder. The resulting muscular movement explains the characteristically great width and depth of the bony portion supporting the chin, which is slim and pointed in other rhinoceroses. The food is well masticated between the broad and flat grinding surfaces of their molars, which contrast with the high, crushing ridges and sloping deep grooves of the relatively smaller teeth of their black relative. In these tropical regions the grasses favored lose their succulence soon after emerging from the ground. Drinking water to aid digestion then becomes all important. Just

about the time the last puddles dry up these white rhinoceroses find large sections of their haunts becoming arid. All wallowing places are then deserted, even the few connected with trickling springs that retain some moisture, and only in the rainy period do the huge beasts scatter again.

The Southern White Rhinoceros

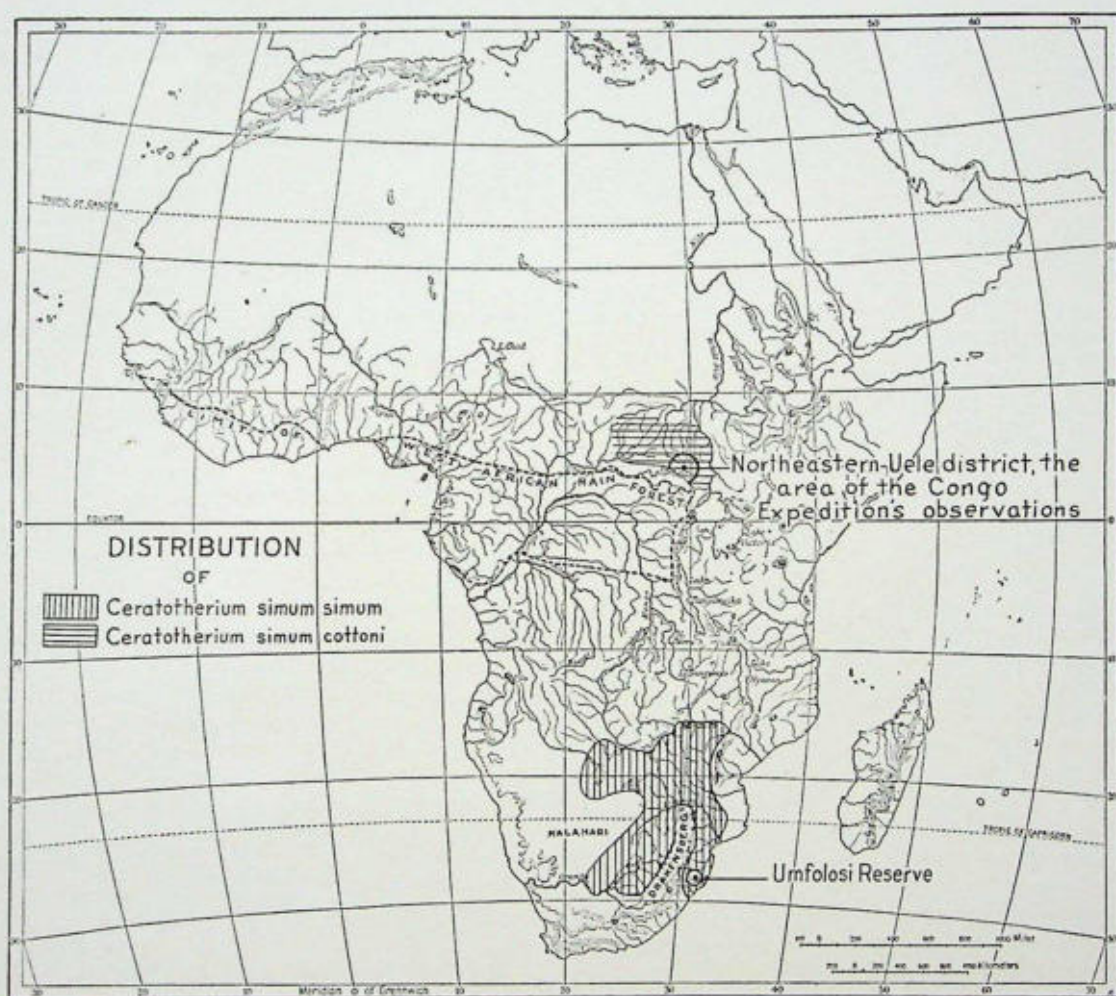
The area of the former distribution of the white rhinoceros in South Africa (*C. s. simum*), as determined from available information, hardly ever attained more than 300,000 square miles. Probably it was much less, as they inhabited chiefly the grassy regions between the middle Zambesi southward to the central section of the Orange River and Natal provinces. All localities of their actual occurrence fall within the range indicated on the map shown herewith. Damaraland, erroneously attributed to Andersson and quoted by a few recent authors, has been excluded. His first white rhinoceros was killed just southwest of Lake Ngami, "at Kobis," which, together with the more southern Kuruman, also in Bechuanaland, represents the easternmost limit of the species. No white rhinoceroses ever have been known west of, or in the Kalahari Desert proper, nor from the Drakensberg Range in the east.

Range of Northern Race

The range of the Nile-Congo race (*C. s. cottoni*), a form discovered as recently as 1900, was believed to be restricted to the Lado country and the immediate neighborhood of the Nile. Contrary to all surmises its range has steadily increased. These white rhinoceroses are now positively known to extend from a little north of Lake Albert to three hundred miles down the Nile to a point near Shambe. From there it stretches four hundred and fifty miles westward to the Dar Fertit section, and two hundred miles south to Rafai.* The southern limit extends about five hundred miles across the northeastern Uele district to the territory northwest of Lake Albert. This habitat thus forms an oblong area of about 100,000 square miles, all situated west of the Nile, which is the eastern limit of their dispersal.

Southward their haunts reach to the forested and hilly transition belt just north of the West African Rain Forest, but in the north and west the boundaries can not be considered definite. They might ultimately be found along the grassy outskirts of the Sahara, just as in South Africa the southern form was at one time abundant about the edge of the Kalahari Desert, near Lake Ngami, and in eastern and southern Bechuanaland. In the west, one can point to

* Schouteden, Rev. Zool. Afr., I, fasc. 1, 1911, p. 124.



FORMER AND PRESENT RANGES OF THE TWO WHITE RHINOCEROS SUBSPECIES

The South African race is now extinct save for a very few individuals still living in the Umfolosi Reserve, Zululand. In their northern ranges, with the Nile route open, white rhinoceroses are afforded little protection. The map shows the easy access to the home of these monsters by way of Khartoum, the point of departure for steamers bound southward.

the hopeful omen of the presence of black rhinoceroses in the Niger-Shari districts, south of Lake Chad, especially as both species were found together in many regions of South Africa.

According to the information of Maruka, an intelligent native chief of the Logo at Faradje, it may be possible that in former times the two kinds of rhinoceroses shared their ranges in the northeastern Uele. He told us that when the rinderpest swept across Africa from the northeast in the early nineties, the rhinoceros feeding on bushes died out, together with most of the buffaloes, elands and antelopes, and never appeared again. Only in the last ten years have the white rhinoceroses and other game become sufficiently numerous in that section to figure once more in the natives' larder.

Gap Between Two Ranges

The great gap between the northern and southern ranges of white rhinoceroses represents a territory over 1200 miles long. So far no positive proof of their former occurrence there has come to light, notwithstanding various reports to the contrary. In regions where hyenas abound and long rainy seasons accelerate the destruction of even the heaviest bones, the chances are slight that their remains have found a safe burial, to come to light again as witness to former flourishing times. In ages past Africa has changed, though less and more gradually than other continents, and instead of whole mammal groups being completely wiped out, some were able to hold their own in scattered areas. Interrupted distribution



MARUKA, THE GREAT CHIEF OF THE LOGO

In his territory the regular annual toll of white rhinoceroses killed by natives for meat exceeded forty.

among living groups of African mammals is a natural condition, and not so rare as generally believed.

**The
Black
Species**

Even so decidedly widespread a species as the black rhinoceros cannot boast of a continuous range, though it is found yet in many sections of South Africa and all the way north to Abyssinia, neighboring parts of Egypt, across the Sudan to the eastern bank of the Nile, and also in Angola, and the Katanga district of the Belgian Congo. At present it is totally absent from all that territory known as the range of the Nile-Congo race of white rhinoceroses, though, as stated, occurring again in the Shari-Niger region south of Lake Chad. Thus in the north both species apparently live apart.

**Near
Extinction
of Southern
White
Rhinoceros**

Of the habits of the only white rhinoceroses still alive in South Africa Vaughan-Kirby* has just published an interesting study. There, in the Umfolosi reserve in Zululand, embracing an area of about 90,000 acres, and for the greater part

situated between the Black and White Umfolosi rivers, both the prehensile-lipped black and square-mouthed white rhinoceroses live under natural and undisturbed conditions. For some strange reason their number in this last refuge, stated in 1910 by Stevenson-Hamilton to be "some fifteen" seems now to have dwindled to "some ten" individuals, according to Heller's reference, later quoted by Vaughan-Kirby, who nevertheless gives assurance that reproduction is proceeding as rapidly in the reserve as in the Congo-Nile region.

**Habits
and
Tempera-
ment of
Northern
White
Rhinoceros**

In the field one need not worry much about dangers from aggression by white rhinoceroses. All those who have wandered the veldt know the fascination of tracking hour after hour under constantly shifting winds. Finally the reward may be to catch a glimpse of what perhaps promises an exciting adventure, but now, beyond the hazy screen of thicket, looks merely like an outcropping boulder. These rhinoceroses, gregarious, sociable, and piglike in many ways, lie down helter-skelter in the fashion of heedless vagabonds. An occasional snort and the rumbling of gases in their intestines alone break the dead silence of a tropical noon. Instinctively and as in a dream their ears continue to fan the air, the eyelids twitch, the muzzle quivers, and the tail whisks off the hosts of harassing flies. The shifting of a bulky head or the fidgety turn of a body will not disturb a herd. But at the slightest evidence of your presence their elbows jerk the forelimbs from beneath the body. One or all may sit up in dog fashion on their haunches, listen and sniff, and if all is well, lie down and quietly drowse again.

Once roused from rest the sluggish body is full of hesitation; and doubt and fear are easy losers. The massive brutes seem suddenly to realize that the traditional freedom of their haunts is at stake. Bewilderment is changed into blind fury. With astonishing speed they dash across the veldt. Sharp horns, swift hoofs, mighty weight, and hide like solid armor, they recognize no obstacles. The clumps of bushes, gnarly scrub, entangled masses that no one has yet dared brave are trodden down and brushed aside like trembling blades of grass. The weirdness of the crashing sounds, the booming of the thundering progress fan still higher the flames that furnish energy and motion. Yet one cannot help but note how quickly the fearful rush gives way. Soon they trot and

* Ann. Durban Mus., II, part 2, 1920, pp. 223-242, Pl. XXVII.



CAMP OF THE CONGO EXPEDITION NEAR FARADJE, IN JANUARY

At this period, grass fires sweep the country and camping sites are cleared to prevent accidents. In the foreground, the row of loads contain accessories for a habitat group ready for transportation to America.

then they walk in stupid lassitude, glad to use the easy, deep-worn trails their aimless wanderings shaped so long ago.

Hunting the White Rhinoceros With our base camp at Faradje our numerous side trips brought us one might say into the very midst of the white rhinoceros population. Once for over seven hours we had been following various trails, and toward noon we came upon a bull that had broken away from his companions and was feeding alone on the edge of a swamp, eagerly nibbling the grass. This stately brute, ordinarily a rock of immobility cast into living flesh, was moved by only hunger, rage, fear and love. During the night he had gone hungry, his time having been spent in riotously prancing about a cow. The freshly burnt ground gave an exceptionally clear record of his movements. Uninterested in her lover's display, the cow, like the other members of the herd, had apparently continued to enjoy the succulent blades of grass that had sprung up among the bristly, charred tussocks.

A whiff of air from our direction sent him off at good speed until he reached the trail. Then he slowed down to a saunter, to join his company of five. Though he must have known them well, he carefully investigated their deposits along the trail, following suit himself. But our conclusion that the bull would help us find the others was wrong. Many times he stopped, away from the trail, waiting for us "around the corner." Once he truculently trot-

ted up to within twenty yards. Presently he snorted, and then evidently took fright at the click of the camera, for most unexpectedly he gave a shrill whistling sound.

Following him for about three miles across country, no further chance to photograph seemed possible. We had wasted our time and now it was too late in the afternoon to find another fresh trail.

A Mix-Up with a Herd

Suddenly, as we were quietly waiting for our black porters to come up, Balla, a very plucky native, jumped to his feet with a warning cry. The ground trembled and the jungle sighed. Our bull had returned, but not alone. Six big rhinoceroses passed like a living tornado a few yards away. Had they charged straight upon us we could hardly have escaped!

A Calf Taken

But not all of them vanished into space. Near us a calf began to squeal frantically, because it was transfixed by Balla's spear! Our hunter's irrepressible zeal had snatched the youngster from its mother as the herd dashed by. There was a question whether the mother would return, until at last the noise of the band as it crashed through the jungle became less distinct, and finally died away. We had been taken completely unawares. The sandy ground near the great swamp had effectually muffled the approach of the frightened monsters. Little time there was then in which to wonder what had started the herd on its maddened course, for



AT BAY AFTER A TWO HOUR CHASE

Although wounded, this young bull traveled about ten miles across country. Mr. van de Kerkhove with his rifle courageously covered his quarry, so the author declares that he "took no particular risk" in photographing the maddened brute.

now we had to take care of our unexpected prize, which was needed for the habitat group.

On another occasion three of us passed within a few yards of a good-sized bull. The tip of his horn as it rubbed against a clump of trees, was just visible, but the high grass and occasional bushes had cut off our prospects of taking a photograph. My friend, Judge Smets, thought he could head off our quarry and cautiously advanced. We waited. It was not his intention to shoot, but a sudden detonation from the express rifle drowned every other noise. The rhinoceros had turned upon him, and he fired over its back.

Balla Spears a Huge Bull

Now, with the beast thundering through the brush it raised the wrath and courage of our native hunter. Balla acted as if the firing pin had nerved his heart anew and given strength to every muscle. A few leaps, and the thud of his spear brought forth a squeal from the maddened brute. Yet the famous Azande lay prostrate in the track of his victim, unharmed, to be sure, but how could he withstand the force that hurled his six foot lance? Cutting through the middle of one of the animal's ribs and penetrating half a foot beyond, the spear caused a stream of blood to gush forth from its nostrils. In the mad rush through the jungle the shaft splintered, the blade bent and the vital organs were still more lacerated.

Balla was now deaf to all questions, his mind set on murder as he thought of the meat that would nourish his family and the deed that would stamp him a hero even in this land of many hazards. Crawling forward on his hands and knees, he found a branch torn down and trampled upon in the wild stampede and covered with clots of blood. This aroused him to fresh exertions. Presently he recovered the shaft of his lance and smeared it with the gore of his victim to insure future good luck. Twice he slapped his hands against his thighs, meaning twenty, then with the left hand counted five and raised four fingers. This was the twenty-ninth rhinoceros to fall to his spear!

Great Effort to Make Photographs

Of our many attempts to take photographs from life, the following episode is typical. Before daybreak Judge Smets, Matari his faithful gunbearer, and I, with Alimasi my fearless Mangbeta, dived into the dark gray mists of the apparently unknown. Matari had been scouting for the last two days. His report held out a good chance for me to

take photographs of live rhinoceroses. A heavy rain had fallen and ceased shortly after midnight, and this incident greatly favored our enterprise. Finding tracks that were perfectly fresh, we proceeded to follow them without delay. A glorious sunrise swept off the last vapors and by ten o'clock the intense heat made it certain that the troop of rhinoceroses we were after must have settled down to rest.

We found that the great beasts had satisfied their thirst in a nearby swamp, and at the first wallowing place the stirred-up mud revealed that they had been having the time of their lives. How many there were could not be determined. Footprints on the trail a little beyond showed three had entered the jungle, but the old bull, by far the biggest animal, had passed on. Crossing the hill in a hurry we saw by the trail that the members of the herd had rejoined one another. After scanning the expanse of short grass of the lower lying morass right in front of us, we decided to make a short cut to the next plateau, where we hoped to find the rhinoceroses sound asleep.

Only a few words were spoken, and then a sudden commotion, several hard snorts, and a wild rush were our punishment for having broken the silence. The bolting of our quarries, which had been standing in the high grass only twenty yards away, seemed to announce that surprises might be the rule of the day. Now that their vigilance was aroused we might have a long chase and it would be far better for us to go slowly and give them a chance to allay their fears. Though it was still an hour before noon we halted to take a bite and soon were loudly joking.

Twenty minutes passed, when, "What was that?" Matari dropped the food from his mouth and stared straight ahead, blank consternation seemed to have paralyzed him. At first no one dared to move. He and his master soon stood ready with their rifles. Our rhinoceroses had returned and we could now see their dark gray backs hardly ten yards away. Mr. Smets was happy and motioned me to take photographs. Certainly it seemed an admirable chance, but every blade of grass in front of the rhinoceroses enlarged itself to the size of a curtain on the mirror of my graflex camera. We all went back to the trail, the Judge alone would try to turn them, and if this were impossible, he decided to wound the bull.

Anxious seconds, minutes, and a half hour passed. Finally a shot rang out, followed by



LOYAL TO THE LAST

A bull calf white rhinoceros, standing guard over its dead mother. Rushing forward and trotting about, he snorted and whistled like a steam engine. In the side view the distinctive nuchal hump of this species is already well marked.



DANGER SIGNALS

The twisting of the tail is generally followed by an immediate charge, but in open country like this, one can easily jump aside.

the usual uproar of stampeding rhinoceroses. Just at that moment, as I started to rejoin my friend, the most terrific, awe-inspiring squeal and racket arose right ahead of me, and I rushed forward.

A
Self-
Trapped
Bull

What luck! There was the big bull madly struggling but securely caught between two gnarled trees. Blind fury and blustering impetuosity had landed him in this dilemma. His terrific onward rush had jammed his head between the twin trunks, which held him fast. Rage, fright and terror made matters still worse and he had forced both forelimbs through until he was caught and held in living stocks, made by nature. The tree-stems shook, but they were slow-growing partners, not used to bending, and had braved many storms. The violent efforts of the rhino only increased his helplessness. His huge body slipped upward, and in no time the feet had dug out what ground they could still reach. Matari and I frantically worked to tear away a few bunches of grass and to cut some of the bushes, so I might focus. Dead silence ensued for a moment. Our captive gathered his strength, sank back, and feeling firm ground, he reared up, and on coming down again he was free! The tree nearest to us had been weak at the base, and it simply had to give way. The Judge

rushed up just in time to see our prize disappear with tail in the air.

Judge
Smets
Shoots a
Big Bull

The cause of all this was that after we had left Mr. Smets, he with infinite patience succeeded in sneaking up in the high grass to the place where the cow and two younger animals were walking about. Altogether too late he discovered that the bull was facing him, and he had to fire on short notice.

It was not yet noon, and my companion laughingly remarked that my opportunity was still to come. Matari warned us to go slowly, and with fingers on his lips motioned for silence. We followed an easy trail. Our bull merely went from waterhole to waterhole, and from one wallowing place to another, but always heading away from our camp. Twice we caught sight of him going at a fair rate. It was no longer a question of photographing. We would not abandon an animal that might not recover from his wound.

With barely sixty minutes' intermission we had been on the move for nearly twelve hours. Night was at hand and we could not possibly reach camp until several hours after dark. With no moon, it would be pitch black, and if a storm broke loose we would be in for it. I was in favor of taking up the trail anew next morn-



WHITE RHINOCEROS AT HOME

When hunted during the torrid hours of the day, they love to cool off and linger in far-extending swamps.

ing, but the Judge wanted to continue for another half hour.

**At Close
Quarters
with an
Angry
Bull**

Ten minutes later Mr. Smets and Matari, with rifles shouldered, were a hundred yards ahead. This was the one day I did not carry mine, and now I even turned my camera over to Alimasi. In this short grass country I felt sure a wounded rhinoceros would not lie down. But suddenly, hardly ten feet beyond me, the wounded beast arose like a ghost. He made straight for me. It was impossible to jump aside. Here indeed was the chance of my life, not to photograph—but to run, and to run fast. One glance back and I saw my camera dancing on the back of the oncoming brute. Alimasi had hoped to turn his course by hurling my photographic outfit at him, but on he came faster still.

Just one cluster of gnarled trees about sixty yards off was my only chance for safety. Both the rhinoceros and I went at top speed, and both landed at the same spot. When I dared look again there was not an inch between me and the source of furies. In fact the sharp tip of his front horn reached beyond my ankles. But he was in front of the trees and I behind, as safe as if an iron wall had sprung from the ground.

With the terrific rush he had rammed his horns between the trunks, in that one stroke con-

centrating all his revenge. For the second time that day he was caught, now held fast by the horns. Try as he might he could only groan and rage. Finally with a mighty effort he broke free. Mr. Smets, rushing up, aimed, shot, and brought him down in a flash. My friend took no further interest in the noisy brute, and, turning to me, started to joke, but I was still absorbed in its struggles.

And then, heavens! It rose again, shook itself, and started to run. The Judge would not fire a second time. He knew he had hit his mark. With every step the rhinoceros gained greater vigor—and suddenly turning, disappeared in the jungle.

"What did you look for in your left pocket when you were playing hide-and-seek with the rhinoceros?" Mr. Smets asked. "Your pistol was at your right." I answered, "It was of no use for me to shoot with a pistol. I wanted my spare glasses, not to lose one precious moment of a spectacle one can not see twice." This was the finale of our day's work—it had all the settings of a movie story, and with not even a line of pictures to show.

**The
Bull
Was
Secured**

The night was cool and we hurried, too tired to walk slow or to stop. At ten we reached camp. Next morning at daybreak I saw the Judge's swollen foot protruding from the blankets; he had run against an

iron-hard root in the dark and would have to rest for days. Matari and Alimasi Mulai, six of the skimmers, and ten porters left with me. By eleven our bull was discovered, totally unable to give further surprises. After leaving us he had run at a good pace for a few hundred yards, then slowed down, and his last three miles included many stops. Mr. Smet's first shot had hit exactly in the middle of the fleshy hump. His second, after the bull's charge, had torn through just above the vertebrae, stunning him for a moment, but not preventing his last dash. Two days afterward, horns, hide, and skeleton were on their way to Faradje.

As an example illustrating their more peaceful disposition the following incident is instructive. I was camping for a few days in the veldt north of Faradje, not far from a trail near the Aka River, where rhinoceroses often crossed



SOLE OF LEFT FRONT AND HIND FOOT

In these odd-toed Perissodactyls, the middle toe is much enlarged, and the sole of the hindfoot is elongated. The hoofs of the white rhinoceros are nail-like, but of peculiar shape.

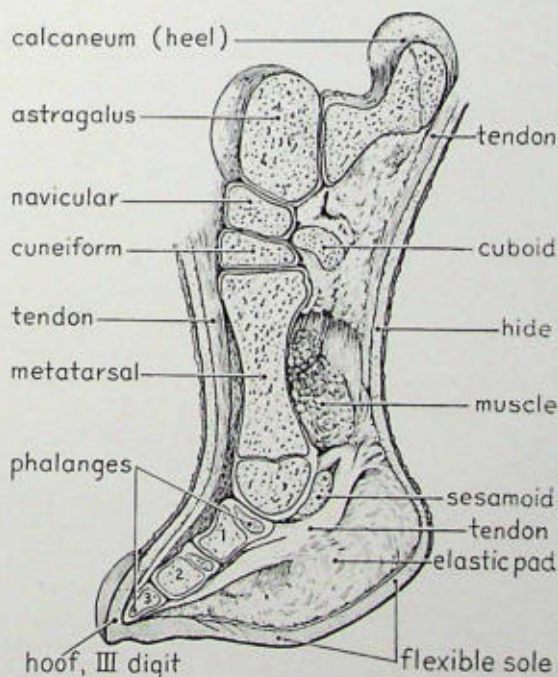
eastward to the savannah. The grass shelters of my thirty natives formed a wide semicircle which was closed with our workshop. My A-tent, just large enough to hold a sleeping bag, occupied the center. Toward dusk it rained quite hard and though in these regions one keeps no night fires burning, it had been cool and some of the natives warmed themselves before a few smoldering brands, which were later extin-

guished by another shower. The stillness after the storm had lulled us all to sleep. In the dead of night I was suddenly roused. Instinctively I grabbed my pistol and felt for my rifle. What was prodding me from the rear of the tent? Matari's warning click meant danger. "Rhinos are in camp," he whispered, "be careful." Faithful as ever, he was lying alongside, rifle in hand and ready for any emergency.



HIND FOOT OF CALF KILLED BY LEOPARDS

At every step, the bulging, flexible sole is flattened by the tremendous weight of the body. As shown by this drawing from a cross section made in the field rhinoceroses walk on tiptoe. The great pad of elastic tissue absorbs all shock like a rubber heel, and gives an easy and secure tread.





WALLOWING PLACE OF WHITE RHINOCEROSES

Tracks and churned-up mud marks of an early morning frolic at the edge of a pool, a few feet below the level of the savannah.

**Rhinoceros
Herd
Invades
Sleeping
Camp**

Here I was in a real trap. The tent was securely closed and mosquito-proof as well. With rhinoceroses in front I could not open it and even the noise of ripping the back might make things worse. Carefully unhooking one corner, I peered out. There in the darkness fifteen yards away, four monsters were sniffing at the ashes in front of one of the shelters, from which the natives had long since fled. For ten minutes Matari and I anxiously watched our uninvited guests wander about. Finally one of them ran into a pole supporting a crate upon which a skeleton was stored out of reach of hyenas and leopards. With a crash the platform came down, and then great was our relief and surprise to see the night-prowlers make off at a fair pace.

Hardly were they out of camp when the fires were burning again brightly. Native dances started and songs rang through the midnight air. Over and over echoed the monotonous refrain: "The rhinos' strength was bewitched, and like sheep they had to leave the white man's camp."

**Visual
Powers
of the
White
Rhinoceros**

I had always supposed that the sight of these animals, known to be poor, was more acute at night than during the day. But though one of the rhinoceroses had stared in my direction for a considerable time during this visit, his interest was not aroused, even when I later moved around. The orbits are small and well protected by a series of skin folds or pads that effectively shield them from injuries during wild stampedes.

Visual power certainly plays but a small part in agitating the usually sullen mood into fury. Should a rhinoceros hold its head in a horizontal position the eyes would naturally look obliquely up toward the sky. The curious angle at which the eyes are placed suggests that they are chiefly used at close range, as during grazing. But it is generally believed that favorable conditions may permit them to recognize at a hundred yards what ordinarily is out of their range at thirty.

**Sense
of
Smell**

The sense of smell is admirably developed, but often places the rhinoceroses in the sorry plight of having to content themselves with only such hazy information as the wind will carry. Bewilderment, which is coupled with their hesitation and fear, may be the natural result of their inability to define clearly what danger confronts them. Like men of the old stone age, with but few implements for defense or attack compared with the multitude of destructive weapons in our times, the rhinoceros seems to lag ages behind in the development of its various senses. But relying on smell and hearing, backed up by two tons of weight and irresistible power, it might exist for centuries to come and succumb to none of the ordinary dangers of attack, if it were not hopelessly doomed by modern firearms.

**Food
Habits**

On the ground I was surprised to find at times plants they had accidentally chewed. At first I thought that only strong-flavored herbs were rejected, but this is not the case. A well developed taste discriminates against everything but grass.



THE BEGINNING OF A WATER HOLE

In the midst of the jungle a mere puddle may rapidly be transformed into a deep hole, for with each wallowing each rhinoceros carries off a heavy load of mud.

as stomach contents and droppings also attest. Perhaps such a restricted diet is one of the reasons why no white rhinoceroses have ever reached civilization alive. A careful supervision of their food would undoubtedly help keep these monsters alive after capture. Strange as it may sound the young are easily handled. In 1907 I had the pleasure of turning over to Dr. William T. Hornaday, Director of the New York Zoological Park, a young black rhinoceros I brought to New York from Mombasa, East Africa. I can vouch that the monstrous weight and power is not so serious a drawback. These giant pets show great affection for those attending them and at the slightest call give instant response. Even when racing at top speed a mere whistle will make them brace their four limbs and turn with a rapidity that astonishes every one.

Habits of Black and White Rhinoceroses Black rhinoceroses live in rather solitary fashion, and stand about or travel with head generally carried well off the ground. Their sources of information being more dependent on the wind are uncertain, a fact accounting for their more truculent temper. Usually their droppings are left along trails, in well established sites, and the large accumulations are thoroughly kicked over and nosed about by other passers-by. Much in the same

manner as dogs sniff about, these black rhinoceroses gather information about the presence, number, and sex of their kin. These malodorous messages of course are really important for the welfare of their race.

The white rhinoceroses travel with nostrils close to the ground, the whole family within a narrow compass. No special excitement need necessarily rouse them to a spirit of aggressiveness, their information being transmitted through scent, is always close at hand. Their temper is therefore less susceptible to being ruffled by continuous doubt. Unlike the black species, they deposit their droppings wherever they happen to be, usually during the early morning; they may nose them and occasionally scrape the ground with their hind feet, but otherwise leave them untouched.

It would thus seem that the different methods of depositing excreta in the black and white species, are not accidental habits. They probably are based upon fundamental differences in instinct, with a definite purpose, and are related to the fact that in both kinds the eyesight is poor.

Rhinoceros Trails

The impress these rhinoceroses leave upon their habitat bears but little comparison to the general havoc wrought upon a region by passing herds of elephants. True, the latter also have a few well-worn highways, but the daily ten to twenty mile stroll of rhinoceroses endows their haunts with good trails, welcome to all. Relentless habit, softening rains, and hardening action of the sun—these are the factors that have slowly formed the greatest jungle trails in Africa. Here the primitiveness of a one-track brain, the rhinoceroses brutal strength and ponderous weight have forced their right of way, and the results can well compare with those wrought by the American bison. Where do these age-old pathways lead? To native hovels, to far off hamlets, to hard-tilled soil, or to white men's brick-built posts? No! They claim their world, and throw a mighty span across the jungle. The whole savannah, with its level stretches and its hills, the rivers, swamps, luxuriant grazing grounds and barren outcrops all are in

their domain. No narrow-minded spirit has imposed a plan—they follow nature, lead nowhere, and are owned by none.

Feet of the White Rhinoceros The feet, with three broad-nailed hoofs, leave an unmistakable track and the accompanying photograph shows the differences between the oblong sole of the hind foot and the more roundish one of the forefoot. Consistent with their greater size, the tracks of old bulls are perceptibly larger and deeper than those of cows.

To say that rhinoceroses walk on high heels seems far-fetched, yet this is practically what happens. These mighty monsters step on tiptoe, their full weight resting on a pad of resilient tissues which absorbs every jar and acts in a manner similar to, but far more efficient than any rubber heel. Protected by a horny flexible sole, at each step this cushion of elastic tissue can adapt itself to any surface. Even on slippery, sloping ground, where I saw a big bull giraffe trip and tumble, a white rhinoceros passed safely at a swift pace. As in elephants a rather shuffling gait with steam-roller-like action upon the vegetation is their usual manner of walking. The many broad trails are witnesses to the smoothing effect of their oft repeated travels. In rambles by day or night they tramp in leisurely fashion often in single file, through the primeval wilderness. Speeding on smooth ground any good horse could readily overtake a rhinoceros in the first five hundred yards.

Fleet animals like antelopes or horses are little hampered by the density of the vegetation near the ground. To leap over impediments is like a mere pastime to them, and their high-placed knees and hocks furnish a freedom of action that allows a maximum of speed and endurance. The small hoofs, long cannon bones, compact muscles, and rope-like tendons effect with ease what would be impossible for the ungainly, loose-jointed stocky and short legs of the rhinoceros. The great entanglements of a grass covered brush country demand a new exertion for each step. The lower part of the pillar-like fore and hind limbs terminates abruptly in clumsy, truncate feet, difficult to



WHERE HERDS GATHER TO PLAY

A mud bath is so necessary to the comfort of white rhinoceroses that the drying out of their favorite "wallows" induces them to migrate. At full length, they plunge about in the mud, much like pigs. Some of the mud is rubbed off on the bushes, and by rolling about on the ground great clearings are worn down.

lift far from the ground; but the relatively short, stout bones, muscles, and sinews are well designed for the tremendous pushing effort needed.

Anatomical Features

Since the motive power is generated only by coarse grass of rather slight nutritious quality the digestive organs are enormous, a living "steam-boiler" hooped by broad ribs and an armor-like hide. The rest of the carcass is but bone and sinew, with surprisingly few large muscles. This is a serious defect in the eyes of meat-hungry natives, and even the hide, roasted and boiled like meat, is not a sufficient compensation; and so in their songs they bitterly complain of it.

Fighting Rare

Only once have I heard of a combat between white rhinoceroses. Their usual, unruffled calmness may suddenly give way to a senseless charge, but a determined struggle, as among elephants and buffaloes, is hardly in keeping with their temper. The solitary bull, fought out of the herd, is rarely met with. Continued breeding seems to foster the formation of small family troops from which domestic pugnacity is happily absent.

With the exception of man they have no enemies but lions and leopards, which prowls about



AN AGE-OLD TRAIL

To the left of the tall tree where the native stands, is one of their wallowing places; an almost daily resort for wandering rhinoceroses.

seeking their young. Near the crossing in a papyrus swamp we came upon the remains of a calf that had been overpowered by two leopards, and later feasted upon by hyenas. Fortunately there was enough left to furnish me a cross section of the hind foot. From the photograph of this preparation the accompanying drawing was made to show its interesting structure. To judge by the tracks there had evidently been a very short struggle, and the mother, usually so devoted to her offspring, had abandoned it. Probably the calf was attacked at the very moment it attempted to enter the water.

The Young The young rhinoceros shows a great fondness for its mother. At her death the awe-inspiring whistling noise the calves make is proof of their anxiety. In confusion they trot back and forth, deliberately charge, and return again when chased away. However, in two cases such orphans later followed and were adopted by other rhinoceroses.

It is surprising how early the young are weaned. When six weeks old they are practi-

cally independent of their mother for nourishment, as we could plainly see by their deposits of digested food.

Breeding Habits

Reproduction is also unexpectedly rapid, though but one young is born at a time. Often troops of five included, besides the adults, a calf, a three-quarter grown and another still youthful member. In spite of well pronounced climatic seasons there is neither a rutting nor calving period, and at any time throughout the year young may be seen. They walk either ahead of or behind the mother and, contrary to general belief, this surely is not a characteristic distinction between the white and black species; but in case of danger the calf invariably precedes.

Insect Pests

Among the smaller pests that may inconvenience white rhinoceroses are various ticks, the most typical of which have a beautiful metallic lustre. They chiefly infest the softer, wrinkled parts of the hide about the eyes, ears, neck, abdomen, tail, and limbs. Credited with removing these insects are the oxpeckers (*Buphagus africanus*),

which, however, in the Uele district and the Bahr-el-Ghazal are far more eager to follow herds of giant eland. It so happens that at

A least one of these birds always
Guardian seems to be on the lookout to warn
Bird big game of the slightest danger.

As the little oxpeckers rise higher and higher into the air their sharp shrill notes act as a magic whip even for rhinoceroses. Without a moment's delay the thud of swiftly moving feet affirms the obedience shown to the tiny feathered sentinels. In long, dipping flight the birds follow their charges, which do not resume the interrupted siesta until the order to move is countermanded. This quick response on the part of those dull beasts seems to indicate that their hearing, like the sense of smell, is not hampered by the lethargy shown in sight and touch.

The oxpeckers' food consists only of ticks, although some hairs are swallowed incidentally. Often they are said to enlarge their hosts' wounds, from which they are believed to gather some nourishment. With their strongly hooked claws they have no difficulty in clinging to the hide of the larger mammals, following herds of game and also cattle. Over the rough hide of a rhinoceros an oxpecker clings and climbs in any direction, head up or head down, like a brown creeper on the rough trunk of a tree. It is difficult to prove whether they actually intend to warn their hosts, or whether their natural shyness indirectly causes the alarm. Surely among herds of cattle they become so tame that they can be approached without trouble.

No cow-herons (*Bubulcus ibis*) were seen with white rhinoceros in the Uele, though Roosevelt reports them in numbers near the Nile.

Fly
Enemies Some might think that horseflies (*Haematopota* and other Tabanids) find the hide of the white rhinoceros too thick, but another, really minute, blood-sucking fly (*Lyperosia*) is a characteristic companion, constantly hovering in great swarms about their huge prey. Their presence often indicated to us the proximity of a sleeping herd before we could actually see it. In such cases we listened for the usual noises that denote their exact whereabouts. And even while we halted, other tiny flies, which never attack the healthy human skin, gathered upon wounds or small scratches, and their bites always produced an infection which retarded healing. On careful inspection it became apparent that the hides of rhinoceroses have thousands of little injuries

whose exudations furnish ample nourishment for these insects.

More remarkable still is an æstrid fly (*Gyro-stigma pavesii*), whose grub-like larvæ often cover large portions of the stomach lining, just as those of other species do in zebras. According to Dr. Rodhain's investigations,* this large, beautiful fly, whose entire life history is intimately connected with the white rhinoceros, fixes its eggs upon the skin of the head, neck, and shoulder of its host. The young larvæ after escaping from the egg probably crawl about, enter the mouth of the rhinoceros, and reach its stomach, where they remain throughout their successive stages. Final transformation into the imago is attained when together with the excrement they leave the body and burrow into the ground to pupate.

Internal
Parasites Intestinal parasites, especially round worms (nematodes) are numerous, and most noteworthy is a broadened, rather short tape worm (*Taenia*). The large numbers of these parasites are astonishing, yet they seem to be rather a sign of good health, instead of a serious plague.

Use of
Horns
and Hide What has indirectly contributed more than anything else to the gradual extermination of the white rhinoceros are the horns, a dusky inconspicuous mass, and a relatively insignificant part of the bulky brute. They made the horn-bearer a danger, and the horns could be sold. Greek and Hindu traders were ready to buy them at the value of ivory which has proven so fatal to the elephant. Superstitions of peoples in far off Asia made a market for horns, at good prices. Greasy and sleek humanity, rudely cursing or suavely smiling, has been willing to guarantee health to those stolidly believing, so long as the mere powder and scrapings from rhino horns sufficed. The craze among native chiefs to own a horn staff of unsurpassed length helped decimate the white rhinoceroses in South Africa.

White man, too, has bid for these rarities, and not in vain. Polished and shaped into canes, gold-topped and diamond encrusted, these horns become valuable "curios." Amulets to keep away witchcraft were carved easily, and worn willingly. A cup turned out of rhinoceros horn was believed to splinter at the mere touch of obscure poison, and insured carousals their unchallenged happy-go-lucky strain. Now statuettes and other bric-a-brac, fashioned by

* Rodhain, J. and Bequaert, J. Bull. Biolog. France et Belgique, LII, 4, 1919, pp. 379-465, Pl. III.

artists of many lands, still delight those eager for quaint trinkets.

The many-thonged slave-trader's lash cut out of rhinoceros hide now finds its counterpart in the dainty horse-whip of the more refined. The hide, raw or burnished, or given an amber-like appearance and polish, is often transformed into queer-looking tables, trays, and smaller objects. Thus it adds to the pride of the home owned by men of the colonial set. And finally, industry has found that disks cut from the hide and put on the lathe give a high polish and stand great wear.

Changes to be Expected In young countries like Africa we must expect rapid changes in economic aspects. The natural paradises of game now seem to vanish as fast and as surely as the buffalo from the wide plains of America. Greed for lucre, the facilities of travel, perfection in firearms, alleged necessity, all have played their parts. At first caravans helped the slave-trader and the missionary, the trader and the sportsman. Oxcarts and railroads brought the settler, and his indus-



HIDE OF RECORD BULL RHINOCEROS

When first stripped from the carcass the heavy skin needed about twenty porters to move it, but after sixteen hours of scraping and paring, and as finally dried and packed, it weighed only 65 pounds and was carried by one native.

tries. Today automobiles are displacing oxen and horses. Chances for the game become sligher, and the difficulties for those who try to protect it greater. The countless herds are fast losing their heritage. Great game reserves have been set aside throughout the "Dark Continent," and the laws of various governments guarantee to the teeming multitudes freedom unharassed. At times clamoring settlers and prospectors with their following enter. Economic stress tightens the purse strings of colonial administrations; restrictions are lessened,—and all hope for the game is gone. The elephants of the Addo Bush furnish proof of this in their last stronghold in southernmost Africa. The huge beasts could not be corralled nor controlled. They simply had to go.

Fortunately the white rhinoceroses of the Congo-Nile race have little of the aggressiveness that makes the black form so dangerous a brute. Their realm lies far remote from civilization, and they leisurely roam over regions wherein



THE USUAL FATE OF A RHINOCEROS

Rhinoceros meat, and also the thick hide, is cut in strips a few inches thick and thrown across a hastily constructed rack. The fire and smoke, together with the heat of the sun, transform the dried flesh into a staple food for the natives.



SUCCESSFUL RETURN TO HEADQUARTERS

Small caravans were used for many side trips made during the Congo Expedition. On this occasion we secured, in addition to skin and skeleton, the first plaster cast ever taken of the muzzle of a white rhinoceros (carried by porter fourth from left), a valuable aid to the correct mounting of specimens for the Museum's habitat group. In the foreground an ideal pasture for these broad-mouthed monsters.

the call of forward struggling civilization is still faint. They are protected by the natural indolence of natives, and the commercial poverty of nature. They have a fair chance to survive the native spear, but not modern gun and powder, and today the negro marvels at the small bullet that brings him so easy and big an exchange in meat.

Judging from observations made by others and ourselves, from 2000 to 3000 white rhinoceroses may still be alive in the entire northern range. Just how rapidly their numbers will decrease, depends upon the protection afforded them. Their fate now lies in the hands of three Colonial Administrations: the northeastern Uele district of the Belgian Congo, the adjoining portion of French West Africa, and the Anglo-Egyptian Sudan. Perhaps complete restrictions to traffic in the horns of white rhinoceroses would be the most important step toward saving from extinction one of the few huge beasts dating back to Pleistocene times.

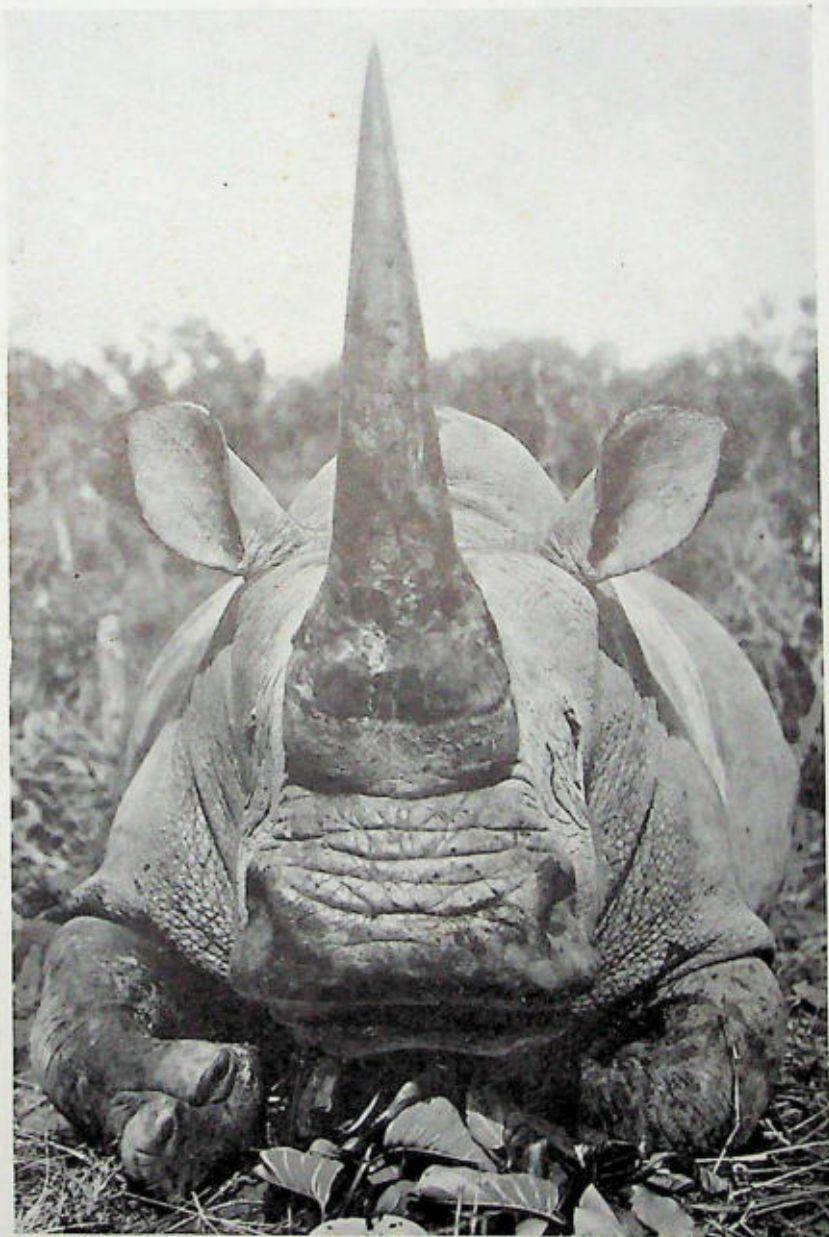
According to Colonel Roosevelt "the white rhinoceros is, next to the elephant, the largest of existing" land mammals. Among living giants it is the only one that has been considered ex-

inct, the only one never brought alive to civilized countries. In Museum collections mounted specimens are still scarcer than of the rare okapi, which thanks to the remarkable pluck of a Belgian woman, Mrs. Landeghem, recently reached Antwerp alive.

**Capture
Live
Specimen
for New
York**

Is any American sportsman willing to help capture so coveted a prize? Or will any one be so generous as to enable the New York Zoological Society to be the first to exhibit a monster that has successfully daunted skill and courage? It would be a fitting and well deserved triumph for one of America's leading institutions, which, backed by keen enterprising spirit, has aroused the admiration and envy of century-old competitors abroad. Fortunately rhinoceroses in captivity have proved to be among the longest-lived creatures in the world. For half a century a white rhinoceros might interest the millions of New York city.

The Nile route is open. December to June is the best season. Six months of sport and adventure might bring crowning success. Shall America be first?



THE MONARCH OF THE JUNGLE

In the prime of life the conical shape of the front horn is typical, but with age it becomes worn near the base. Photographed in the pose the white rhinoceros usually assumes when at rest.

AQUARIUM NUMBER

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ZOOLOGICAL SOCIETY BULLETIN

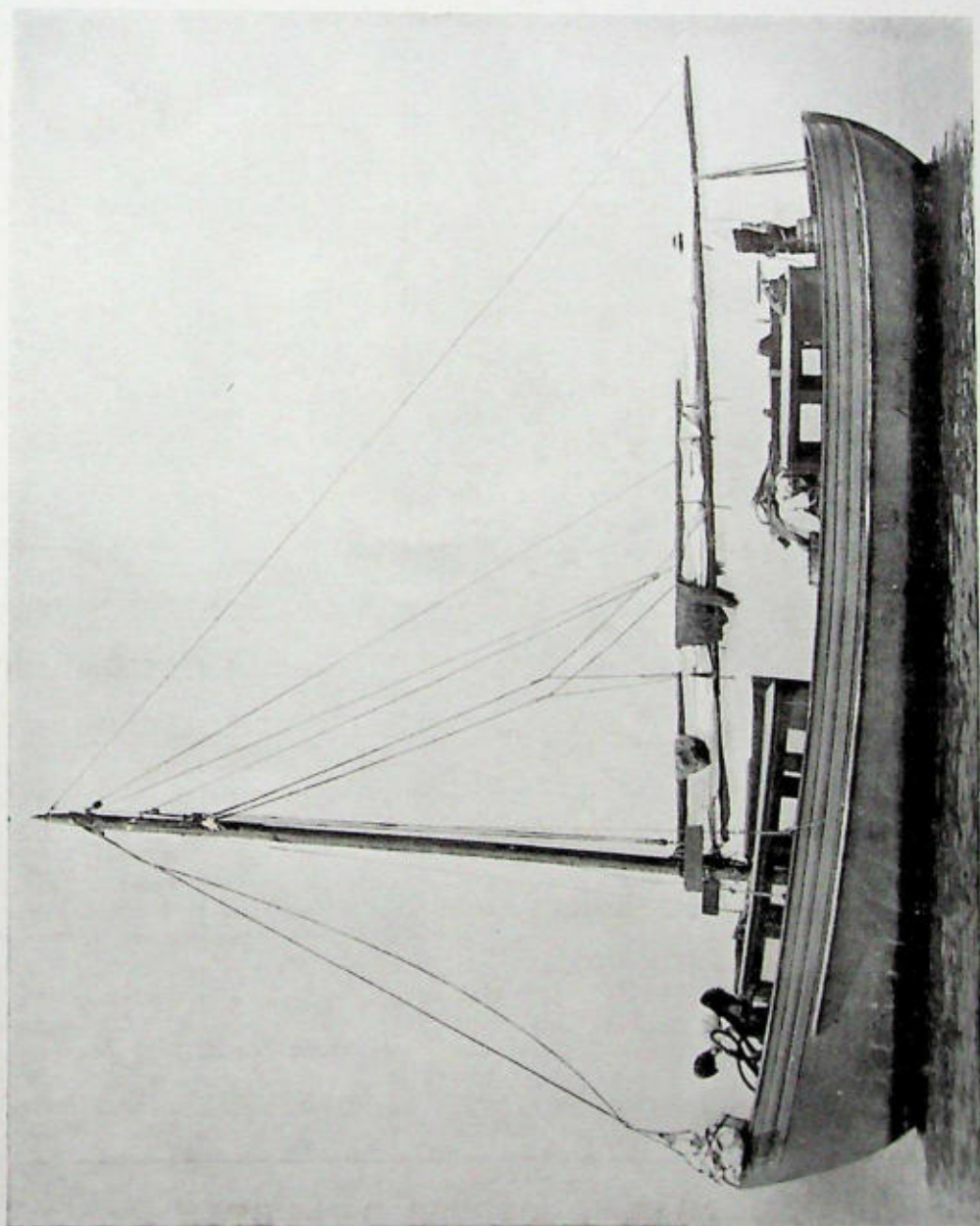
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THE WELL-BEAT SEAHORSE BUILT BY THE NEW YORK ZOOLOGICAL SOCIETY FOR THE USE OF THE AQUARIUM
Length, thirty-five feet; beam, eleven feet; draft, three and one-half feet; engine, twenty-five h. p.

ZOOLOGICAL SOCIETY BULLETIN

Published by the New York Zoological Society

VOLUME XXIII

NOVEMBER, 1920

NUMBER 6

THE WORK OF THE AQUARIUM WELL-BOAT

By C. H. TOWNSEND

THE possession of a first-class well-boat for the collecting of specimens has recently enabled the Aquarium to increase its marine exhibits, which are now larger than they have been at any time in the past. A boat of this kind has long been needed, as all public aquariums are under the necessity of procuring their living exhibits directly from Nature's sources of supply. The animal dealer has little to offer aside from marine mammals.

Visitors are generally surprised when told that the fishes and invertebrates of the Aquarium are all brought in by our own men and a large proportion of them captured with our own nets.

The work of keeping the tanks well stocked both in numbers and variety has until recently been no easy matter, as all transporting of live specimens had to be done in small tanks carried in boats or wagons hired for the purpose and constantly aerated by hand.

With a well-boat always ready for service, fishes are now safely floated to the door of the building and disheartening losses in transit are eliminated, specimens are also received in better condition and are therefore better fitted to survive under the conditions of captivity.

Our well-boat, the *Seahorse*, was specially built for the service of the Aquarium by the New York Zoological Society. The vessel was launched from the boat-yard of A. Hansen in Brooklyn on May 20, 1920, and has been in service ever since. Collecting trips lasting from twenty-four to forty-eight hours have been made weekly during the summer and will be continued until sometime in November, when cold weather makes fishing unprofitable as well as difficult. The craft will then be hauled out for the winter.

The *Seahorse* is thirty-five feet in length, eleven feet beam, three and one-half feet draught, and is registered at nine tons gross. The well amidships is ten feet long at the bottom, with the width and depth of the boat. The forward cabin is ten feet long, the engine cabin seven feet, and there are berths for four men. The boat is strongly built and thoroughly seaworthy.

The *Seahorse* has a twenty-five horsepower engine, is sloop rigged and is well adapted for the kind of work to be done. The boat made nineteen trips to Sandy Hook and Raritan bays, bringing in nearly three thousand live fishes and over eight hundred crustaceans, to say nothing of other fishes and small marine forms used as fish food.

The collecting outfit includes a twelve-foot seine boat, a three-hundred-foot haul-seine, and a beam trawl. Next summer an otter trawl will be added to the equipment.

Owing to unfavorable weather conditions a few trips were barren of results. On the other hand, more than three hundred live fishes have been carried in the well of the boat on a single trip. The largest fishes secured were sand sharks and red drum from three to four feet in length, but fishes up to ten feet in length can be carried. About sixty different species of fishes were taken up to October 14.

There are no beaches suitable for the hauling of seines near the City. It is necessary to go to the lower bay to find sandy beaches clean and free from bottom obstructions, but even there the nets are sometimes snagged and torn.

The *Seahorse* makes the run from the Battery to Sandy Hook, a distance of sixteen miles, in



THE SEAHORSE OFF ON A CRUISE

two hours, with favoring wind and tide. Sails are set whenever it is advantageous to do so. The only cruise made into Long Island Sound was so disappointing in results that it was not repeated. The lower bay, that is, the region comprising Sandy Hook and Raritan bays, having proved satisfactory, our work has not yet been extended farther. The exploration of Jamaica Bay and Barnegat Bay will be deferred until next summer.

The presence of forty large permanently located

pound nets in the lower bay, operated by commercial fishermen, proved a sufficient inducement to confining the collecting work to that region for the present season. The pound nets are emptied of their catches every morning except Saturday and Sunday, and it is only necessary to be present when this is done in order to secure many kinds of fishes that cannot be caught in seines along the beaches. Desirable food fishes can be transferred directly from the pound nets to the well of the *Seahorse*, by paying the fishermen the prevailing market prices, while the numerous kinds rejected by the fishermen are also available. The latter are of course equally desirable as Aquarium exhibits, as they include interesting species of skates, puffers,



STOWING THE SEINE IN THE SEINE BOAT



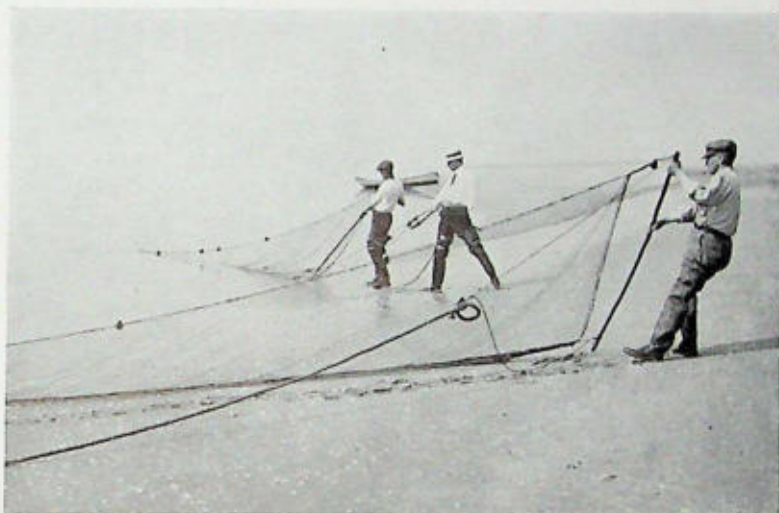
SEINE BOAT READY TO SHOVE OFF

sculpins, dogfish and the unmarketable in general.

The usual procedure of the *Seahorse* crew is to spend some hours seining the beaches, dredging under sail, or collecting invertebrates along shore, then after lying at anchor over night, visit the pound nets when they are lifted at day-break. Fishes that have been handled carefully and placed in the well of the *Seahorse* require no further attention, and the cruise may be prolonged if desirable, as the water supply changes constantly with the motion of the boat.

The *Seahorse* has proved a valuable acquisition and the Aquarium would have had better exhibits, secured with less effort, if the craft had been built a dozen years ago. The *Seahorse* could have made many more cruises if a crew had been available at all times, but the day's work at the Aquarium necessarily comes first and collecting trips are therefore arranged only when men can be spared.

All expenses connected with the operating of the boat are paid by the Zoological Society.



BEACHING THE SEINE

EXHIBIT OF FANCY GOLDFISHES

An exhibition of fancy goldfishes, held at the New York Aquarium by The Aquarium Society on October 10, 11 and 12, proved of great interest to the public. The varieties exhibited were principally Moors, Calico Telescopes, Japs, Comets and Lionheads, and included some remarkable prize winners. The jetty blackness of the Moors, the red-white-and-blue patterns of the Japs, the black-red-and-blue tapestry of some of the Calicoes, the strange anatomy of the Lionheads, and the graceful bodies of the Japs and Comets, drew exclamations of admiration and wonderment from many of the 25,716 persons who viewed this exhibit.

No addition to the present exhibits of the Aquarium could be more enthusiastically welcomed than a permanent display of these curious

and interesting varieties of goldfish. Bred for centuries by the Chinese and Japanese from "sports" and oddities, in much the same manner that pigeons have been bred by the English, for the mere human love of creating, they are delightful to the eye of the lover of beauty and form, and interesting to the student of heredity.

The Aquarium, though long desirous of showing a large and varied collection of these beautiful animals, is not properly equipped to maintain them in health and comfort. Not adapted to our Catskill running water that reaches a temperature of 39 degrees in the winter, nor yet to the heated water in which tropical fishes thrive, they require balanced aquaria, well stocked with plants on which a strong light can fall. The Aquarium has no appropriate place for such an exhibit.—I. M. M.



SEINING AT SANDY HOOK



WELL-BOAT SEAHORSE—DRYING SAIL



THE SEAHORSE ENTERING "THE BASIN" BEHIND
THE AQUARIUM

A LONG-LIVED SEA HORSE

On January 11, 1916, the Aquarium sent six sea horses (*Hippocampus hudsonius*) to the aquarium at Venice, California. They were shipped by way of experiment, in one-gallon sealed jars of sea water charged with oxygen, two fishes to each jar, and reached their destination safely.

Under date of September 10, 1920, Mr. John J. Kemp of Venice writes that most of them lived until the present year, the last one dying in September, 1920. Mr. Kemp states that they were always fed on live amphipod crustaceans of minute size.

It has always been the practice at the New York Aquarium to feed sea horses on small amphipods of the genus *Gammarus* gathered along the sea beaches. They have, in fact, never been successfully fed on anything else, and as there are long periods in winter when *Gammarus* could not be obtained, specimens were sometimes lost from lack of food. Two or three years has been the limit of life for sea horses in the Aquarium under favorable conditions.

The collecting of suitable food in the mild climate of southern California has evidently not been as difficult as it has at New York, and this seems to have been the secret of the success in keeping sea horses in the Venice Aquarium.

—C. H. T.

"Continually study the history of nature, and trace the progress of bodies from one form and species to another; contemplate often upon this subject, for there is nothing contributes so much to greatness of mind."—Marcus Aurelius.



DIP-NETTING SPECIMENS FROM WELL OF SEAHORSE



AQUARIUM GUIDE BOOK

Up to November 1, 1920, 1755 copies were sold of the new Guide Book to the New York Aquarium issued last February. This is a book with 170 pages, 160 illustrations, in which 350 species are briefly described. Numerous mail orders have been received, some of them from points as far distant as the Gulf of Mexico and the Pacific Coast.

HOISTING A BUCKING SHARK
WITH BLOCK AND TACKLE

GIANT GARFISHES (*LEPISOSTEUS TRISTOECHUS*)

Presented to the Aquarium by Mr. Henry D. Whiton.

Photographed by Elwin R. Sanborn

GIANT GARFISH FROM LOUISIANA

By C. H. TOWNSEND

THE Aquarium has seven giant or "alligator" gars (*Lepisosteus tristoechus*), the gift of Mr. Henry D. Whiton of New York. So far as known, these are the first specimens of this species to be exhibited in an aquarium. They were captured in Lake Calcasieu, in southwestern Louisiana and arrived at the Aquarium on May 28.

The gars are about half grown, averaging four feet in length and thirty pounds in weight. The American Museum of Natural History has a mounted specimen of the giant gar eight feet long, but we know that the species grows much larger. Mr. Whiton has furnished a record of a twelve-foot specimen killed in the Lake Calcasieu region by M'sieu Tata Ibert. It is said that it grows still larger, but our opinion on this point is reserved until the claim can be demonstrated.

This is the second lot of gars secured for the Aquarium by Mr. Whiton, the first shipment

having been lost in New York during zero weather before the fishes could be removed from the steamer.

The transportation of these large fresh-water fishes by steamship presented a problem, as sea water could not be used for renewing the water supply of the large tanks in which they were carried. The problem was solved by the use of a steam-driven air compressor for the constant aeration of the tanks, both collections of gars being brought to New York without change of fresh water except for a limited quantity spared from the ship's supply.

The fishes arrived more or less bruised and chafed, but they have recovered their normal appearance, and after five months in the Aquarium appear to have accepted the conditions of captivity and settled down to the simple life.

The sheltered life of the Aquarium tanks involves a complete change in habits for this big,



SAND SHARKS AND DOGFISH, CAUGHT IN SANDY HOOK BAY

Photographed by Edwin R. Sanborn

voracious fish, which has been called "the freshwater counterpart of the shark." Among freshwater fishes it rivals the sturgeon in size. Its formidable jaws are armed with dangerous teeth. We have before us the personal letter of a bather in a Louisiana lake whose arm was seized and badly lacerated by a garfish. Its voraciousness and destructiveness to other fishes is well known. It is a plague and a pest to all interested in the fisheries. The giant gar is not only armed for offense, but is heavily armored for defense, its body being completely protected by hard rhombic plates—ichthyologists do not describe them as *scales*. The giant garfish is one of the few survivors of the extinct ganoids of Eocene times. It inhabits the middle and lower Mississippi River and streams flowing into the Gulf of Mexico.

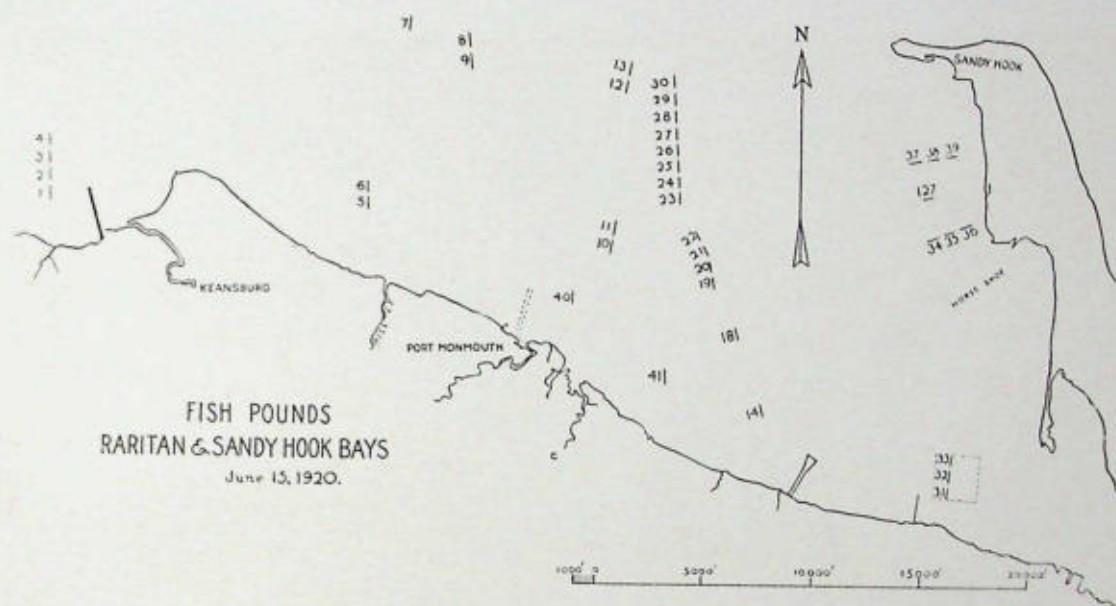
Our specimens refused to take food for several weeks, but are now feeding freely. They no longer insist on live fish, but are willing to eat dead ones. It is to be hoped that they will prove as hardy in captivity as the small northern gars (*Lepisosteus osseus*) which have lived in the Aquarium twenty years. Should they keep on growing and give promise of reaching giant

size, the Aquarium will have an exhibit that will increase in interest as time passes.

Last November the writer participated in the capture of the first lot of gars donated by Mr. Whiton, which were also taken in Lake Calcasieu. A heavy 400-foot seine was used and over forty gars were taken in a few days, the largest being six feet long. The fishes were placed in seven wooden tanks, each eight feet in length, and loaded on a barge which was towed through the Intercoastal Canal from Lake Calcasieu to Sabine, Texas. From this point the Union Sulphur Company's steamer *Hewitt* brought them to New York.

The census of the Alaska fur seal herd as taken by the U. S. Bureau of Fisheries in August 1920, shows that the herd has now increased to nearly 550,000 animals.

The annual attendance of the Aquarium, which dropped during the war to less than a million and a half, is now returning to the pre-war figure of over two millions. The number of visitors to November 1, 1920, was 1,741,858.



MAP SHOWING LOCATION OF POUND NETS IN 1920

POUND FISHERIES OF LOWER NEW YORK BAY

By S. A. CALLISEN

FEW people in and about the City of New York, including even those who daily travel by boat to Red Bank or the Highlands, realize how large a fishing industry is carried on at their very threshold.

Compton Creek, flowing into Sandy Hook Bay some three miles from the Highlands, furnishes a shallow but sufficient harbor for the fishermen's boats, and has therefore become the center of this activity. Despite the fact that the creek affords but a scant four feet of water at low tide, it is ideally located to form a base for the pound fishermen. It is near the fishing grounds and well protected, while its meanderings through salt meadows gives ample opportunity for spreading, mending and tarring the nets. The town itself, known as Belford, lies somewhat farther inland and its trim, comfortable homes give proof of the size and profit of its trade.

It would be well at the outset clearly to define pound fishing. It is, in reality, fishing by means of large trap nets set so as to catch the fish as they follow rather clearly defined lines of movement. The trap, known in its entirety as a pound, is composed of four distinct parts, the "leader," the "big heart," the "little heart," and the "bag" or "pocket."

The "leader" is a ten-inch mesh net from three hundred and fifty to four hundred feet

long, and ten to twenty feet deep, tarred, and weighted at the bottom with large stones. It is set in a straight line and held above high tide level by poles driven into the bottom at intervals of about twenty feet. The "big heart" is composed of two nets set opposite each other in the outline of a heart. The "leader" ends in the notch, while the point of the "big heart" is truncated so as to form the notch of the "little heart." The nets are three-inch mesh, tarred, weighted with chain, and held up by poles like the leader. The "heart" thus formed is from 100 to 150 feet in length from the base of the notch to the opening of the "little heart" formed by the truncated point, with about the same width at its widest part. The "little heart" is similar in construction and design, the notch, as stated, being formed by the point of the "big heart." Its point, however, is different, ending in a funnel that is carried into the center of the "pocket" or "bag." The "little heart" is from forty to seventy feet in length, with about the same width. The "pocket" is a box of net held in place by poles, with either a roughly rectangular or circular outline. Its lower side rests on the bottom, and it is pierced on the wall nearest the "little heart" by the funnel, which projects into the center of the pocket. The funnel opening is about six feet square and is held in place by a rope passed through a pulley fastened to a stake on the opposite side of the net. The pocket is made of two and one-eighth inch mesh tarred net, and is twenty-five to thirty feet deep, fifty-five feet



MENHADEN FACTORY AT PORT MONMOUTH, N. J., FOR THE PRODUCTION OF FISH OIL AND FERTILIZER

long and forty-five feet wide. It is not lashed directly to the stakes, but is held by so-called "stops," "hauls" and "brails" at a little distance from them in order to facilitate handling. The leaders are set as a rule at right angles with the beach, since the fish follow the coast line coming in or out of the bays. The fish strike the leaders and are headed into the "big heart," the "little heart," and finally the "pocket," as they always

follow the line of the net in an effort to escape. They are diverted at the open notch of the hearts by the turned-in ends, until they at last find their way through the funnel into the "pocket." This seems to form an almost perfect trap for fishes and even crustaceans.

The entire pound must be raised, one part at a time, every two or three weeks, depending on the season, and taken ashore, a substitute net



BAILING OUT THE CATCH
Pound Net and Boat of J. C. Johnson.



A HEAVY CATCH OF MENHADEN
Pound Net and Boat of Jacob Schnoor & Sons.



FISHING BOAT INSIDE THE POUND, PREPARING
TO BAIL OUT THE FISH
Pound Net and Boat of Jacob Schnoor & Sons.

being put in place. This is necessitated by the rapid growth of weed and low animal forms which collect dirt and rot the net. On shore the nets are washed clean if necessary, loaded into a wagon and then spread to dry on the meadows. Here they are carefully gone over and repaired, a task involving skill and patience. They must next be tarred, which is done by passing them into a large pot and then over a grating, which takes off the excess tar. They are again spread out and allowed to dry until needed to replace the nets off shore.

All this handling makes for expense. The two sets of nets needed for each pound cost from \$1500 to \$2500. Seventy to eighty poles are needed at \$2.50 apiece. New twine and ropes are constantly used for repairs; and so it is evident that here, as elsewhere, upkeep takes the lion's share of the profits.

In Sandy Hook Bay, the location of the nets is determined to a large extent by the limits set by the War Department. Nets must be kept clear of the ship channels and cannot be placed profitably beyond a depth of about thirty feet.

They are grouped in lines of two to eight, with a few single ones scattered about where fish are known to run.

The boats used to reach these nets are all of the same general model and dimensions. They are from thirty to forty feet in length, eight to ten feet beam, and draw twenty-two to thirty-six inches. They have a narrow wash board some ten inches wide, along the sides, with a deck covering the bow and the stern so as to give a working platform. A narrow bench raised a foot or so above the bottom, runs along both sides for the same purpose. A closed cabin forward or aft houses an engine ranging from sixteen to twenty-eight horsepower, which drives them along at a rate of nine knots an hour. In this cabin is also the steering wheel and compass, so that the helmsman has direct control of the engine. Each boat has a mast set well forward with a gaff used as a derrick arm. The body of the boat is open so as to give maximum space for stowing the catch. They have a capacity ranging up to one hundred bushels, although when loaded down they can hold much more. They carry half a dozen bushel baskets in a

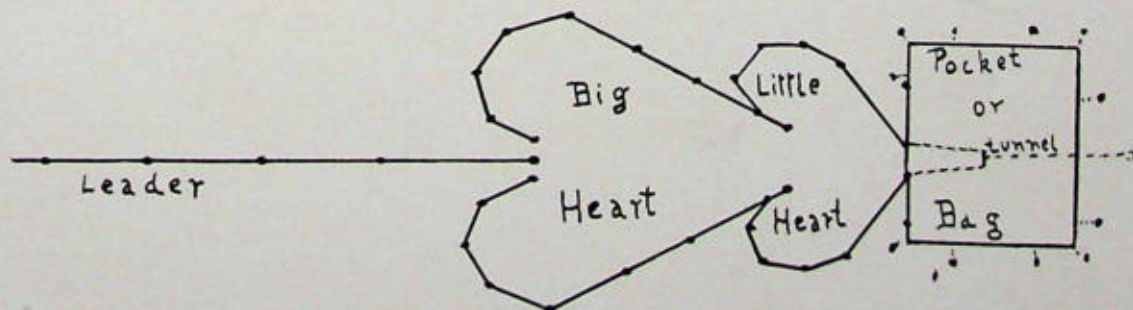


DIAGRAM OF POUND NET
Drawn by S. A. C.



BAILING OUT THE CATCH
Pound Net and Boat of A. Runyon.

space divided off in the stern, together with a large scoop net and one or two small ones. Amidships is a pump which can remove all bilge water taken aboard in handling the fish or nets. A large oar and a boat hook complete the outfit. Each pound boat tows a skiff aft, locally known as a *bateau*—a curious use of a French word for which no explanation is offered. The boats with their equipment are valued at from \$2000 to \$3000, but are so well built as to render service over a considerable period of years. Despite their open construction and low freeboard, they are very staunch and even deeply loaded seem to be quite seaworthy. The ease with which they can be handled is surprising to the novice and their worth has been proved since they have superseded all other types for pound fishing in this locality.

The crews vary from three to eight, the difference in size being caused by the number of nets owned and their location. A man with three sets of nets located in deep water needs of course more men than the man with only one net well inshore. The owner of the nets is captain and either he or his son is in charge of the engine as well. It is no easy matter to place a boat just

right in running alongside a pound, and in a heavy fog experience and a perfect knowledge of the local waters and landmarks is essential. Many of the owners are of Dutch extraction, but the crews hired are, of course, of many stocks, Swedes being fairly common. Like all seafaring men, they seem to be a strong, healthy lot, and toward a bothersome specimen collector certainly patient and amiable. Theirs being a wet occupation, the regular costume is gum boots, oilskin trousers and jacket, and when necessary a sou'wester. They receive \$35 a week and find their

own keep. With good management they are sure of Sunday off, together with Saturday, and several afternoons a week. The season lasts from the middle of April to the middle of November, after which they have often little or nothing to do. The work is, of course, hard, and the hours rather long; but it is far healthier than thousands of other more remunerative occupations.

"Early to bed and early to rise" is indeed a fitting motto for Belford. In summer everyone is stirring by four o'clock, and before sunrise



BAILING OUT THE CATCH
Pound Net and Boat of Paul Tarnow.

ZOOLOGICAL SOCIETY BULLETIN

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ELWIN R. SANBORN, *Editor*

VOL. XXIII, No. 6

NOVEMBER, 1920

the boats begin slipping out from the mouth of the creek. They head directly for their nets, and on coming close run up on the lee or off tide side of the "pocket." If no net is to be reset, a corner of the "pocket" is at once lowered, and the boat pulled into the enclosure, a large oar and boathook being used to clear the rudder and propeller. After this it is hauled up by the man in the skiff and made secure. The funnel is then hauled up, closing the bag completely. The bottom of the bag is then pulled up gradually, partly hauled on board and then dropped over the side so as to pull the boat across the net and confine the fish in an always decreasing space. As soon as this has become sufficiently small to make their handling easy, the net is hooked into pegs inside the gunwale of the boat, and the large scoop net brought into action. This is operated from the gaff, one man hoisting while another, holding it by the handle, directs and dumps it. When the net has been emptied the boat is taken out of a lowered corner as before, and the net again hoisted into place. A catch of eighty to one hundred bushels, while not extraordinary, is considered a good fare, but the average would seem to be nearer fifteen from each net. Menhaden, of course, are caught in great numbers, and when running strong are first sorted out from the food fish. As each net is hauled, the Seabright skiffs of the lobstermen gather about it to purchase bait. This is sold to them at twenty-five to forty cents a bushel depending upon its abundance. Any excess menhaden is taken to the fish factory at Belford, where the same prices prevail.

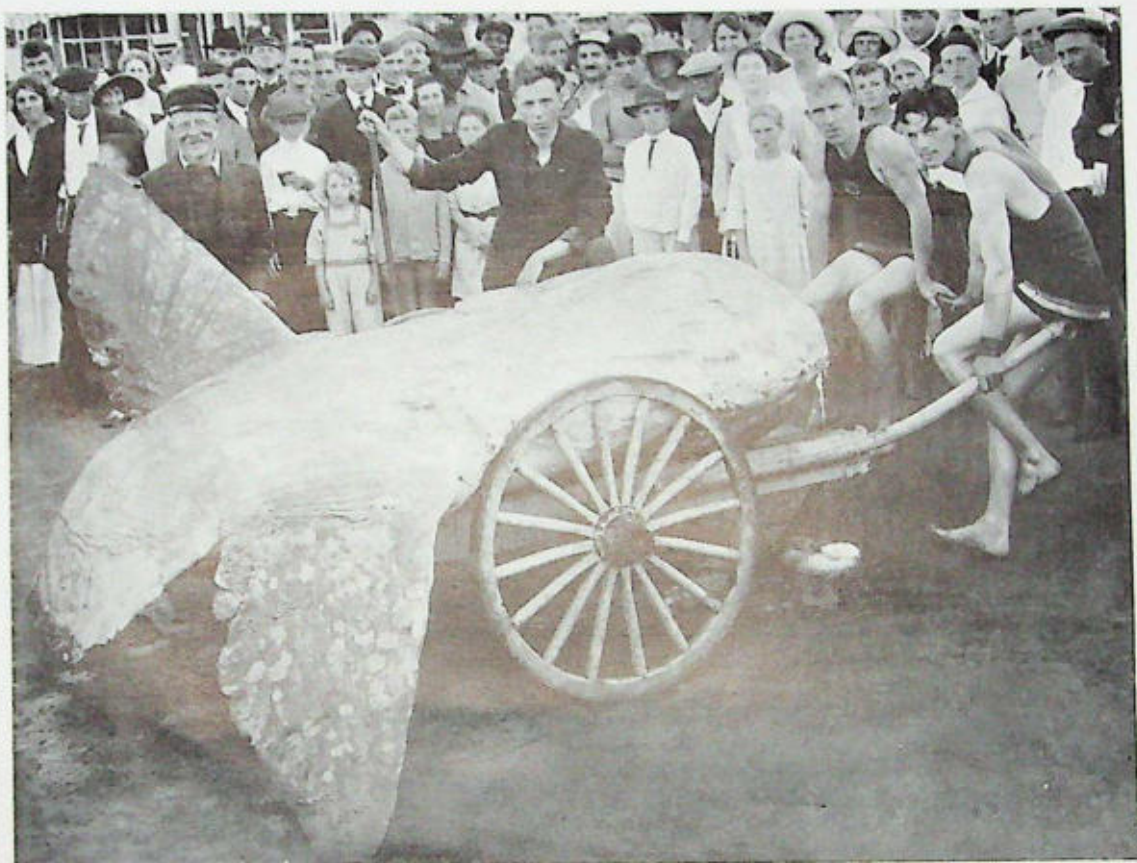
During the current year 500,000 bushels of fish were ground for oil and scrap, of which approximately 312,500 bushels were brought in by the pound fishermen. When the catch of food fish is sufficiently large to warrant it, the boat is run with its load directly to Fulton Market, New York. As a usual thing, however,

the catch is taken to the market boat, which lies at the mouth of the creek. The fish are packed in large boxes and covered with chipped ice. The charge for transporting to New York is twenty-five cents a bushel, the fishermen supplying their own ice. Due to the great demand for fish on Friday, an effort is made to haul the nets on that day, no matter how the weather may be. The next haul is made on Monday, as there is no sale of fish over the week-end.

At present there are forty nets in actual operation. These belong to seventeen men, all of whom, with but two exceptions, hail from Belford. According to last year's reports, the value of the nets ran from \$700 to \$11,500, the total value for all employed being \$78,703. Eighty-five men and seventeen boats were employed, not counting some men whose duties were confined to mending nets ashore, and 12,070,444 pounds of marketable fish were caught during the season of 1919, which brought \$147,246.61 in the market. Individual sales for the year ran from \$1,000 to \$17,000, the average being about \$9,500 for each of the seventeen men owning pounds. This does not represent all the assets, since the sale of menhaden must be reckoned in, but on the other hand it is far from being pure profit. Wages, wear and tear, repair and replacements, taxes and licenses, all cut into the actual money received for the sale of fish. Then also at best it is a very uncertain game, since the ways of the fish migrations are far beyond human ken. During 1919 and 1920 there has been a tremendous run of menhaden, while for several years previous almost none were taken in the Bay. Bluefish, on the other hand, have been very scarce this year, as have most food fishes.

In April the first run of fishes consists mainly of shad, later weakfish, spot, croakers, various flounders, and bluefish. Besides these, a large variety of fish are caught, some edible but many of interest chiefly to the aquarium collector. The nets catch considerable numbers of sharks, dogfish, scup, skates, puffers, sea robins, and such "trash," which, while cherished by the collector, is thrown overboard by the fisherman or sold at low rates to the Italians and others less finicky of taste. Some of the sharks formerly rejected now have a considerable market value as food fishes. It is surprising to find how many tropical and semi-tropical fishes wander north in summer. Since Long Island forms the northern limit of many kinds, the Lower Bay is naturally well situated for the procuring of these southern stragglers.

The Aquarium is indebted to the kindness of the pound fishermen for over a thousand excellent specimens from local waters.



OCEAN SUNFISH (*MOLA*) CAPTURED AT SANTA CATALINA ISLAND, CALIFORNIA, BY MR. VAN CAMPEN HEILNER

NOTES ON THE TAKING OF AN OCEAN SUNFISH (*MOLA MOLA*) OFF SANTA CATALINA ISLAND, CALIFORNIA. SEPTEMBER 3, 1919

By VAN CAMPEN HEILNER

WE first sighted the sunfish about 3:30 in the afternoon, basking on the surface of the Pacific, some three miles east of the town of Avalon.

I had been fishing for swordfish for several days without any success, and for want of some excitement I suggested to Captain McKay that we attempt to harpoon the creature.

We ran up to it, and from my position on the bow, I hurled the harpoon with all my strength at the great tan colored body that flapped lazily about in the blue waters. The iron struck near the head, a head-on blow, and glanced off the tough hide as though it had been thrown against a granite wall instead of a living creature. The sunfish immediately sounded and for some time was lost to our view. In about twenty minutes,

however, it rose to the surface about a quarter of a mile distant and we again approached it.

This time I threw for the tail and the harpoon found its mark, burying itself to the hilt in the great mass of flesh. From then on our troubles commenced. The *Mola* sank, taking out all the available rope which it strained to the breaking point. But by judicious handling of the launch, the captain enabled me to regain some of the line, and in the course of an hour we had the fish up to the boat.

I managed to get a large gaff into the creature's mouth and another in its eye socket which held it close to the side of the launch. But not for long, for one of the gaffs straightened out and the rope on the other parted, leaving the harpoon as the only connecting link between us and the fish.

We finally inserted the gaffs once more, after a great deal of difficulty. The weight of the *Mola* listed the launch dangerously to one side, and at frequent intervals it opened its small round mouth and belched forth great quantities of small food particles and spray, covering us with a disgusting slime.

It had been my hope to tow the fish into Avalon alive, but I soon saw this would be impossible, due to the tremendous weight of its resistance. I was forced to shoot it with a large calibre revolver, which, although it did not kill it, subdued it sufficiently to allow of more ropes being fastened to it.

We started at low speed for Avalon, the *Mola* towing behind, weaving back and forth in the water after the manner of a fan which has been thrown into the air.

Upon our arrival at shore an attempt was made to hoist the sunfish onto the steamer pier, but the weight was so great that the block and tackle collapsed, and the fish fell into the sea.

After some Herculean efforts, a cart was pushed into the water and the sunfish floated over it, when it was dragged up on the beach where a large crowd assembled to view it.

There were no scales available to record its weight. The only thing for which I can vouch is the measurement. The *Mola* was over all—from tip of snout to end of caudal—ten feet, eleven inches; and in depth—from tip of dorsal to tip of anal—ten feet, nine inches. These measurements may be verified by Captain Hugh McKay and Mr. Ernest Windle, editor of the *Catalina Islander*. Mr. Windle in a letter to me, says: "At the time the fish was caught I asked several boatmen to estimate the weight of the sunfish. The estimates made were 'from 1,800 pounds to 2,000 pounds. The latter figure would be a safe estimate. I have seen a number of sunfish brought into Avalon, and yours was the largest.'"

ALBINOS

By IDA M. MELLEN

THE albino lake trout, *Cristivomer namaycush*, now on exhibition at the Aquarium, excellently illustrates some of the peculiar characteristics that accompany albinism in whatever animal found.

The most careless spectator cannot help noticing that they wholly lack color except for an occasional faint tinge of pink or pale purple. The lateral line, though distinct enough, is without a particle of pigment, and resembles a dotted indentation in wax. The eye is pure garnet; minus the black pupil to which we are accus-

tomed in normal animals, it looks more like a drop of raspberry gelatin than sentient matter, and on close inspection proves to be pear-shaped, the apex of the pear pointing toward the mouth. The translucent cornea is not so conspicuous as in most fishes. In the albino rabbit the red pupil is set in a pinkish white iris; but in the albino trout the iris is apparently orange colored and can be seen only in a bright light and only at the apex before-mentioned. As far as can be discerned in the living specimens, the pupil occupies the visible remainder of the eye-slit. The whole eye appears an unbroken garnet; moreover, as in most, if not all, albinos among the lower animals, it moves only at the owner's volition. The eyes of many human albinos exhibit an incessant, involuntary oscillation from side to side (nystagmus).

Looking down on the fish from above the water, we plainly see the more superficial bones of the skull through the colorless flesh, and we also notice that the animal appears to feel rather than see its approach to the stone walls of the tank.

In referring to the albino fish as an abnormal animal, we do not mean that it is less healthy than other fishes, or, barring certain handicaps presently to be mentioned, that it is less fitted for the struggle of existence. It has splendid physical vitality as a rule, reproduces its kind, lives as long under protection, grows as fast and does as well as other fishes.

Under natural conditions an albino fish is handicapped in two serious ways. That the living garnet of its eyes is ravishingly beautiful, cannot be gainsaid; yet here, as so often elsewhere, beauty and utility are divorced, just as conversely, we find it rarely true that "Handsome is that handsome does." Pigmentation is nature's protection against sunlight, and lacking normal eye pigment, the albino cannot see as well as other fishes, especially in a strong light, and, because of the almost uniform whiteness of its body, can be seen much better by enemies. In outdoor pools, ponds or lakes, we fancy Mr. Kipling's Ethiopian observing that it "shows up like a bar of soap in a coal-hod." Translated into terms of life and death this means, of course, that it is snapped up far more quickly by fish-eating birds such as kingfishers and herons, and by larger fishes.

To say the very least, it is a freak of nature, and it is a misfortune to be an albino; and we may well rejoice that albinism is infrequent because it is a latent, not a dominant trait, in inheritance. That is to say, it is a character which, by judicious mating, can be bred out, the judicious mating consisting principally in pair-



ALBINO LAKE TROUT (*CRISTIVOMER NAMAYCUSH*)
Photographed by Elwin R. Sanborn

ing with an albino an animal in no wise related to it by blood and among whose relatives there are no albinos. From two albino parents there can be nothing but albino offspring, and this inexorable law of heredity binds all animals—mice, rabbits, fishes, birds, men, and every other species.

Someone, experimenting some time ago with albino trout, made the statement that they grow slower and catch their prey faster than other fishes. At the Aquarium our observations have been quite contrary to these. Our albino lake trout have grown much faster than our pigmented lake trout, and the man who feeds them could feed a dozen other tanks of fishes while feeding the single tank of albinos, even on dark days when they see best and even in summer when the warmth of the water accelerates their appetites. The albinos, as though realizing that dignity is an admirable co-relative of beauty, make no rude rushes for their food. No other fishes eat so leisurely. Furthermore, it is necessary to take time to throw the food to them deliberately, in order to catch their imperfect vision and enable them to take it before it sinks to the bottom. While most fishes with normal sight will pick up food that falls, only three of

our eleven albinos appear to be able to see it on the bottom of the tank, and these often make several lunges before succeeding in securing it.

When fed raw beef cut in small cubes, they mistake one another's eyes for bits of the meat, and their vision is so poor that in taking a piece of meat, if it happens to be close to a companion's fin, they often take the fin too. As a rule they do not appear to injure one another by these false moves for eyes and fins, probably because of their extreme deliberation in seizing their food, although in one instance noted the side of one was bitten by an erring companion sufficiently hard to leave a slightly ragged imprint of the teeth that was visible for several days.

Two of our specimens are developing blindness, and it seemed at first that this might be due to injury from lunges made at the eyes in mistake for food. But the white spots, on as close examination as is possible with live fishes, appear to be directly upon the pupil, and not on the cornea. The parent stock has been blind for years, supposedly from lack of protection against sunlight, which would have blinded normal fishes as readily. Our specimens are the first of their descendants to develop this char-

acter, which seems, therefore, not to be hereditary, and no explanation can be offered for it at the present time. Dr. Lucien Howe, the distinguished ophthalmologist, informs us that he knows of no statistics to show that albino eyes are more subject to blindness and cataract than normal eyes.

ANIMAL LIFE ON A PIECE OF SEA LETTUCE

By IDA M. MELLEN

AQUATIC vegetation always harbors a certain amount of animal life. If we remove a plant, or even an old dead leaf, from a pond, and shake it, crustaceans and young dragon flies, water spiders, beetles and leeches are likely to be thrown off, and if we scrape it and place the scrapings under a microscope, we discover them to be rich in unicellular organisms and minute and wonderful worms (kite-shaped rotifers, may be, with rapidly whirling cilia), crustaceans (blue-green, one-eyed "cyclops," perhaps, with handsome orange egg-cases), and other curious and fascinating creatures.

The sea is ever more fertile than the pond, and its life is varied and marvelous, and so bewilderingly rich that we are urged to profound admiration for the mind of science that has achieved and fostered the extreme patience and penetration necessary to sorting and naming, grouping and classifying, studying and describing, so many animals of such diverse forms and habits of life, in order that the world at large may be made familiar with the "hidden treasures of the deep."

As a bit of sea-growth floats past us on the ocean we see only a strip of green or brown vegetation, and let it sail on with but a casual glance. Were our eyes fitted for minuter observation, we would recognize a microcosm passing by—a little world of life and action.

If we snatch the plant—let us say, for example, a leaf of rich green sea-lettuce (*Ulva*) from the wave and deposit it in a dish containing sea water, we may, at leisure, take inventory of our booty.

Threatening us with almost invisible but none the less angry baby claws, a blue crab, scarcely big enough to cover the nail of one's little finger, scurries excitedly over the surface of the plant and rushes into a brown eel, another mere baby but three inches long. The eel glides into a different fold of the leaf, with that peculiar grace and rhythm of motion which eels, perhaps

most of all the sea's inhabitants, possess in superlative degree.

A killifish that had been dozing in the sea plant, leaps about in mad efforts to escape, joined, possibly, by a tiny fish of some other species lately seeking and finding in the floating vegetation a sure protection from some pursuing enemy.

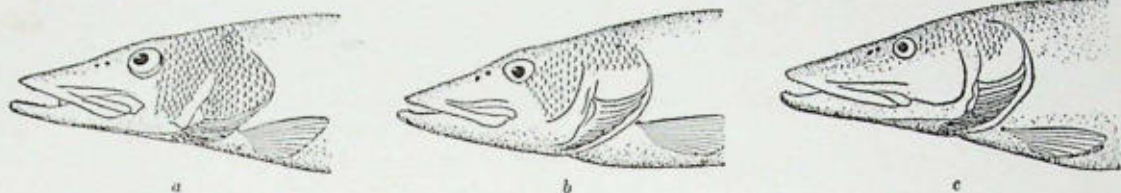
Small crustaceans—shrimps and salt-water cyclops somewhat larger than the fresh-water species—dart wantonly over the vegetation, while more sedate little pink anemones spread their soft, treacherous tentacles to capture what they can, and white sea-squirts repose picturesquely on the plant as if an industrious merman had blown them out of glass and set them there for ornament. One would not guess them to be highly organized animals that escaped being vertebrates only by sheer degeneration.

Here and there a *Spirorbis*, one of the smallest of the sea-worms, secretes its coiled limestone tube, while rows of dwarf hydroids, like microscopic anemones, adorn the edges of the leaf and vie in fantastic beauty with the regular rows of vase-shaped egg-cases that a prolific mud snail is gluing to the leaf. And a naked mollusc slimes its tortuous way among numerous wriggling worms of various sizes, shapes and colors. Nothing in the world is more awe-inspiring than one of these baby sea-worms just out of the egg, especially clam worms timidly initiating themselves in the use of their many active pseudopods, (false feet), the strange anatomy of which they do not quite understand, and never will, but which they will nevertheless learn to manage and manipulate with agile perfection.

A very young sea-mussel, not over three-thirty-seconds of an inch long, already adept in the use of its byssus threads, clings fast to its moorings on the leaf, while white-and-black sea-spiders, all legs and about the size of a decimal point, crawl clumsily among numbers of dancing protozoa that can be seen only under magnification.

We cannot yet profess familiarity with all the animals living on the bottom of the sea, but any of us may discover thus easily the forms that travel from time to time in the surface vegetation.

Acknowledgments.—The photographs reproduced in this bulletin have been furnished by C. H. Townsend, S. A. Callisen, Ida M. Mellen, Van Campen Heilner, E. R. Sanborn, Madame Frieda Hempel and Leonidas Westervelt.



ARRANGEMENT OF SCALES ON HEAD OF PIKES

a, Pickerel; b, pike; c, muskallunge.

DISTINGUISHING THE PIKES

THE Aquarium is occasionally called upon to settle wagers of sport fishermen, as to whether their prize captures were pike or muskallunge. Quite as frequently the question is asked, What is the difference between a pickerel and a pike?

The most concise and lucid answer to these questions is an illustration appearing in a paper on the pikes, by William Converse Kendall of the U. S. Bureau of Fisheries, published in the Report of the Commissioner of Fisheries for 1917. The illustration is here reproduced, for the benefit of our future disputants who may not be familiar with Mr. Kendall's paper.

First it will be noted that the pickerel, pike and muskallunge are all pikes—*Luciidae*. Secondly, that the slight difference in the shape of the head would be of doubtful assistance to the angler in determining which species he had caught. Thirdly, that the only positive means of identification is by the squamation—the arrangement of scales—of the cheeks and gill covers.

It will be observed that in the pickerel the cheek and gill cover are completely scaled; that in the muskallunge there are only a few scales behind the eye and on the upper half of the gill cover; while the pike is intermediate between the two, having the whole cheek and upper half of the gill cover scaled, the lower half of the gill cover being unscaled.

The muskallunge is generally stated to be the largest of the pikes; but the common pike is known to have reached a greater weight, muskallunge not having been recorded as weighing over 100 pounds, while a 145-pound pike is on record. The muskallunge averages from twenty-five to eighty pounds, with a length of four feet, although it has been known to attain eight feet; the American pike runs from five to forty pounds and reaches a length of four feet; and the pickerel runs from about four to fourteen pounds, with a length of from one to two feet.

Large specimens of the pike and pickerel may easily be mistaken for muskallunge, and the angler will find an identification key useful.

—I. M. M.

THE JENNY LIND CENTENNIAL CELEBRATION

By IDA M. MELLE

In commemoration of the one hundredth birthday of Jenny Lind (October 6, 1820-November 2, 1887) and of her first American concert, which was given in the Aquarium building (Castle Garden) in 1850, the Executive Committee of the Jenny Lind Centennial Celebration opened an exhibition of her relics at the Aquarium on October 1, to continue for ten days. Owing to the great appreciation shown by the public, permission was asked and granted to extend the exhibition until October 23. During this time 163,151 persons visited the Aquarium and viewed this exhibit.

Six museum cases of relics of the famous prima donna were shown, two handsome satin

flags loaned by the United Swedish Societies of New York were hung in appropriate places, one being the flag of Sweden, the other of America. Two pianos used by Jenny Lind at her concerts in America were exhibited—one a Chickering, belonging to Chickering & Sons, the other manufactured by W. Geib (New York) and owned by Mrs. John W. Tobin of New York. A photograph was shown of a third piano which Jenny Lind took back to Sweden with her as a wedding gift to Mrs. Louise Munthe Broman, whose brother, Judge C. H. Munthe, now has it in his home near Stockholm. A dress of yellow moire silk worn by the singer, three autograph letters of hers, and numerous likenesses



JENNY LIND WITH GIOVANNI BELLETTI, TENOR,
AND JULES BENEDICT, CONDUCTOR
(Castle Garden, 1850)

were shown—prints, photographs, paintings and daguerreotypes—the most curious of these being an "image parée" portrait set in a heavy gilt frame about a foot square, arms extended and hands crossed on knee, the figure dressed as Jenny Lind had dressed and with part of a lace collar and yellow satin gown once worn by the "Nightingale."

Perhaps the most charming likeness was the daguerreotype here reproduced, of Jenny with her husband, Otto Goldschmidt, whose arm is about her in the picture. To this gifted musician, nine years her junior, she was happily married in Boston, February 5, 1852. This daguerreotype was exhibited by Mr. Edward Francis Coffin of Worcester, Massachusetts, and later purchased by Mr. Leonidas Westervelt of New York, owner of an enviable collection of relics of the great singer, which he has been collecting for the past decade.

Among Mr. Westervelt's exhibits were biographies of P. T. Barnum, who first contracted with the "Swedish Nightingale" to sing in America, one of these containing a bar of music with the appended signatures of "Otto Goldschmidt" and "Jenny Goldschmidt, nee Lind;" two blue-green glass bottles with the head and shoulders of Mademoiselle Lind raised in the

glass; Barnum's own copy of her life; a photograph from an ambrotype and a daguerreotype taken in Boston; upward of fifteen different medals struck in commemoration of the singer's popularity; two large volumes of her music and thirty of her American musical programs bound; a book from her library, some of the George Baxter prints of her, printed in oils (1850), one showing her singing "Coming Thro' the Rye," and two statuettes—busts of the singer in Haviland china, made in England about the same year.

Miss M. H. Osman of Buffalo loaned for the exhibit a fan presented to Jenny Lind by the Princess Eugenie of Sweden, a black lace veil worn by Jenny Lind and an autograph letter of hers. Mrs. John W. Tobin loaned a quaint china perfume bottle. Mr. John F. Anderson of San Diego, California, exhibited a volume of Jenny Lind's programs printed on embellished silk cloth, together with Exeter Hall Programs (London, 1849).

Mr. Elliott Smith's collection included a splendid engraving with autograph signature, a Baxter color print showing Jenny Lind as "The Daughter of the Regiment," books, programs,



JENNY LIND IN *LA SONNAMBULA*
(Collection of Mr. C. H. Jones)



JENNY LIND AND HER HUSBAND, OTTO GOLDSCHMIDT
AT THE TIME OF THEIR MARRIAGE IN BOSTON, 1832

(Daguerreotype owned by Mr. Leonidas Westervelt of N. Y.)

medals, an envelope stamped with the head and bust of the singer, and various engravings, one of especial uniqueness, portraying the singer walking along the fallen tree in "La Sonnambula," a part which it would seem was trying to her as was the hanging-from-the-bell scene in "The Heart of Maryland" to Mrs. Leslie Carter, for she closed her eyes when taking the perilous steps, to render the part realistic.

Mr. Ashley Cole exhibited a daguerreotype and autograph letter, program, and a copy of "The Jenny Lind," a two-sheet newspaper published in Boston and printed in gold ink.

Numerous other relics were exhibited, and replicas of the program of her first concert at Castle Garden were sold for the benefit of the same New York charities to which Jenny Lind contributed the proceeds of that concert.

On October 6 a gathering at the Aquarium paid tribute to the birthday and the memory of Jenny Lind as woman and singer, to her in whom were combined the most lovable qualities of womanhood, the noblest instincts and aspirations of humanity, and that rare gift of song which gave rise to the expression "human nightingale." As Glorioli said to Litrebili, there are but two human nightingales born in every century—a male and a female.

Dr. Johannes Hoving, who presided at the meeting, read cablegrams to and from the King of Sweden:

October 4.

"To His Majesty the King, Stockholm.

"The Committee in charge of the Jenny Lind Centennial Concert felicitates your Majesty and sends its respectful greetings on the one hundredth anniversary of the birth of the great Swedish singer.

"HOVING, *Chairman.*
"MARVIN, *Secretary.*"

October 6.

"The Jenny Lind Committee.

"Thanking for your kind telegram, I send my best wishes for the celebration of the memory of the famous daughter of Sweden, the great singer and noble personality, Jenny Lind.

"GUSTAF."

Mr. Madison Grant, as Chairman of the Executive Committee of the New York Zoological Society, welcomed the Swedish Minister and the Jenny Lind Centennial Celebration Committee and thanked them for the exhibition which they had installed in the New York Aquarium.

Mr. Grant made some vitally interesting remarks about the uniform independence of the Swedish people and the Scandinavian stock from which the "Nightingale" sprang, stating, among



MADAME FRIEDA HEMPEL AS JENNY LIND

Carnegie Hall, October 6, 1920.

other things, that Sweden has never been invaded or conquered ethnically from the outside within the historic period, and is the only example in Europe of a nation with a single racial stock, language, religion and culture.

He remarked that it was peculiarly appropriate that the relics of Jenny Lind should be displayed in Castle Garden, not merely because of the memories of the great singer that cluster round the old building, but also because through its portals so many of her countrymen have entered America. Of all the many peoples that America has welcomed to her shores, Mr. Grant said none have contributed in proportion to their numbers so largely as have the Swedes to the racial elements and cultural ideals established by the earliest settlers in America.

The singing of Jenny Lind, he said, had also refuted the wide-spread belief that the Nordic race, while highly endowed with all the attributes of intellect, was devoid of the soul of music. Its rivals conceded its pre-eminence in physical strength and beauty and its achievements in the manifestations of genius, but always claimed that music could flourish only in the south and east of Europe. They admitted that intellectual capacity and administrative ability diminished as one traveled south and east from Scotland and Scandinavia. As these failed, the emotional expression of song and dance increased proportionately as the traveler approached Hungary and Poland. To all such ideas the singing of Jenny Lind and the instrumental achievements of Ole Bull were a sufficient answer.

Director Charles H. Townsend gave an outline of the history of the Aquarium building; its construction as a fort, its subsequent use as an audience hall, when Jenny Lind and other celebrities helped make it historic; its conversion into an immigrant station; and its final transformation into the largest aquarium in the world.

The Swedish Minister to the United States, Mr. W. A. F. Ekengren, read a resume of the life of his noted countrywoman, whose origin in poverty and obscurity terminated in such brilliant achievements, world-wide renown and admiration.

To all who love animals there is something fascinating about the fact that except for a pet cat to which (or should we, like Walter Scott, in referring to cats, say "to whom"?) the nine-year-old Jenny sat singing in a window and thereby attracted the attention of a passerby who happened to recognize her musical gift, she might never have been known. Her education for twenty years at Government expense,

the provision that made her development possible, gives us food for thought in America to-day. Were such opportunities granted our indigent, talented children, what flowers we, too, might snatch from the fate of "wasting their sweetness on the desert air" and plant in the perfumed Garden of Fame! When Manuel Garcia, her final instructor, uttered the prophetic words, "Mademoiselle, no singing teacher can do anything more for you, genius must do the rest," her career was assured; and King Karl Johan's appointment of her as Court Singer placed her beyond the need of charity. She to whom so much had been given without cavil or price, became in turn the giver and not infrequently gave, for good works, the entire and immense proceeds of her concerts. For personally, as well as professionally, "she belonged not to Sweden, but to the world."

The meeting was opened and closed with singing by the Swedish Singing Society Svea under the direction of Mr. Ole Windingstad, perhaps the most fitting compliment to which was paid by a gentleman who said he had never heard our "Star-Spangled Banner" sound really musical and beautiful before.

The concert given in Carnegie Hall was a success, socially and financially, and the proceeds will be devoted to the same charities fostered by Jenny Lind on her first concert in New York, the program of which was followed at Carnegie Hall. Mme. Frieda Hempel, who had made a careful study of Jenny Lind costumes, appeared in a gown like that worn by her famous predecessor and made especially for Mme. Hempel in Paris. She used the Geib piano owned by Mrs. Tobin, the same used by Jenny Lind in New York in 1850. She sang divinely.

ITEMS OF INTEREST

THE WHITEFISH IN CAPTIVITY.—One of the large fresh-water tanks in the Aquarium contains a hundred or more Lake Erie whitefish which were hatched at the Aquarium in January, 1913, and are now nearly eight years old. Being the only whitefishes in the country of a known age, they have attracted the attention of certain biologists engaged in determining the ages of fishes through a study of their scales.

It has been known for several years that growth and age can be ascertained by examination of the scales. Fishes in northern latitudes grow faster during the warmer months, while in winter growth is retarded. The periods of rapid and slow growth leave their impress on the scales.



LAKE ERIE WHITEFISHES, NEARLY EIGHT YEARS OLD

Hatched in the Aquarium, January, 1913. There are about 130 remaining.

Photographed by Elwin R. Sanborn

Prof. Reighard of the University of Michigan, in studying whitefishes of the Great Lakes under the auspices of the U. S. Bureau of Fisheries, has requested specimens of our whitefishes, or scales taken from them at intervals during the year. The Aquarium being well supplied, will, of course, contribute to the carrying on of such investigations.

The scales of fishes in captivity may not, however, show the seasonal changes found in wild fishes, although the fresh water in which they live varies from 36 degrees in winter to 75 degrees in summer.

It is not easy to raise young whitefishes. The specimens shown in the accompanying photograph were carried through the critical period of infancy by feeding on herring roe and the larvae of mosquitoes.

Never having enjoyed their natural live food, these fishes are undersized notwithstanding their age. One of the smaller specimens before me measures ten and one-half inches and weighs only five ounces. Many of them, however, are from twelve to fifteen inches in length and must be decidedly heavier.—C. H. T.

RECENT ENLARGEMENT OF EXHIBITION TANKS.—The work of enlarging the glass-fronted tanks located on the main floor of the Aquarium, which has been going on intermittently for three or four years, is now completed, with the exception of four tanks which, on account of their position, cannot be made larger. Most of the work of rebuilding the tanks has been done by the employes of the Aquarium as opportunity afforded, without cost to the City except for cement and other materials.

A donation of \$2,540 from the Zoological Society has provided for the completion of the improvement and the eleven tanks just finished by the contractor have already been stocked with fishes.

The enlargement of the ground floor series of tanks has greatly increased the space for exhibits and each tank now contains about three times as many specimens as it formerly held.

The Aquarium has at present a larger collection than ever before and the fact is commented upon by many of its numerous visitors. The ground floor tanks, originally constructed with their rear walls four feet back from the glass



Above: UNICORN-FISH (*ALEUTERA SCRIPTA*) RECENTLY RECEIVED FROM FLORIDA
 Below: ORANGE FILE FISH (*ALEUTERA SCHOEPFI*) FOUND IN NEW YORK BAY IN SUMMER
 Photographed by Elwin R. Sanborn

fronts, now have a depth of ten to eleven feet back from the glass. The increase in swimming space has been of positive benefit to the occupants of the tanks and has added enormously to the attractiveness of the whole series. As soon as suitable material can be found, the new tanks will be provided with linings of rock work suitable as backgrounds for the exhibits they contain.—C. H. T.

THE UNICORN FISH.—Among the fishes received from Florida in September was the unicorn fish (*Aleutera scripta*). Although fairly well known in the Florida-West Indies region, it has been brought to the Aquarium only twice before. It reaches a length of over two feet, our specimen being about eighteen inches long. Like other file-fishes of this genus, it is deep of body but much compressed laterally. It has the same long head, with small upturned, terminal mouth, and the eye so far back that it seems to be on the body rather than on the head. It is slow of movement, like the orange file-fish so common in New York waters in summer, and rather disposed to lie on its side near the surface of the tank. The unicorn fish is strikingly colored, the head and body being covered with round black

spots and streaked lengthwise with many broken stripes of blue.—C. H. T.

AN ODD USE FOR THE SEA HORSE.—According to Chinese logic, everything has some purpose and an animal that has no commercial or food value must be intended for medicine. The Chinese materia medica therefore contains not only many plants and drugs used by occidentals, but a variety of animals prepared and preserved in different ways. Chinese drug stores in California display lizards, snakes, birds, fish and inedible parts of other animals, dried, pickled, salted or otherwise treated.

The idea that by eating a certain animal we may become possessed of its most striking peculiarities, is common among primitive peoples and still persists with the Chinese, who steep a broth from the finely chopped portions of the animals. Thus a man become ferocious and dangerous after drinking snake wine. This is prepared by introducing a live rattlesnake into a crock of rice wine. The longer the snake lives and the more it strikes at the sides of its prison, the more potent the wine becomes; and the pecuniary value of a snake so used rests, first

upon its size, and secondly on the degree of its viciousness when placed in the wine.

An assortment of dessicated sea horses reposing in a large candy jar in the window of a Chinese apothecary in San Francisco attracted my attention, and the proprietor rewarded my curiosity with the remark, "Alle kin' medicine," that is, a panacea. We could wear a dried sea horse on our watch chain and nibble its tail when indisposed.

At the Customs House, whither I went for further information, I found a book by Stewart, *Plants used for Medicine by the Chinese*, and incidentally learned from it that grass cut from the mouth of an old well, dried and placed beneath a baby's bed, would prevent its crying during the night. But there was no printed reference to the medicinal virtues of sea horses, nor could the Chinese officials enlighten me.

Returning a few days later to the drug store, I purchased a dried sea horse—for ten cents—and the proprietor now assured me that it was "good for lookum," that is, a curio, as well as a panacea.

Another Chinese apothecary, however, volunteered the more valuable information that a steeped essence of Hoy ma (sea horse) is a certain cure for the itch!—C. G.

NOISES MADE BY FISHES.—Very few persons are aware that nearly all fishes are capable of producing sounds. All of the *Haemulon* family, commonly called grunts, get their name from the grunting sounds they make; the drum fish's name is derived from its drumming noise. Most members of the sculpin family emit certain sounds, the sea raven having won the name of Sally Growler from fishermen, because of its habit of growling on occasion, like a puppy over a bone. The eel is called smacker, because of the curious sound it makes when feeding on fish fry and young sea worms at the surface of the water, and this fish also makes a peculiar hissing noise when out of water or when confined in small quarters. The croaker came rightly by its name, and puffers produce certain sounds when held in the hand, similar to the grinding of teeth.

Weak fish are perhaps most notorious among seafaring men, for the noises they make. They are attracted to vessels anchored in the bays, and I have heard more than one captain of a brick schooner plying from Haverstraw-on-the-Hudson to New York, remark that weakfish, croaking under the ship on a still night in June or July, produced enough noise to keep a light sleeper awake. The weakfish also make the same sound out of water.—W. I. DEN.



THE PERPETUALLY INTERESTING HORSESHOE CRAB (*LIMULUS*), NEAREST LIVING RELATIVE OF THE EXTINCT TRILOBITES

Abundant on the New York Coast.

IN THE AQUARIUM

This is a place of enchantment, where two worlds come together,

Full of impossible beauty and wondering little children.

Here, serene and silent, are creatures of gold and of silver,

Sprinkled over with rainbows; others of pearly transparency;

And others of delicate colors shifting and blending like music—

Calm and aloof in a world of their own, imper-
turbably gliding.

This is a place of enchantment, where suddenly
one desires

Like them to be strangely lovely, living with
effortless ease

In a crystalline world unapproachable; yet
nevertheless to be,

Like them, for little children a wonder of pure
delight.

—MARY, in *The Evening Sun*.

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KOALA, OR NATIVE "BEAR"

One of the most remarkable of the strange mammals of Australia. It is extremely difficult to keep it alive in captivity.
Photographed in the New York Zoological Park by Mr. Ditmars a few hours before its unexpected death.

ZOOLOGICAL SOCIETY BULLETIN

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JANUARY, 1921

NUMBER 1

ZOOLOGICAL ARGOSIES

A BIRDSEYE VIEW OF THE NOTABLE ARRIVALS DURING 1920.

THE war's stagnation of the wild animal market led to a universal drop in our exhibits. From 1916 down to July 1920 it was a steady fight against empty cages and corals.

However, thanks to the ripening of seed sown in previous years, the year 1920 brought an incoming tide of specimens that has filled some of our Zoological Park collection units full to the point of actual overflow. On account of the new accessions, the collections that we sent to Antwerp, London, Pretoria and Johannesburg, in 1919 and 1920, have not been missed.

Today our Park is well dotted over with the cheerful scarlet label which says "Recent Accession."

During 1920 there were three great arrivals. Curator Crandall started the inflow in July, with the collection of about 500 birds, mammals and reptiles that he worked hard to gather in England and on the continent. No sooner was that lot safely stowed away and the wreckage cleared than the "Chinese Prince" floated in from South Africa, having on her forward deck Mr. A. K. Haagner and an amazing collection of African antelopes, small mammals and birds and reptiles both great and small. There were 96 cages and crates,—and the giraffe house merely counted "one."

The landing, the dividing, the hauling and the installing of that lot made for us and for our Philadelphia partner in the enterprise, weeks of work; but like all things earthly, at last it came to an end.

And then came the steamer "Belle Buckle", directly from Sydney, Australia, via the Panama Canal, with Ellis S. Joseph, most amazing of

zoological collectors, and a collection of Australasian birds and mammals of staggering proportions. Mr. Joseph is a man of boundless energy and resource, and his one great object in life is the gathering of the rarest of the rare in bird and animal life, and placing it where it will do the greatest good to the greatest number. It is for this reason that he brought four species of birds of paradise, the turquoisine parrakeet, the kea, the koala, the feather-tailed opossum, the mandrill and an actual living specimen of the famous Australian lung-fish, *Ceratodus fosteri*. He had,—and he has—in Sydney a live platypus, but the government would not permit him to bring it to us. It will die, at Sydney, in Mr. Joseph's pond, and our 2,000,000 visitors never will see it.

Fortunately for us, not all of the Joseph collection was for us. Had we been obligated to absorb all of it, repletion certainly would have ensued. Portions of that great collection,—certainly the greatest and most valuable that ever left Australia at one time,—were purchased by Philadelphia, Washington, Boston, Chicago, Cincinnati, Cleveland, Minneapolis and a few other places.

Under the circumstances, the very least that we can do for the readers of the Bulletin is to offer a brief story of the most rare and notable of the arrivals of 1920, and as in duty bound by our system we begin with the

MAMMALS

The Chimpanzee Baby.—The birth of a living and perfect baby to Suzette, the Chimpanzee, thrilled the Zoological Park from centre

to circumference. But fortune was unkind, in leaving out of her chain of evolution the connecting link of animal instinct that no human hands could supply, because of the savage suspicion of the ape mother. The exasperating decline and death of the baby have been fully described, and we will not dwell upon that painful episode.

The Giant Mandrill.—Fortunate indeed is the Primate House that can count among those present a huge, well muscled, gorgeously painted and savagely fanged male Mandrill Baboon in full color. His face is brilliant red, white and blue, garnished by a brilliant yellow beard long enough to shelter a million germs. Adult mandrills in full color are scarce because it takes six years for one to reach full maturity, and of the young captives only one out of six accomplishes that feat.

The Hoolock Gibbon.—Mr. Crandall bought two in London for 80 pounds. The larger of the two has a voice that can be heard a mile; and he is very generous in its use. Whenever any other boarder at the Primate House thinks that he has a voice and attempts to show it, Hoolock shows him what a Real Voice is like. The old White-Handed Gibbon, who one night caught a big rat and ate half of it, is so envious of his new rivals that his temper is more savage than ever.

The Black Drill, first cousin to the Mandrill, purchased by chance in New York, is coming on nicely, and again we hope to rear a Drill to full maturity.

The Zebra collection achieved during the year 1920 three great rarities, which brought the level of the collection one species higher than it ever before attained.

The Onager, a pale salmon-colored wild ass from Beluchistan (north-west of India), was caught by Mr. Crandall in London at the opportune moment shortly after its arrival from India. It is a fine young animal, practically adult in size, and being a female it will make an excellent mate for the Kiang, of Tibet.

The Mountain Zebra brought from Cape Colony by Mr. Haagner, was sorely needed to replace the old specimen that died in 1919. This is the first species of zebra seen and described by a zoologist, and its name is *Equus zebra*. Only 400 head remain alive, in the central mountains of Cape Colony, and there is only one man who is able to catch one or two of them each year, for the zoological gardens.

The Chapman-Burchell Zebra is fully described elsewhere in this Bulletin.

Two Rocky Mountain Sheep were presented to us early in 1920 by the City of Denver, through the good will of Albion K. Vickery, Superintendent of Parks. It is now a practical impossibility to purchase Big-Horn Sheep, because no state or province that possesses wild herds is willing for any of them to be captured for exportation. The female (three years old) of this pair astonished the Zoological Park people by giving birth to a lamb on May 10, 1920, for which she seemed too young. The lamb did well for about a month, then passed out one night without the slightest warning.

Again the **Musk-Ox** of the Frozen North is to be counted among our prizes. The year 1920 ended in a blaze of glory that was lit up on the afternoon of December 31 by the arrival of a fine pair of *Ovibos wardi*, twenty months old. They were caught at Franz Joseph Fjord, east coast of Greenland, by bold and hardy Norwegian fishermen, landed and kept for a time in Norway, and then shipped to us.

Our former Musk-Ox herd did very well by us. Its members lived far beyond our original expectation, and we believe that the last of them outlived all previous records of Musk-Ox longevity. Our oldest inhabitant lived here seven years and nine months.

The new pair occupies the quarters of their illustrious predecessors.

By close crowding the Small-Deer House has been made to contain several valuable new kangaroos, derived from the Ellis Joseph collection.

The Big Red Kangaroo species is further represented by a huge old male who is so gray in color that he looks like a great gray kangaroo. With him is shown a smaller specimen that is properly red. This species is fast disappearing from all parts of Australia, in response to the insatiable demand for their soft skins for shoe leather, and their pelts for "fur."

The Bernard Kangaroo is a species both new and rare. We never saw one before this arrival. It is about the size of a medium-sized red kangaroo, but its muzzle is so short and thick that there was nothing else to be done than to set it off as a new species. Mr. Joseph took unbounded satisfaction in bringing to us that rarest of all kangaroos. It is brown in color, and comes from North Australia.



THE GREATER KUDU

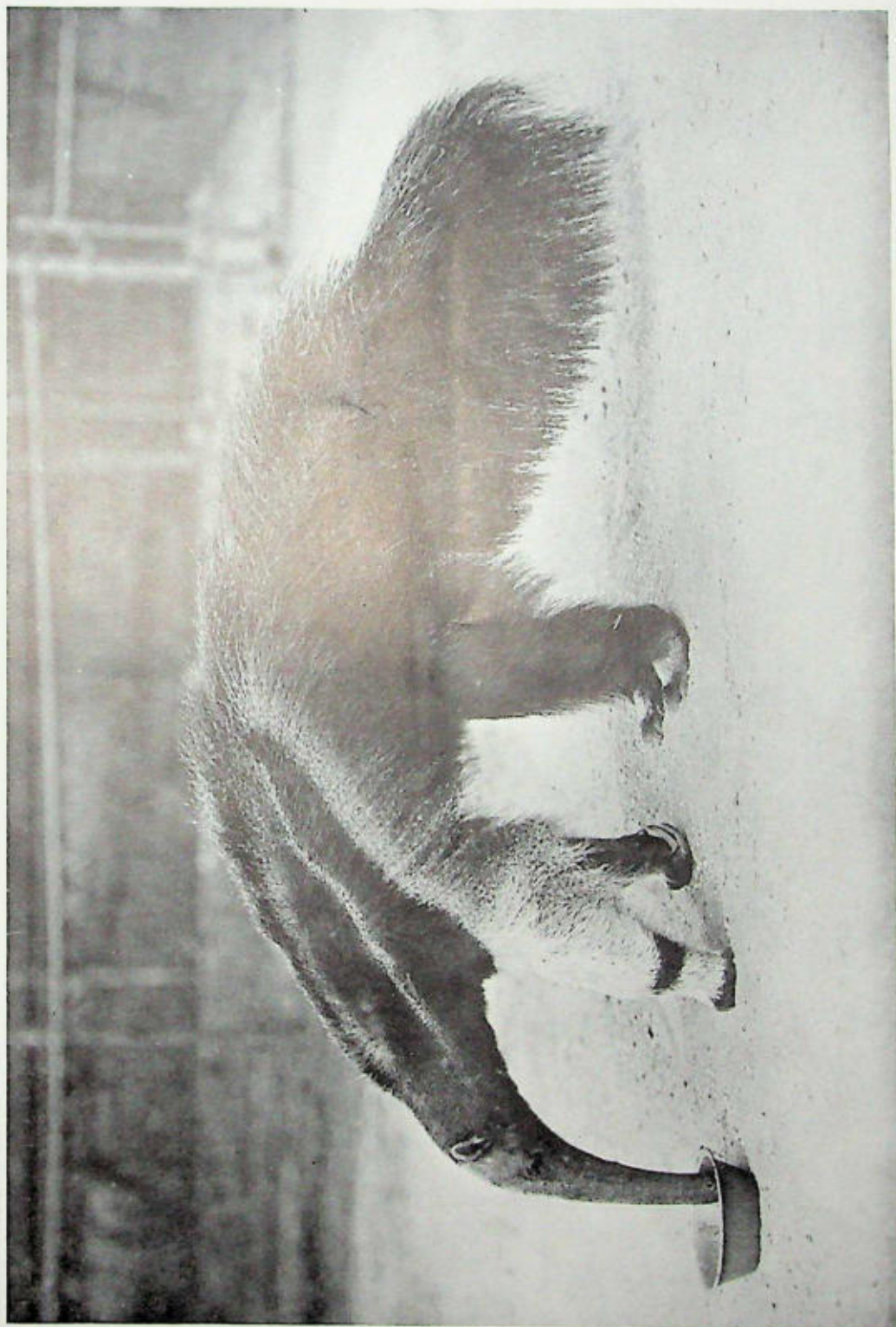
This fine young specimen of the most beautiful African antelope species was a pet in the Pretoria Zoological Gardens. In the Zoological Park its first acquaintance was cultivated with pieces of bread, of which this animal is very fond. The horns of the adult animal are very long, strongly spiraled, and generally are regarded as the most beautiful horns developed by any of the many species of African antelopes.

(Courtesy of Wide World Photos)

The Female Wart-Hog, adult size, that was brought to us by Mr. Haagner, is caged next to "Clarence," of British East Africa, now getting along in years, and displaying the longest tusks on record.

The Antelope House collection has been greatly strengthened by new arrivals. Never since it was first filled have so many valuable animals been added to it in one year.

The Masai Giraffe.— Of commanding zoological interest is the very dark colored young female Giraffe, of the Masai species (*Camelopardalis tippelskerchi*) that was very kindly loaned to us last spring by the Ringling Brothers of the Barnum-Bailey-Ringling Show. The Ringling Brothers have astonished the world by their enterprise, skill and success in gathering, breeding, and rearing giraffes under the handi-



GREAT ANT-EATER

A fully matured specimen in perfect pelage. When this animal lies down the tail with its feathery effect of extremely long and coarse hair is laid over the body, almost completely concealing it and to a certain extent sheltering it from rain.



CAPE LONG-EARED FOXES. PRETORIA COLLECTION

These foxes are characterized by the extreme length and size of their ears.

caps that naturally surround the animals of a traveling show. Up to date three giraffes have been born and reared, and what is more the young animals have been each year exhibited with the show! This success we consider nothing short of marvelous, and it is our hope that it will continue.

Having two female giraffes that could be spared from the show, they were kindly offered to us as a deposit, and we received them most gladly. Our own giraffe is a big and powerful male nearly fifteen feet high.

The Masai Giraffe is a species with very dark markings, from southwestern British East Africa, and we never before have seen a specimen in America.

The Greater Kudu from Pretoria, reared in the Zoological Gardens there, is our greatest prize from the Haagner collection. The animal is about half grown, and has fine, perfect horns that promise to be quite large. We regret to learn from Mr. Haagner that even yet this rare and very beautiful animal is being shot in the

Transvaal for "sport" and we have sent back an S. O. S. request that this should at once be stopped.

The Sable Antelope is again with us, through the shipment from Africa. The specimen is not quite fully grown and still is in the brown coat, but in the fall of 1921 we should see it in black.

The Great Ant-Eater, purchased of Mr. Louis Ruhe, of New York, is an arrival of which we are very proud, because we can render no smaller tribute to that remarkable beast. Of nearly a dozen specimens that we have had, this one is the largest, the finest, and the most satisfactory. His picture tells the story of his wonderful form, and also his giant size.

The Feather-Tailed Opossum is the smallest and the last of the notable mammals that we have space to mention. It is regarded by Mr. Joseph, who brought it to us from Australia, as the prize mammal of his collection. It is about the size of a large domestic mouse, grayish brown in color, and the hair on its *strongly*



SPRINGBUCK FROM SOUTH AFRICA

This interesting antelope, once very common throughout a wide area in South Africa, is now very greatly reduced in numbers and in range. At the present rate at which it is being shot for sport this beautiful animal soon will become extinct.

(Courtesy of World Wide Photos)

prehensile tail grows out in a long feather, sidewise only. It is very lively, but nocturnal in its habits. We keep it at the Reptile House, in the Economic Rodent Collection.

NOTABLE BIRDS

By LEE S. CRANDALL

WHILE arrivals during 1920 were not up to pre-war standards, they were far greater than in any other year since 1914. Moreover, so many rare and striking species were included, that the collection is richer at the present moment than ever before. We now have many birds that we never had hoped to possess, a considerable number of which have not previously been exhibited in zoological gardens.

White-barred Ant-thrush.—The first bird of importance was purchased on July 16th, and was imported by Gustave Sebille, a well-known collecting dealer. This was a White-barred

Ant-thrush (*Thamnophilus doliatus*), a small and inconspicuous creature in the eye of the public but nevertheless of great interest, for it is, without doubt, the first representative of this great neotropical family ever to reach a zoological garden. This bird is a female and a few months later, a male was acquired from the same source. Nothing previously was known of the habits and needs of ant-thrushes in captivity but we have found them less delicate than most other purely insectivorous birds. Probably more than 350 species of this family (Formicariidae) are known in tropical America.

Cock-of-the-Rock.—On August 13th, we received from the Tropical Research Station, two fine male Cocks-of-the-Rock (*Rupicola rupicola*). Since the bird sent to us in August, 1919, was still thriving, we decided to risk two of them together in a large cage. The birds quarreled at first but finally settled down and now



ROCKY MOUNTAIN SHEEP, OR BIG HORN

Gift of the City of Denver, through Albion K. Vickery, Superintendent of Parks.

are one of the most striking exhibits in the Large Bird House. We have found that, provided with plenty of sound fruit of suitable character, these birds are not nearly so delicate in captivity as once supposed. There are no specimens on exhibition elsewhere at the present moment.

Lesser Bird of Paradise.—On August 25th, the consignment collected in Europe by the Curator, arrived in care of Keeper Bailey, of the Zoological Gardens of London. Probably the most important individual is a male Lesser Bird of Paradise (*Paradisaea minor*), an adult in full color. We now have two of these splendid birds, kept in adjoining cages.

Vultures.—Two Pondicherry Vultures (*Otogyys calvus*) replace a species we have not had for many years, and two White-backed Vultures (*Pseudogyys bengalensis*) are quite new to us. Large, hardy birds that can endure our winters out of doors in the Eagles' Aviary, always are gladly received, since the tropical species must be removed in winter, leaving vacancies which are not easily filled.

Hemipodes.—There are two species of Hemipodes or Button Quail—the Indian (*Tur-*

nix tanki) and the Little (*T. dussumieri*). These curious little birds are of great interest, since they belong to a small Order (Turniciformes), closely related to the fowl-like birds, and characterized by peculiar nesting habits. As in the Emus and others, incubation is carried on by the male alone, the female making the advances of courtship.

Olive Grass Parrakeets.—Among the many other interesting birds secured in Europe, are two Olive Grass Parrakeets (*Melopsittacus undulatus* var). These birds are the latest by-product in the variation of the common green Grass Parrakeet, which has been developed by European breeders. This color variety was produced in the breeding of the beautiful blue variety, and is characterized by the rich, deep olive which has replaced the brilliant green of the wild bird.

Early in September, Mr. A. Haagner, Director of the Zoological Gardens of Pretoria, arrived with the first important consignment of South African birds to reach America in several years. The collection was apportioned between the National Zoological Park of Washington, the Zoological Gardens of Philadelphia, and the



FEATHER-TAILED OPOSSUM

This exceedingly rare Australian mammal may be seen by special arrangement in the Rodent Section of the Reptile House.

New York Zoological Park, but the share which fell to our lot included many valuable specimens.

White-bellied Stork.—Most important was a White-bellied Stork (*Abdimia abdimi*), a species seldom seen in captivity and never before represented in our collections. It is smaller than most storks, but is conspicuously marked in black and white, the face and beak brilliantly colored in blue and crimson.

White-headed Vulture.—A handsome White-headed Vulture (*Lophogyps occipitalis*) is a welcome accession and the first to be exhibited alive in New York. It is very rare in collections and at the time of the writer's visit, was represented in European gardens by a single individual at Antwerp.

The White-headed Sea Eagle.—(*Haliaeetus vocifer*) resembles in some respects our own Bald Eagle but is more brightly colored, having the breast, as well as the head and tail, pure white, and the abdomen deep chestnut. The single bird brought by Mr. Haagner is the first we have had and like the White-headed Vulture, was represented in Europe last summer only by a bird at Antwerp.

Two White-faced Tree Ducks.—(*Dendrocygna viduata*), brought from South Africa, are a reminder of one of the most curious twists of geographical distribution found among birds. This handsome little duck is found in tropical Africa and Madagascar, as well as in the West

Indies and tropical America. Separated by an impassable barrier thousands of miles wide, birds from the two hemispheres are indistinguishable and so far have defied the systematists who have sought to separate them technically.

The most important shipment of the year was that of Mr. Ellis S. Joseph, who arrived from Australia early in November. Shipping difficulties had prevented transportation since 1917, so that the accumulation of several years was ready when space finally became available. The extraordinary interest and value of this collection probably never has been equalled by any other arrival in this country, certainly not in recent years. It included species from every part of Australia, as well as from Tasmania, New Zealand, New Guinea, New Caledonia, and the Caroline Islands. Thirty-five have never before been represented in the Zoological Park and a good number are quite new to aviculture. Among so many striking forms, only a few of the more important can be mentioned here.

Blue Bird of Paradise.—First place must be conceded to the splendid pair of Prince Rudolph's Blue Birds of Paradise (*Paradisornis rudolfi*). This beautiful bird, so different in coloring from other Birds of Paradise, is found in the Owen Stanley Mountains of southeastern New Guinea, at an altitude of about 8000 feet. The inaccessibility of its habitat and the hostile attitude of the savage tribes which control the interior, account for the scarcity of this bird in



PANDA

Born in the London Zoo and presented by the Zoological Society of London

collections. In 1907, the first living specimen, a young male, was captured for Sir William Ingram, and deposited in the Zoological Gardens of London, where it lived only three weeks. Two years later, a pair was obtained by Mr. E. J. Brooke, a well-known Scotch aviculturist. Our pair, which Mr. Joseph had on deposit in the Zoological Gardens of Sydney, Australia, appear to be the only specimens which have reached civilization since 1909.

Other **Birds of Paradise** in Mr. Joseph's collection included three immature Six-plumed (*Parotia sefilata*), two immature Magnificent Rifle Birds (*Craspedophora magnifica*) and a Green Manucode (*Manucodia chalybata*), all natives of New Guinea. These birds, with our

own Lesser and Count Raggi's Birds of Paradise, give us six species of this wonderful family, a greater number than have ever before been exhibited in America.

Turquoise Parrakeet.—The parrot tribe is strongly represented by a great number of the gorgeous-colored species found in Australia. The rarest is the Turquoise Parrakeet (*Neophema pulchella*), a tiny creature with a striking color scheme of olive, turquoise and chestnut. This bird, once abundant in Australia, now is on the verge of extinction. In fact, it was believed to be extinct until the three specimens secured by Mr. Joseph appeared. One of these birds, a lovely male, has been added to our collection.



ONAGER

This very rare and interesting species never before has been exhibited in the Zoological Park.



YOUNG BACTRIAN CAMEL

This notable arrival was born in the Zoological Park, and when photographed it was being christened "Sophie Smith" by two Senior girls from Smith College

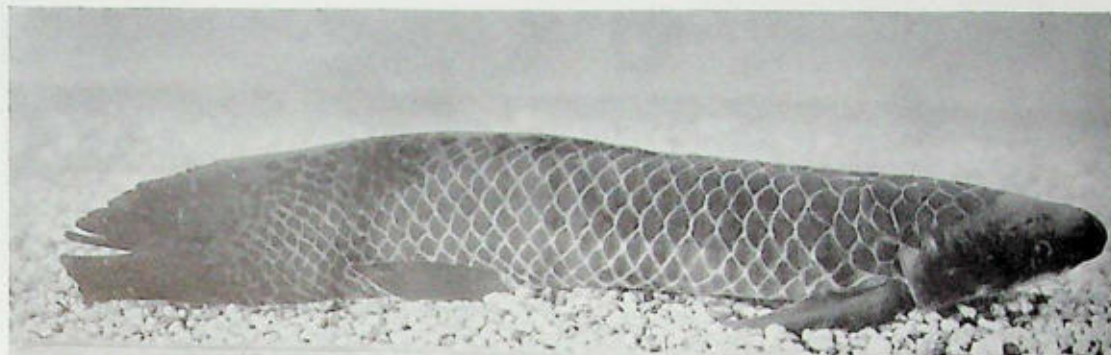
Princess Alexandra's Parrakeet.—Larger and perhaps more delicately colored, is a male Princess Alexandra's Parrakeet (*Spathopterus alexandrae*). Its predominating colors are soft gray, apple green and purple. The history of this bird is most interesting since, after its capture in its home in central Australia, it was carried 800 miles on camel-back across the desert, then 150 miles on horseback and a final fifty by motor, to Oonadatta, the railway terminus. From that out-post to Adelaide, is a distance of about 500 miles by rail but that was not enough, since the bird still had to travel another thousand miles by train to Sydney. To a bird so accustomed to the road, the trip from Sydney to New York was of small moment and he reached us in immaculate condition.

Kea and Kaka.—There was a pair each of the famous sheep-killing parrot of New Zealand, the Kea (*Nestor notabilis*) and its much rarer cousin, the Kaka (*N. meridionalis*). Both of these birds, more especially the Kaka, have been

brought to the verge of extermination by the colonists.

White-fronted Bronze-wing Pigeon.—Handsome doves and pigeons are always welcome additions to a collection of live birds, since the seed-eating species, at least, are hardy and long-lived. Mr. Joseph had a number of these desirables, several of which are of great rarity. The finest is the White-fronted Bronze-wing Pigeon (*Henicophaps albifrons*), a product of New Guinea. It is a grotesque creature, with a huge, rail-like bill and a white mark on the forehead, very suggestive of the frontal plate of a gallinule. There seems to be no record of any previous appearance of this bird in captivity.

Pigeons.—The genus *Phlogoenas*, which includes the well-known Bleeding-heart Pigeon, had three representatives in Mr. Joseph's shipment, all of which seem new to collections. These are Beccari's Pigeon (*P. beccarii*), the Amethyst Pigeon (*P. kubaryi*), from the Caro-

LUNG FISH (*CERATODUS FORSTERI*)

Recent arrival from Australia. Exhibited in the Reptile House

line Islands and the Yellow-heart Pigeon (*P. rufigula*), a lovely shadow of the Bleeding-heart, with the crimson breast paled to golden yellow.

Fruit Pigeons.—The group of fruit pigeons contains some of the most brilliant of birds of the world but unfortunately their food habits make them less easily kept than their grain-eating relatives. These beautiful birds are seldom well represented in collections but Mr. Joseph brought three species new to us: the Lilac-shouldered (*Chlorotreron iozona*), the Golden-fronted (*Sylphitreron aurantiifrons*) and the New Guinea Purple-breasted (*Megaloprepria poliura*). We seem at last to have solved the problem of keeping fruit pigeons and still have a number brought us in 1917 by Mr. Joseph. Our present series of seven species of these gorgeous birds has never before been equalled in our history.

THE LUNG FISH

By RAYMOND L. DITMARS

THERE are no zoological subjects in the world more fascinating than the Lung Fishes. The fact that they have continued to survive through a period which staggers human imagination forms a problem which scientists are unable to solve. Contrary to the history of Evolution, which is spectacularly written among the rocks and soils and attested by the towering fossils of dinosaurs and other wierd creatures, the Lung Fishes were halted in a transitional stage of evolution and have thus remained and survived since the Jurassic period, now imbedded in a solidified grave of wide-strewn rock from the dim past of over thirty million years ago.

These remarkable creatures were actually part fish and part amphibian when wondrous changes were taking place and they were definitely swinging along the course of evolution and out of the strictly aquatic class to become air-breathers. Crude limbs of the amphibian type were represented by members occupying the location of limbs, but in outline like the fins of a fish. The fish-like tail was the sole other swimming member. There were no dorsal or anal fins.

The body was coated with large and thin scales, narrow gills were retained, but the swimming bladder had developed into the form of a large lung so that it was possible for these creatures to actually breathe air.

According to many phases of animal life that have passed through such transitions, this crude form, hastening toward another phase of life, should have completed its transition, but some inexplicable thing happened and while a great procession of animal life swept by and with the passing of millions of years absolutely changed their forms, the Lung Fishes never left the water. Their progress in Evolution simply ceased—and thus they remained crude, ancient forms until the present day, with no similar types of such imperfect development anywhere on earth to match them except the most ancient fossils.

As an answer to the problem it has been suggested that the Lung Fishes, consisting of only three types and strangely scattered over three widely separated areas—tropical South America, tropical Africa and Australia,—have been "reconciled" to their development, as their air breathing powers and strictly aquatic adaptability meet the requirements of the stagnant waters in which they live and enable them to hide in crevices and self-made cells when their native rivers temporarily go dry during certain sea-

sons. But this explanation is in the face of evidence which shows that the legions of Nature have never been satisfied with half measures—and still leaves the Lung Fishes stranded in doubt.

The specimen on exhibition in the Reptile House is the Australian Lung Fish (*Ceratodus fosteri*). It is nineteen inches long. For two months, in its journey from Australia, it traveled in a glass tank several inches shorter than itself, refusing food and with no change of water. The specimen was brought to us by Ellis S. Joseph, who thought it best, while the creature was *en route*, not to disturb it in any way.

Upon arrival at the Park the Lung Fish was placed in a plate-glass tank $3\frac{1}{2}$ ft. long by two feet wide and covered with a dome of wire screen to prevent it jumping from the water—a habit noted on board ship. It was developing a large patch of fungus, which covered the greater part of its head and appeared in patches along its back and side. It also refused food. Our first care was to destroy the fungus growth which showed indications of pitting through the skin.

The water in the tank was dropped to a depth of about an inch when the creature was gently rubbed with a swab of cotton dipped in a solution of permanganate of potassium—the solution mixed to show a deep amethyst hue through a glass jar. The bathing process was continued for ten minutes, when the water in the bottom of the tank was run off and the tank filled. This treatment was continued every alternate day for about two weeks, when the fungus was entirely destroyed.

After a week in the Reptile House the Lung Fish commenced feeding. We had cabled to the London Zoological Gardens, where a specimen had lived for a number of years, and asked the authorities what food they had used. They advised chopped raw beef and lettuce leaves. Our specimen fed sparingly upon the beef, but refused the lettuce leaves. We later killed several small frogs, cutting these in small pieces, and they were taken with much more interest and to a greater amount than the beef. Later we tried earthworms and these were taken in considerable amounts, about ten at a meal, and appear to furnish the most suitable food.

This creature now appears to be in perfect and vigorous condition. It spends much of its time lying motionless upon the bottom of its tank, then rises in strong swimming movements exploring the tank for five minutes or so, when it goes to the top for a generous gulp of air—amphibian fashion—after which it again retires

to the bottom. The trips to the surface for air appear to be quite as frequent as those of a big Japanese salamander in a nearby case.

The specimen has been provided with a large, descriptive label, has attracted much interest from the public and has been photographed for the Society's records. The writer has prepared a very complete series of motion pictures of the Lung Fish, for exhibition at the Annual Meeting of the Society.

The Lung Fish was purchased from funds provided by the John L. Cadwalader bequest for the purchase of animals.

A GREAT ZOOLOGICAL COLLECTOR.

All intelligent persons should know and remember that the wild animal collectors and dealers are to be counted among the best friends and strongest allies of the zoological parks of the world. Without them we would indeed be compelled to struggle mightily to obtain for our collections the best wild beasts and birds of other lands. Foolish and shortsighted is the director who drives hard bargains with the men who laboriously roam through wild lands, risk their lives on land and sea, and stake all their money on the fickle fortunes of eccentric wild creatures that are prone to die without warning or reasonable excuse.

Mr. Ellis S. Joseph, of the World at Large, is a remarkable man. Tall in stature, big in heart, a marvelous engine of energy, intelligent, fair and square, it is a pleasure to know him, and to count him as an ally. Fortunately for us, we had sufficient animal instinct to appreciate the work of this tireless collector from the first hour of our personal acquaintance. One strong feature in his favor is his almost fanatical devotion to the pursuit and care of zoological rarities. But for a lapse on the part of the government of New South Wales, he would have brought to us this year a living platypus, with the koala, the blue bird of paradise, the "extinct" turquoise parrakeet and the *ceratodus*.

Mr. Joseph is 48 years of age, he stands 6 feet in height and he weighs 275 pounds. He is at home everywhere in the southern half of Africa, in Australia, New Zealand, England, America, Panama and the Pacific islands. He handles all kinds of wild beasts and great snakes, and he is as proud of a feather-tailed marsupial opossum as some collectors are of elephants. To see him reach into a crate, seize a big kangaroo by the tail, drag it forth struggling and kicking and hold it up in midair for your admiration, is a daily incident possible only to him.



ELLIS S. JOSEPH

ZOOLOGICAL SOCIETY BULLETIN

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<i>Mammals</i>	<i>Aquarium</i>
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ELWIN R. SANBORN, Editor

VOL. XXIV, No. 1

JANUARY, 1921

MR. A. K. HAAGNER, OF PRETORIA

It is always refreshing to welcome zoologists from far-distant countries. As we scan the "proceedings" and "transactions" of zoological organizations in Tasmania and Perth, Melbourne, Sarawak, Singapore, Pretoria and Cape Town we are, by each one, reminded that the brotherhood of science encircles the globe.

We remember vividly the delightful call at New York eight years ago of Mr. W. H. D. LeSouc, Director of the Zoological Gardens of Melbourne, and the great uplift that he imparted to our knowledge of "Wild Life in Australia." His visit certainly tended to put Australia on the zoological map.

With the coming of a great collection from South Africa there came to us another far-distant zoologist, Mr. A. K. Haagner, Director of the National Zoological Gardens of South Africa, at Pretoria, Transvaal. To tell the whole truth, we were so desirous of meeting Mr. Haagner that we urged, and even insisted upon, his coming, and his visit was fully as interesting and agreeable as we had anticipated it would be.

It was in 1916 that Mr. J. A. Loring, who went to South Africa as our agent in quest of animals, discovered Mr. Haagner—for us,—enjoyed the benefits of his good will and practical helpfulness, and laid the foundation of the Africa-to-America collection of 1920. For three long years Mr. Haagner had been collecting and keeping the animals that finally culminated in the arrival of the steamer "Chinese Prince" in Philadelphia on September 2.

Mr. Haagner is a young man, in full vigor, tall and muscular, and his energy is boundless. He won his spurs as Director by eight years of service in the Pretoria Gardens as assistant director. Already his zoological work, as represented by his books and published papers, has given him a place with the leading zoologists of South Africa. More than this, we observed that he is deeply concerned about the destruction of wild life in South Africa, and we confidently expect that he will develop into a strong conservator of African game.

Mr. Haagner is the author of "South African Bird Life" (1914) and "The Mammals of South Africa" (1920), and a large collection of scientific papers on the fauna of South Africa.

While here Mr. Haagner shipped back to South Africa, for Pretoria and Johannesburg, a very large collection of mammals, birds and reptiles from the zoological parks of New York, Philadelphia and Washington.

W. T. H.

A BULL MOOSE AND A RAILROAD.

The game preserve established by Mr. William C. Whitney on October Mountain near Lenox, Massachusetts, still shelters a solitary bull moose of fine proportions, whose name is recorded as "Old Bill." It is reported by Mr. William Sargood, Game Warden for Berkshire County, Mass., that Old Bill occasionally descends from the sky pastures and sheltering woods of October Mountain to the railroad track of the Pittsfield Branch of the N. Y. N. H. & H. R. R., and that, with more confidence than good judgment, he occasionally promenades along the track between the rails.

Fortunately, the engineer and the trainmen of the railroad are good and true game preservers and whenever Old Bill is seen on the track ahead, the train is stopped and the trainmen humanely and patiently go out and shoo him off.

Fortunately, thus far the diversions of the big moose on the railway's right of way seem to have been confined to daylight hours. It is to be feared, however, that on some moonlight night Old Bill will make the tactical error of walking along the track without permission from the section boss and will come to grief by accident.

But what an opportunity is there presented for wild animal photographers in photographing a wild and savage bull moose in his native haunts! Surely such a golden opportunity as this will not be too long neglected. Our advice to the knights of the camera is "Go early and avoid the rush!"



CHAPMAN-BURCHELL ZEBRAS IN THE ZOOLOGICAL PARK

Received from Pretoria, South Africa, in September 1930

The shadow stripes and horizontal leg stripes that mark the Chapman sub-species but faintly appear in these specimens.



BURCHELL ZEBRA IN THE UNITED STATES NATIONAL MUSEUM

RESTORE THE BURCHELL ZEBRA

By W. T. HORNADAY.

TWO recent arrivals at the Zoological Park from South Africa present an excuse for recording certain impressions that we long have entertained.

For reasons best known to herself Dame Nature saw fit to create and install in Africa a brilliant display of the Horse Family. Beginning with the Somali wild ass, entirely destitute of body markings, she began to decorate with stripes. Her first experiments were with the quagga, now extinct. Gaining confidence with the few experimental stripes laid upon the body of that animal, she next tackled a more northern group and with an excellent outfit of body stripes turned out Burchell's zebra, with white legs.

Feeling mightily pleased with that effort, she decorated other groups with few or many leg stripes, and some mighty broad stripes laid across the hindquarters. When tired of the monotony of plain black-velvet stripes on white or tan, she developed the "shadow-stripe", and upon one group she laid so many that they took permanent root, and produced the Chapman zebra.

Finally, up in British East Africa and Abyssinia, she took the largest and most heavily eared

of all zebras and indulged in a final orgy. On a pure white ground she painted narrow black stripes galore, until the total number was bewildering and there was no room left for even one more. Far down the corridor of time, man at last caught up with that species and called it the Grevy zebra, in honor of a French president who never in his life saw a wild zebra in its native haunt.

The writer's intimate acquaintance with the Burchell Zebra began in 1883, when he secured from the Chief Animal Man of the Barnum and Bailey Show a fine male specimen, and mounted it for the National Museum, where it may today be seen. A picture of it is shown herewith. So far as we know, its status as a typical *burchelli* is not questioned.

For several years, word has been passing around among British and American mammalogists to the effect that "the true Burchell zebra is practically extinct," and people began several years ago to take account of the Burchell stock in the museums. Some living specimens in Rhodesia and the Transvaal that by South African naturalists were regarded as true *burchelli*, were

presently "inspected and condemned" as such, in true military fashion, by—we know not whom. But we never concurred in that decision.

Seven years ago when the Annual Report of the Zoological Gardens at Adelaide, South Australia, contained an illustration of specimens living there which certainly were white-legged Burchell Zebras, we wrote to the Director of those Gardens, urging the utmost diligence in breeding those animals, for the purpose of helping to restore a species that was almost lost.

Four years ago the Philadelphia Zoological Gardens purchased of a dealer in wild animals a pair of zebras, with legs so nearly pure white that it seemed impossible to call them anything else than *Equus burchelli*, and they were so labeled. They have bred, but their offspring have about the same number of leg stripes which their parents possess. The young two-year-old stallion has three of the most beautiful shadow stripes that we ever saw on a zebra.

With the arrival of the shipment brought to us last September from Pretoria by Mr. Haagner, we received a pair of zebras of the Burchell group that brought the status of *burchelli* on the carpet for a definite decision. What should we label them!

The group of Burchell zebras stands as it has been mapped out by British zoologists. Its members have been divided into what are universally accepted in England as five sub-species of the parent species *Equus burchelli*. All these save one have been named after British naturalists or sportsmen, and they stand as follows: Chapman's, Crawshay's, Grant's and Selous', and the *Damaraland antiquorum*. All these sub-species show, by resemblances, their mutual relationships. Their one striking feature of differentiation from the Burchell "topotype" is the white legs of the latter, offset against their legs marked, more or less strongly, by horizontal stripes.

It seems to the writer that to refuse a white-legged zebra a dozen small and insignificant leg stripes without throwing it into a sub-species is illogical and improper. It is our judgment that any zebra of the Burchell group with legs that are 98 per cent white is a true *Equus burchelli*, and should be so labeled. We believe that we have two Burchell zebras, with traces of Chapman's leg stripes. We believe that Philadelphia, Pretoria, Rhodesia and Adelaide have others, and that the Burchell species is by no means extinct.

In recognition of the Chapman trace in our specimens we have decided to label them pro-

visionally "Chapman-Burchell Zebra,—*Equus burchelli*."

If there is anything in selective breeding, it would be an easy matter for those who own white-legged zebras to breed out the last vestige of leg stripes, and thus restore the perfect and immaculate Burchell. This would be absolutely legitimate, and we strongly recommend that this policy be adopted and pursued.

The reasons why man should whenever possible assist nature in restoring species that are at the vanishing point are too apparent to require comment.

A NEW PYTHON

The Reptile House has been fortunate in receiving a fine understudy for the big python which has occupied the large central cage for over twelve years. This giant snake is old and for several years has been troubled by the attacks of parasites, brought with him from his native jungles, and which will ultimately cause his death. His length is about twenty-two feet and we have kept very accurate records of the shedding of skin and feeding periods, which will shortly form a scientific article in the BULLETIN. The understudy for this spectacular reptile was purchased in December from a local dealer and measures slightly over twenty feet. It journeyed all the way from Singapore in a crate barely two feet square, in which tightly coiled position it remained over three months. The specimen is thin, but in good health and with a vigorous appetite. Our first care was to usher the reptile into a generous tank of tepid water. This resulted in softening several layers of unshed skin, from which the big fellow emerged in pattern like an oriental rug. A few months feeding will place this splendid reptile among the star exhibits of the Park and he promises to become as famous as our old specimen, which is now probably the largest serpent on exhibition in the United States.

RARITIES IN EUROPEAN ZOOLOGICAL GARDENS.

By LEE S. CRANDALL

DURING the period of the great war, information concerning the condition of European Zoological Gardens was uncertain and indefinite. Disquieting rumors of harrowing experiences, depressing losses and mysterious catastrophies, reached us through devious channels. But definite facts were seldom revealed and our knowledge has remained incomplete.

As the representative of the Zoological Society, the writer was privileged to visit various European gardens during the summer of 1920 for the purpose of learning conditions, reestablishing broken contacts and, incidentally, acquiring such stray specimens as might be available in the wild animal markets. The trip was fully successful in all these fields. Even the acquisition of animals for our collections was favored by fortune. After the long dormant period, arrivals are becoming fairly frequent in the English market. This is true more particularly of African species but the selection is quite varied and many good things are to be secured. It is a curious fact that buyers who quarreled over the scanty arrivals during the period of restriction, now appear apathetic, and really rare and interesting creatures can often be found in the shops of dealers, awaiting purchasers.

On the continent, conditions are quite different. There have been few arrivals in Holland and Belgium. The shops of the Paris dealers, along the Seine, are well stocked with desirable birds, but the prices asked are so exorbitant that few can afford to buy.

To one equipped with a preconceived idea of desolation and ruin, molded by dark and alarming rumor, the present condition of most of the Gardens is a pleasant shock. Almost without exception, reconstruction is already well advanced and, except for infrequent signs, seen only by the practised eye, there is no indication left of the fearful time of privation and desperate expedients through which even the neutrals have passed.

Living up to its splendid traditions, the Zoological Garden of London is still the first in Europe. The imposing Mappin Terrace has been completed and is well stocked with a fine series of bears. The Apes' House contains, among other things, an Orang-utan that certainly is the largest and finest specimen in captivity. The remarkable Gorilla, John Daniel, while still privately owned, is exhibited at the Gardens three times weekly. He is proving a tremendous attraction and may well be considered the most valuable exhibit in Europe. The good health, happy disposition and gentle manners of this animal make it a most unusual creature. The Monkey House is full to overflowing and contains an unusually large series of the species of *Cercopithecus*.

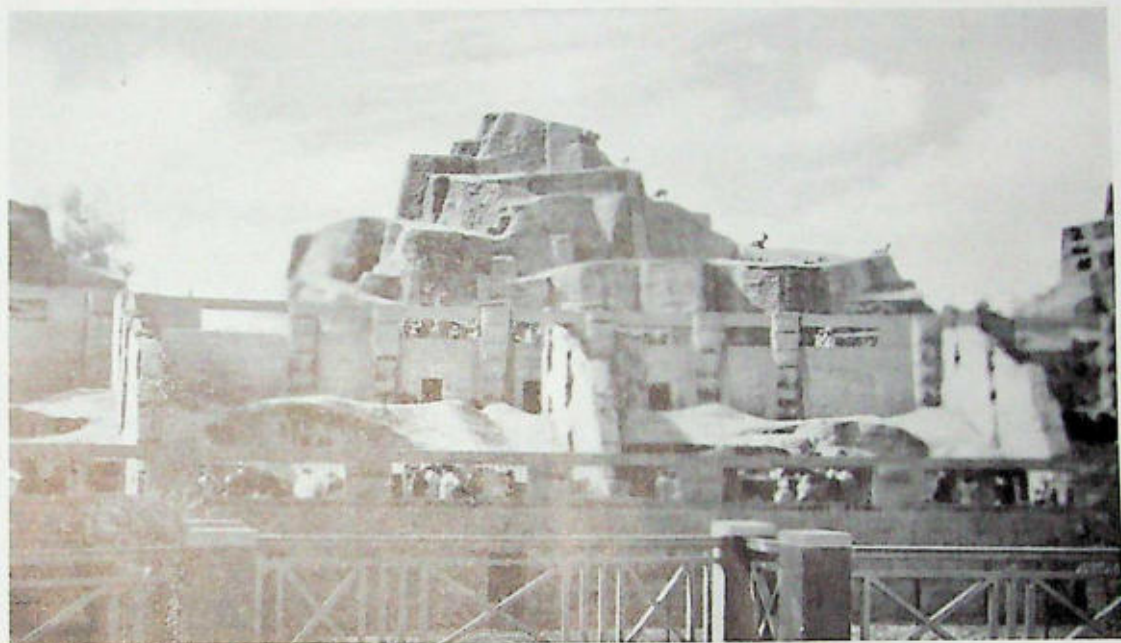
The London Zoo is fortunate in the possession of fine pairs of both American and European Bison, which are kept side by side in commodious yards. The European bull is the finest the

writer has ever seen. He is taller than the well-grown American bull in the next compartment but the comparatively long legs are very heavy in bone and the weight of this animal seems greater than that of his New World cousin. The relatively small head, however, prevents this splendid bison from attaining the majesty of the American species.

The bird collections are in very good condition and contain many rarities. Perhaps the most striking are the curious knob-billed Fruit Pigeon (*Globicera pacifica*) and a gorgeous Ross Touraco (*Musophaga rossae*). There is a large flock of penguins, including two specimens of *Catarrhactes*. The Parrot House is well stocked, and in spite of all obstacles, still contains the world's finest series of these birds.

The Zoological Gardens at Antwerp are in excellent condition and maintain their reputation as one of the best kept in Europe. The grounds are laid out with an eye to scenic effect, and lawns and flower-beds leave no hint of what has passed. There is even no sign of the damage done by a great German shell, which demolished a section of the Lion House and destroyed a number of the feline inmates. The scarcity of arrivals in the continental market has prevented raising the collections quite to the old-time level but the exhibits are well spread out and there seem to be no empty cages. The series of eagles and vultures at Antwerp, as in pre-war days, is the best in Europe. It contains many rarities, including a very fine White-headed Vulture (*Lophogyps occipitalis*). The collection of birds, mammals and reptiles presented by the New York Zoological Society, in the autumn of 1919, continues to thrive, and makes a fine display.

While the Zoological Gardens of Holland did not suffer directly from the effects of the war, as did those of the belligerent countries, they naturally were affected by the scarcity of food and the lack of new specimens to fill gaps. In spite of these conditions, however, the gardens of both Amsterdam and Rotterdam came through in excellent condition. The lawns were as fresh and green, the ornamental shrubs and well-arranged flowering plants as brilliant, as in former times. All of the European gardens are far stronger in man-power than our own, because of the low cost of labor, and nothing that hands can do to beautify them is neglected. Rotterdam, as usual, has a very fine collection of the wading birds with which the country abounds. The water-fowl collection is unusually good and the Monkey House, like those of most of the other gardens, was very well stocked. In the Bird



MAPPIN TERRACE FOR BEARS AND WILD GOATS
LONDON ZOOLOGICAL GARDENS

House, several fruit pigeons (*Carpophaga*), which were exhibited in 1912, are still living and in good health. Unfortunately, the director, Dr. Buttikofer, was enjoying his annual holiday at the time of the writer's visit, so that the aid

of his intimate knowledge of the collection was missed, and no doubt many good things were overlooked.

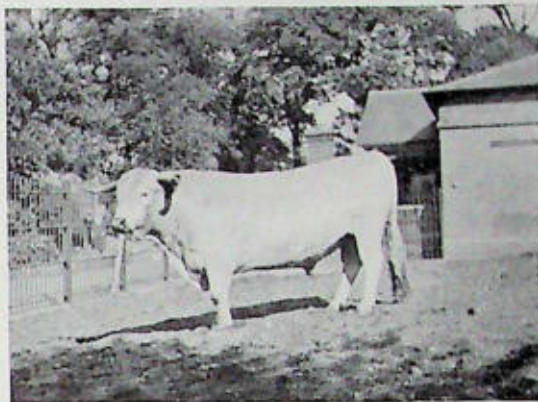
The gardens at Amsterdam seemed to show no effects of the period of close living and the



MONKEY HOUSE, ROTTERDAM ZOOLOGICAL GARDENS



GAYAL IN THE AMSTERDAM ZOOLOGICAL GARDENS.



CHILLINGHAM BULL, LONDON ZOOLOGICAL GARDENS

collections seemed even finer than ever before. Under the guidance of Mr. A. F. J. Portielje, the inspector, many rarities were noticed, which otherwise might not have been seen. Among the mammals, perhaps the most interesting were a number of a new species of Pygmy Buffalo (*Anoa quarlesi*), discovered about ten years ago, in the mountains of central Celebes. This herd contains the only living specimens yet obtained. They have bred in the gardens and Dr. Kerbert, the Director, promises an early paper concerning them.

A very interesting wild dog (*Icticyon venaticus*) has been bred in the gardens, and is now represented by a fine male. It is a small, powerful, tawny-colored creature and has a most romantic history. It is quite possible that this little-known dog may be responsible for the supposed mythical tales of South American natives, concerning wierd creatures that hunt in packs at night, and which they greatly fear.

The Monkey House contains many fine things, including an Aye-Aye (*Chiromys madagascariensis*) and an Orang-Utan little, if at all, inferior to the one in London. One of the most surprising exhibits was an adult Harbor Seal (*Phoca vitulina*). This excellent creature had been in the collection for over two years and its good health was attested by the balloon-like distention of its skin and its engagingly human smile. Seals of all sorts are difficult subjects in captivity but this individual is quite happy and prosperous. It is kept by itself in a yard with a small concrete pool, where its antics are both instructive and amusing.

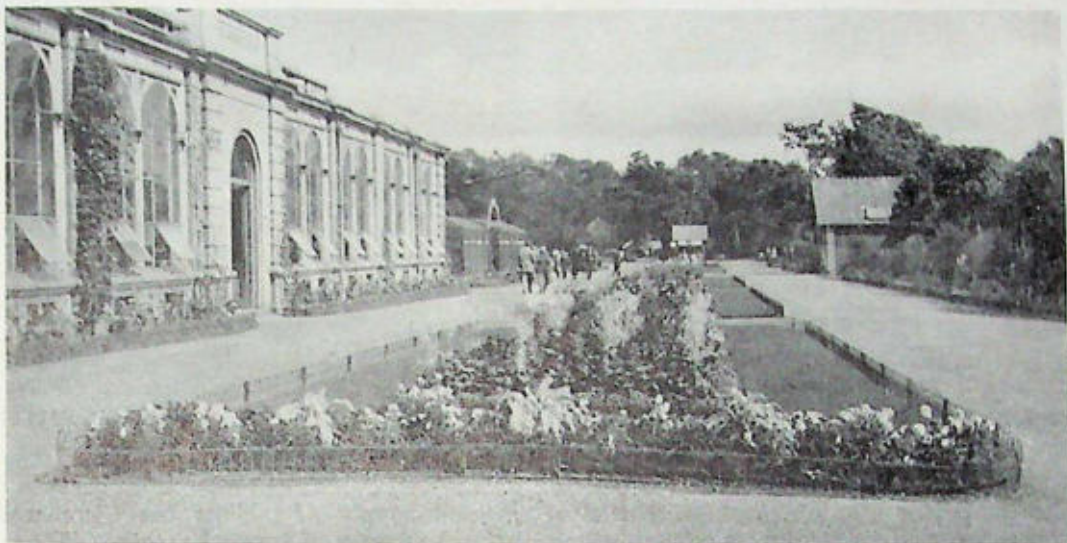
As usual, the series of cattle at Amsterdam is very extensive and contains fine examples of the Gayal (*Bibos frontalis*) and the Gaur (*B. gaurus*), the former having bred freely in the Gardens.

The well-lighted and attractive aquarium had a good supply of exhibits but there was a natural scarcity of tropical species. The most interesting things here were the tremendous pair of Giant Salamanders, certainly the largest in captivity. This pair caused a sensation some years ago by breeding, an event so unusual that specialists came from Japan, the home of this species, to study the development of the embryos.

Amsterdam has always been famous for its cranes, storks and herons and the collection of these birds has not diminished. The famous pair of Goliath Herons (*Ardea goliath*), which have produced two or three nests of young yearly for eighteen years, are still flourishing and were incubating at the time of the writer's visit. These birds have supplied the Zoological Gardens of the world with their offspring. A young bird of their rearing, purchased at the time of the writer's previous visit, in 1912, is still living in New York.



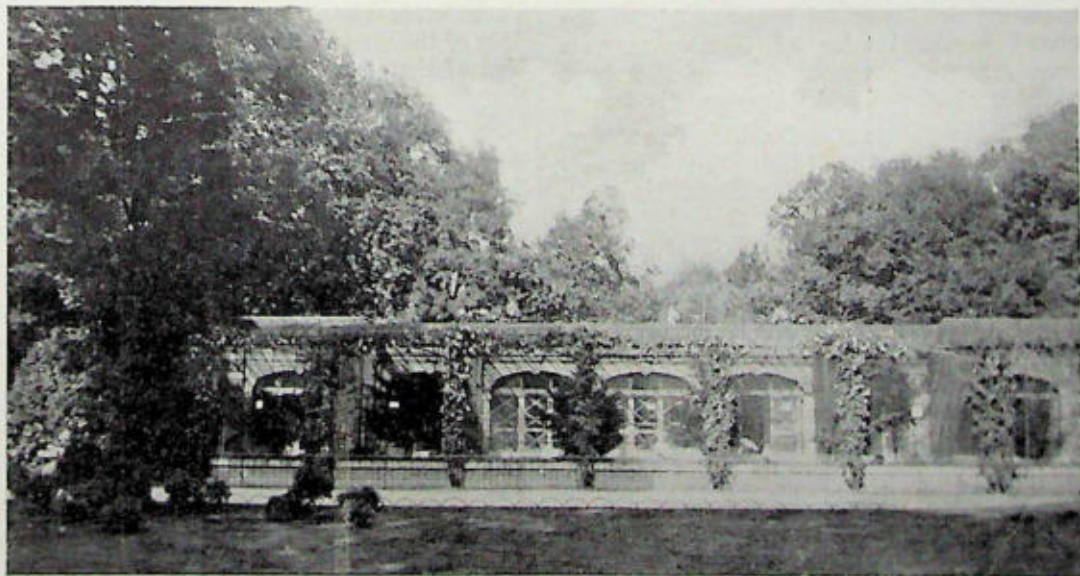
A NEW ANOA FROM CELEBES, AMSTERDAM ZOOLOGICAL GARDENS



MONKEY HOUSE, IN THE LONDON ZOO

Amsterdam was the only continental collection that had duplicates to spare and several interesting birds were secured. The Zoological Society of London presented to us a number of animals, including a very fine Panda (*Aelurus fulgens*), the only specimen ever bred in captivity, and a Patagonian Cavy (*Dolichotis patochonica*). There were also several birds, including a Black-footed Penguin. These, together with numerous purchases from English dealers,

made up a collection of about 500 mammals, birds and reptiles. Transportation conditions were very difficult but through the kindness of Dr. P. Chalmers Mitchell, Secretary of the Zoological Society of London, and Mr. David Seth-Smith, Curator of Birds, the services of Keeper James Bailey were secured. Keeper Bailey landed the collection in New York in very good condition and deserves great credit for his diligence and care.



PHEASANT AVIARY, ANTWERP ZOOLOGICAL GARDENS



COMMON SKUNK OF THE NORTHERN UNITED STATES

The Fur Trade and The Wild Animals

By WILLIAM T. HORNADAY, Sc. D., A. M.

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Photographs of fur garments made by Joel Feder.
Little Striped Skunk and Common Skunk—Permission Chas. Scribner's Sons.
Four Famous American Fur-Bearers—Permission Chas. Scribner's Sons.
Chinchilla and Coypu Rat—Permission D. Appleton and Co.



AN EXTRAVAGANZA IN FUR

Chinchilla wrap. In 1929 a wrap similar to this sold for \$35,000. The chinchilla is now so nearly extinct that the Chilean government has forbidden the exportation of chinchilla skins or living animals.

ZOOLOGICAL SOCIETY BULLETIN

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NUMBER 2

THE FUR TRADE AND THE WILD ANIMALS

By WILLIAM T. HORNADAY, SC.D., A.M.

Director, New York Zoological Park

THE following pages have been written solely as historic notes, and without the slightest expectation that they will cause even one fur wearer, fur dealer or trapper to pause in his, or her, career of destruction, and take measures for tomorrow.

The fur-bearing animals of the world are in a worse plight today than were the birds 25 years ago when the Zoological Society joined in the great crusade against the milliners which has resulted triumphantly in restoring the birds to America and aiding, at least, in the preservation of birds throughout the world.

While there is life there is hope. We are making the present effort in the hope that some remnants at least of the glorious Age of Mammals may be allowed to survive. But, unless immediate steps are taken, we believe that the fur-bearing animals of the world at large are DOOMED. The craze for "fur," for legitimate and illegitimate purposes; the insatiable demands of the trappers and fur dealers, and the mad rush at the counter for fur and pseudo-fur, constitute three irresistible forces with which no outside reform can cope, and no outside conservation campaign can arrest.

Even the present much reduced prices are highly destructive, and if they continue—as they surely will—then must we bid a long farewell to all the wild mammals whose skins can, by any stretch of the human imagination, be regarded as furnishing wearable fur.

PROFESSOR OSBORN'S DECLARATION OF DOOM

The world's final frantic struggle for "fur" brings to our mind Professor Henry Fairfield

Osborn's masterful book entitled "The Age of Mammals." It reviews and throws upon the screen the developments of the world's most interesting geologic period, following the Age of Reptiles, and the passing of the dinosaurs.

Viewing with the eyes of a biologist the war of extermination that now is being waged by trappers, hunters and fur dealers to satisfy the greedy maw of "The Market," and the destruction of wild animals for food and for sport, Professor Osborn today solemnly declares that "The last chapter of the Age of Mammals now is being written in blood, and the end of the period of mammalian life is at hand." By this expression probably he means A. D. 1950. Geologically considered, the great zoologist is indisputably right. Geologic time is longer than one span of human life.

We would like to think that the mammalian species living and thriving today will go on and on, changing and progressing according to their circumstances, for another million years. But all such dreams and hopes are vain and illusory. We are witnessing the extinguishment of the world's grandest group of vertebrates—the class Mammalia. The great tragedy is proceeding on plain and mountain, in forest and field, on lake shore and seacoast, in swamp and desert, in the sea and in the bowels of the earth. Even under the surface of Mother Earth it is relentlessly moving on, and not even the subterranean mole is secure. All the fur in our coats, around our shoulders and upon our hands, implicating alike, outside the tropics, all men, women and children, and even the cradled babe, shows the extent to which we are guilty of participating in the war of extermination.



COAT OF LITTLE STRIPED SKUNK

Commonly called by the fur trade "civet cat." In the southern and southwestern United States the species which furnished this contribution is frequently called the "hydrophobia" skunk, because its bite sometimes results in death from hydrophobia. It contains about 90 skins. Value, \$225.

The killing of game for food and sport is, in all conscience, bad enough; but much has been accomplished by the valiant army of defense to check, and in places prohibit, that line of extermination. Here and there, in wild life preserves both great and small, protection really has begun to protect, and over an aggregate area of many thousand square miles many important species now are safe from total extinction, at least in the tomorrow of our time.

THE HUMAN DEMAND FOR FUR

Thirty thousand years ago the cave men of the temperate zone were the first wearers of

fur garments. It is very unlikely, however, that the Neanderthal Woman ever descended to the zoological depths that now are being explored by the modern fur trader in quest of wearable fur.

Imagine the feelings of a respectable Cheyenne squaw if she were asked by the lord of her teepee to make for him a coat of 300 gopher skins. Even twenty-five years ago the lowly skunk was safe from the trapper; but today *Mephitis mephitis* is "the darling of the gods," and zoological nightmares of undyed striped skunk skins now are seen at large on our streets sheltering and adorning full-grown girls.

If the amazing high prices of fur that prevailed in the winter of 1919 and 1920 had held for five years, the fur question would have answered itself. In five years all species of fur-bearing animals surely would have been exterminated. Thanks to the long and hard fall in fur prices that in the last half of 1920 gave the fur market a terrific jolt, the fur-bearers may be about twenty years in reaching extinction. The annual slaughter will be terrible; but who is going to attempt to resist the demands of vanity, selfishness and greed when made in the sacred name of "Fashion"?

When "summer furs" are in fashion "summer furs" must be worn, regardless of midsummer heat. The girl who can lay bare her legs and her sternum in winter will not balk at furs in the dog-days of August.

At present our interest in the slaughter of the fur-bearers is purely academic. We know that it is useless for us to tilt against the impregnable walls of the citadels of fashion. The truly fashionable woman is a cruel animal, just as game-hogs and pot-hunters are among men. It is useless to try to convince a man with plenty of money that the best of wool is as warm as the poorest fur; hence the "fur" or "fur-lined" overcoat—walking graveyard of wild life. Dame Fashion has not yet decreed that skulls, leg-bones and strings of vertebrae shall now be worn with furs as additional trimmings.

The killing of wild animals for their fur and skins has gone on ever since the days when the fur-bearers outnumbered the fur-wearers by fifty to one, and the wearers sought and used only the best. Then, the annual balance between supply and demand was far within the factor of safety. Humanitarians cheerfully condoned the cruelties of trapping, because men and women sorely needed fur garments. Man himself has been from the first a predatory animal, and even today you may, if you watch, see the strange spectacle of a gentleman wrapped in a



THE COMMON MUSKRAT

A pillar of the fur trade now furnishing the best imitation of more valuable fur, and sold under many names.

much-too-heavy overcoat made of 200 wild animal skins causing the arrest of a truck driver for driving a horse with a lame shoulder. Thus is the jewel of consistency displayed upon the human breast.

For half a century, men with seeing eyes and thinking brains have noted the steady disappearance of the best fur-bearing mammals before the combined demands of the trapper, the dealer and the wearer. Ten years ago we directed attention to this line of destruction. ("Vanishing Wild Life": Destruction of Animals for Fur, p. 193.) Two long lists of the annual fur sales of Lampson & Company, London, for 1911 and 1912 were published to show two things: the enormous number and variety of animals killed for their fur, and the great decline in the supply in one year.

In 1911 Lampson & Co. of London sold 3,460,764 muskrat skins.

In the London winter fur sale of January, 1920, all the London fur houses combined could muster only 333,500 muskrat skins, which represents a proportionate falling off since 1911 of 90 per cent. In other words, Lampson & Co. alone handled in the *first quarter* of 1911 a total of 865,000 muskrats, whereas in 1920 *all* the London dealers together could muster for the winter sale only 333,500, which was an exceedingly small number.

In January, 1920, it looked as if the last act of the tragedy had been staged. It came upon the world like the rush of a cheap modern melodrama that assumes merit in whirlwind rapidity

of action, regardless of sense. During the first two years of the war, with Russia, Germany and Austria conspicuously out of the fur market as competing buyers, and England in much the same position, the bottom of the fur market almost dropped out. Some trappers actually ceased trapping because prices were too low to make it profitable.

But war profiteering and an orgy of extravagant fur buying in America presently changed the whole aspect of the fur trade. The soaring prices of labor and all products of labor in America created a tremendous wave of silk-shirt extravagance and of new desire for extravagant apparel, which quickly developed a new and clamorous demand for furs, regardless of price or quality. It reached a point where to every woman in America a "piece of fur" became the one indispensable badge of respectability. All fur prices went soaring to heights never before dreamed of, with insatiable demands for "more." We saw prices doubled, trebled, quadrupled, and even worse. The raw muskrat skin of our boyhood which brought ten cents "at the store" and more recently fetched 25 cents, has been selling in the country stores of Illinois at an average of \$2.35 and at auction in New York as high as \$4 and \$5! We have already referred to the drop in the supply of muskrat skins in the London fur market from 3,460,764 in the year 1911 to a paltry 333,500 for the winter of 1920, a decrease of about 90 per cent in nine years. Is it any cause for wonder that now the whole United States and Canada are being combed with fine-toothed combs for muskrats?



COAT OF NATURAL MUSKRAT

It contains about 68 skins. Value, for fine quality, \$425.

And is there any intelligent person who believes that the muskrat species can long endure?

Prime British Columbia marten that in 1906 were caught and sold at \$10 each, in 1920 brought in the New York fur auction from \$60 to \$100, and in Montreal even more. On October 8, 1919, at the New York fur auction, 7 dark marten skins fetched \$135 each; and who will undertake to assert that five years hence similar skins will not fetch \$200 each?

ANNUAL VOLUME OF CAPTURED FURS

We know no better index of the destruction of fur-bearing animals than the figures of the great fur sales in London and America. The kinds and quantities tell their own stories.

In the United States and Canada great fur auctions are held periodically at New York, St. Louis and Montreal. Each city is competing for first place in fur importance, and each handles its full share of raw furs. Let us take a few figures from our own mart, which will merely show the quarterly output of only one of the three fur markets of America.

SKINS SOLD IN NEW YORK

Two Sales, 15 Months Apart

	Oct. 6, 1919	Jan. 17, 1921
Muskrat	270,265	295,832
Beaver	15,626	2,655
Otter	2,222	1,015
Marten	9,478	3,625
Stone Marten	2,940	3,549
Baum Marten	1,160	1,139
Japanese Marten.....	695	777
Badger	6,249	1,308
Ermine	52,852	50,581
Wolverine	329	169
Mink	48,425	52,028
Japanese Mink	17,748	3,195
Skunk	173,871	106,380
Fisher	504	272
Silver Fox	257	142
Red Fox	23,470	12,649
Cross Fox	392	424
Gray Fox	8,620	1,337
White Fox	1,042	1,764
Blue Fox	392	964
Australian Fox.....	29,010	16,825
Sundry Foxes	9,825	9,805
Wolf	19,470	19,000
Raccoon	17,753	35,087
Black Bear	865	444
Brown Bear	120	50
Grizzly Bear	17	25
Russian Sable	3,018	439
Chinchilla	544	931
Kolinsky	20,118	22,800
Nutria	34,242	10,289
Chinese Raccoon.....	4,524	1,002
Lynx	2,360	402
Wild Cat	9,885	9,308
Mole	238,760	473,809
Opossum	81,962	185,410
Ringtail Opossum.....	20,148	71,156
Australian Opossum....	63,933	31,094
Tasmanian Opossum....	1,349	8,813
Ringtail Cats.....	6,149	4,583
Fitch (Polecat).....	16,214	55,492
Flying Squirrel.....	2,000	770
Japanese Fox	2,492	...
Squirrel	345,936	124,085
Chinese Weasel.....	...	28,041
Rabbit (skins).....	...	33,668
Rabbit (pounds) 43,596	85,470	
Total	1,567,231	1,683,133

Coincident with the January fur sales in the three fur markets of North America, there occurred in London, on January 26, 1920, a sale of furs which represents an additional output from the fur fields of the world. The figures

are positively staggering. Here is a list of whole skins from wild animals, taking no account of paws, tails and parts of skins, nor of the domestic output.

LONDON FUR SALES IN JANUARY, 1920

730,000 Skunk	155,000 Red Fox,
333,500 Muskrat	Australian
364,000 Opossum	160,000 Opossum,
21,000 Raccoon	Australian
65,400 Civet Cat	3,100 Fox, dyed
96,000 Mink	6,000 Muskrat "Elec-
1,500 Fox, Silver	tric" skins
2,100 Fox, Cross	39,000 Rabbit "Electric"
70,000 Fox, Red	skins
16,000 Fox, White	4,800 Bear
705 Fox, Blue	11,000 Opossum,
15,000 Fox, Gray	Ringtail
65,000 Fox, Kit	189,000 Wallaby
9,000 Beaver	2,000 Chinchilla
4,610 Otter	400,000 Squirrel
980 Lynx	10,500 Fox, Japanese
305 Wolverine	1,500 Mouflon
2,600 Fisher	2,400 Leopard
10 Sea Otter	13,500 Kolinsky
210,000 Ermine	(Siberian Mink)
6,500 Marten	8,500 Fitch (Polecat)
2,800 Sable, Russian	26,500 Squirrel Backs
250 Baum Marten	500,000 Mole
3,500 Stone Marten	55,000 Marmot
30,000 Wolf	131,000 Hare, White
9,700 Badger	70,000 Nutria (Copyu
8,000 Fur Seal, salted	Rat)
450 Fur Seal, dry	25,000 Slink Crosses
420 Fur Seal, dyed	8,000 Slink Skins
5,029 Hair Seal, dry	1,200 Hare, Dyed
	27,900 Mole Coney

Total number of dead wild animals represented by skins, in one London fur auction, 8,965,259.

We leave out of the above reckoning 18,889 house cats, because we are dealing only with wild species.

To the exhibits expressed in terms of skunk skins of the depths to which the fur wearers have descended in comparison with the high levels of fifty years ago, we add the following remarkable showing of unjustifiable slaughter in the name of "the fur trade," drawn jointly from the New York auction referred to above and the London fur sale of January 26 to 30, 1920:

FOREIGN PSEUDO "FURS"

1,500 Mouflon	sold in London
63,933 Australian Opossum	" " New York
26,902 Koala ("Wombat")	" " New York
400,000 Squirrel	" " London
189,000 Wallaby	" " London
65,400 Civet Cat	" " London
63,382 Civet Cat	" " New York
1,216 Ocelot	" " New York
2,400 Leopard	" " London



INDIAN LEOPARD COAT TRIMMED WITH NUTRIA
It contains about 7 leopard and 24 nutria skins. Value, \$475.

345,804 Squirrel	" " New York
55,000 Marmot	" " London
625,000 Chinese Rabbit	" " London
5,029 Hair Seal	" " London

2,344,566

The above list shows how hard pressed are the fur wearers in "keeping up with Lizzie," in the demand for "fur," regardless of quality, actual value or price. As wearable furs, the great majority of the skins enumerated above are poor, and in comparison with real fur, about 80 per cent. of the total number are to be regarded as beneath contempt. Fancy wearing the skin of a prairie dog (marmot) as "fur!" And consider the hair seal as "fur," to keep a lady warm!

The handling of 1,500 real mouflon skins as fur—or on any other commercial basis—is a crime and a disgrace sufficient to bring the blush of shame to any but the most brazen cheek. Whatever nation would permit such a slaughter, or permit the exportation of real mouflon skins for any commercial purpose, would be highly culpable, and deserving of the execration of zoologists and nature lovers, until she apologized to the world and pledged herself to do better. The beautiful mouflon, which is the only mountain sheep of Europe, is now numerically down to a point so low, and is so near to oblivion, that not even ten skins should be spared for commercial purposes, much less the appalling number of *one thousand five hundred*. How could it be possible for all the poachers of southern Europe to find and kill such a number?

This great output of furs and pseudo-furs is due to enormously increased activities on the part of trappers and hunters all over the world, spurred to their utmost diligence by the temptation of high prices. The previous balance, or half-way balance, of natural demand and legitimate supply has been wiped out, we fear, forever.

In all probability the feverish quest for skins with hair upon them will go on with accelerating speed until total extinction is suddenly announced—precisely as the bison millions were suddenly snuffed out in 1882-3-4. That dramatic ending came so suddenly that even the buffalo hunters and skinners were not aware of what they had accomplished until they returned from the barren ranges of Montana in 1885, quite empty-handed.

THE TRAGEDY OF THE KOALA

Australia's Zoological Novelty Adopted, Exploited and Almost Exterminated.

For anyone who has the time and the inclination it would be an interesting task to add up the totals of the fur-bearing animals that have been sold during the last two years in the fur auctions of St. Louis, New York, Montreal and London. For some species the figures would stagger the imagination and create profound wonder that our continental stock of fur-bearing animals could for even two years survive such slaughter.

As an easily calculated illustration let us take the case of one of the pseudo-fur animals of Australia. Zoologically, the koala is one of the most interesting of the many bizarre and remarkable animals of Australia. It is a tree dweller, it feeds on the leaves of the eucalyptus,

it harms nothing and nobody, and there is every reason why a creature so interesting and so harmless should survive. If Australia ever loses this species, then Australia will distinctly be the poorer thereby, and her regret over the loss will be permanent.

Up to date only two living koalas ever have landed in North America. One came to the New York Zoological Park in October, 1920, and for it the Zoological Society agreed to pay the very substantial sum of \$1,250. All haste was made to photograph the animal before it could shuffle off its mortal coil, and this foresight was well timed. The photographs were secured, and while the animal was virtually in the course of transference from seller to purchaser, it died. Its portrait is published herewith.

Now, the hair of the koala looks at a little distance like fur, and the withering glance of the fur trade has fallen upon it. The fur trade demanded the life and the pelt of the koala, and the Australian slaughterers were prompt in responding. The records show that in five of the auction sales of fur recently held in the United States and Canada, the appalling number of 32,376 koala skins, absurdly listed as "wombat," were disposed of.

Now, what was the value at stake in that awful slaughter? The records of the fur sales show that these skins fetched from 70 cents to \$1.25 each, *with \$1.50 as the highest price for a very few extra choice skins!* This means that to the Australian destroyers those animals meant a cash return, in Australia, of not more than 50 cents each.

I know of no case of fur slaughter more wicked than this. Unless the provinces of Australia take thought for the morrow and stop the awful destruction for commercial purposes that now is going on among their mammals, in a comparatively short time it will be possible to figure up the census of the mammals of Australia from the catalogues of the fur sales, because no fauna on earth long can withstand the strain that has been put upon the mammals of the antarctic continent. Recently we have learned that some of the provinces of Australia have taken alarm at the slaughter of the koala and have placed an embargo on the further exportation of koala skins.

AREA OF FUR-BEARING ANIMALS

The most deeply tragic feature of the fur trade's slaughter is the fact that it covers fully one-half of the land area of the world and embraces a long list of species. The accompanying map of the world shows in black the regions



THE WONDERFUL KOALA OR NATIVE "BEAR" OF AUSTRALIA

10950 skins misleadingly listed as "wombats," were sold in New York in January, 1921, at prices ranging from 70 cents to \$1.30. Ten of these animals must be killed to make one short coat. Unless all the provinces of Australia immediately stop the exportation of koala skins, this exceedingly interesting species very soon will become totally extinct.



FUR PRODUCING AREAS OF THE WORLD

from whence come the world's present supply of furs, but the localities of the few pseudo-furs of the tropics are not shown.

From now henceforward, other localities and other species in rapid succession will be caught in the dragnet and thrown into the insatiable hopper of "the fur trade." Will anything with hair escape?

CONTRIBUTIONS OF THE CONTINENTS

At present the continents of the world contribute to the world's fur supply about as follows:

Australia

Kangaroos	Wombat
Wallabies	Opossum
Koala	Rabbit (introduced)
	Fox (introduced)

North America

Beaver	Coyote
Muskrat	Gray Wolf
Otter	Red Fox
Sea Otter	Cross Fox
Fisher	Black Fox
Marten	Blue Fox
Mink	Arctic Fox
Weasel	Gray Fox
Wolverine	Swift Fox
Badger	Black Bear
Raccoon	Polar Bear
Opossum	Brown Bear
Red Lynx	Fur Seal
Canada Lynx	Hair Seal
Ring-tailed Cat	Harbor Seal
	Rabbit

Asia and Europe

All species corresponding to the fur-bearers of North America, and also the

Sable	Brown Bear
Fitch (Polecat)	Civet Cat
Kolinsky (European and Asiatic mink)	Mouflon
	Leopard
Squirrel	Snow Leopard
Marmot	Reindeer

South America

Coypu Rat ("Nutria")	Crab-eating Raccoon
Vicunia	Chinchilla
Opossum	Guanaco

THE STATUS OF THE FUR-BEARERS

The real fur-bearing animals of the world stand on a basis apart from most other wild animals of the world. Many of them are fiercely predatory, and absolutely require the hand of the human killer to keep them from overrunning and devouring man, beast and bird. For example:

Wolves, wherever they occur in large numbers, constitute a nuisance and scourge of the first magnitude. With unparalleled ferocity they devour the wounded and the dead of their own kind, their own pups, and game of every description from mice to men. It is true that their slaughter of men is not great, but that is because man is himself a dangerous animal of no mean proportions. The depredations of gray wolves and coyotes on the cattle, sheep and colts of the western stock ranges are at all times very exasperating, and millions of dollars have been

expended in wages and bounties for wolf destruction.

In approaching the wolves and weasels, some of our principles against the extermination of species break down, and we note exceptions. There are those who believe that it would be a good thing for the world at large if all wolves and weasels were to be totally blotted out of existence. We believe that their destruction of more valuable wild creatures outweighs their own fur value.

All the members of the Marten Family, in which are the fishers, martens, skunks, weasels and mink, are savage and merciless killers. Some of them, such as the weasel, mink and skunk, are wholesale slaughterers who murder helpless birds by the dozen for the vicious lust of murder. For example, on two occasions a mink wiped out an entire flock of over twenty gulls (in the New York Zoological Park) in a single killing, and without devouring even one.

On the estate of Mr. C. C. Worthington, at Shawnee, Pennsylvania, one murderous little

weasel murdered twenty-four ring-necked pheasants in one night!

The skunk is the pariah of the class Mammalia, a dangerous and disgusting outcast, and it is a good thing for the world that his pelt is wanted for its fur. May the price of skunk skins never go down until the last skunk has been gathered in! This view, however, will not receive the endorsement of those fur dealers who hold that the skunk is so nearly harmless to man that he should be tolerated and encouraged for the sake of his fur.

The wolverine is the devil of devils—on four legs. His only redeeming trait is his skin, and even that is a poor excuse as fur.

The "sufferings" of wolverines, weasels, mink and skunk in traps are not so great as they may seem. A marten or a mink will eat a good meal with one foot in a trap. It is the way of the members of the Marten Family to tear and devour their prey alive, and it is the way of man to catch them in about the only way in which it can be done—in steel traps. We do not be-



RED KANGAROO OF AUSTRALIA

This species fitly represents the many species of Australian kangaroos and wallabies that are slaughtered in great numbers for their skins to be used both as fur and for shoe leather. The photograph of an automobile in Australia loaded with dead kangaroos originally intended for this article is at present unavailable.



COAT OF OCELOT, GENET AND BEAVER

It contains about 22 ocelot and 3 beaver skins. Value, \$450.

lieve in any unnecessary cruelty, either in the killing of wild animals or domestic animals, but there is plenty of both. The proper course of humane people is to reduce it to an irreducible minimum.

THE BALANCE OF NATURE

Ever since the days of primitive man, and according to their needs, the carnivorous furbearers have killed and devoured other vertebrates whenever they could be caught; and man

has killed the fur-wearers to supply his own needs. We need not quarrel with those two fundamental laws of nature, for they are as fixed and unshakable as the Rocky Mountains.

On the other hand, it is a right good thing that man's needs have caused him to keep down the increase of predatory animals by killing and utilizing the surplus. Had this not been done, many species of land birds and mammals now living would have been exterminated, and only the largest, the strongest and the fleetest would have survived.

Not merely at the risk, but in the absolute certainty of arousing resentment and criticism, we feel compelled to say that the fur trapper has his legitimate place in the economy of nature. We believe in fur, in moderation, just as we do in the Constitution—minus some of its amendments.

But it is easy for the trapper to overplay his hand, and leave behind him lifeless wastes. To-day the world is trapping not wisely but too well. Too much trapping can be just as ill balanced as no trapping.

It is the duty of the fur trade to get together and take steps to regulate the trapping business, to stop waste and abuses, to stop using species that should not be used, and provide for a continuance of the legitimate fur trade.

There are many species that now should be stricken off the list. Among those that most readily come to mind are the mouflon, koala ("wombat"), chinchilla, sea otter and all monkeys.

THE FUR TRADE'S GREATEST EFFORT

For several years prior to 1920 we noticed in the columns of the *Fur Trade Review* the fact that in the West very keen rivalry existed in the ranks of the fur dealers in the buying of raw furs. By means of tempting circulars and display advertisements, trappers were urged to trap to the utmost, and boys and men who were not trappers were urged to enter that field of activity.

So strong was the appeal to the American boy that we were called upon to contribute to *Boy's Life*, the official magazine of the Boy Scouts of America, an article on "The Ethics of Trapping by Boys." Briefly stated, we took the position that trapping is not necessarily a wicked pursuit and that it is a legitimate industry, but that its unavoidable cruelties are so serious a factor that we do not advise boys to engage in it.

As fortune ordered it, this great campaign of advertising and exhortation was followed by



THE COMMON SKUNK (left) AND THE LITTLE STRIPED SKUNK OR "HYDROPHOBIA CAT" (right)

From the "*American Natural History*," by permission of Chas. Scribner's Sons.

steady increases in the value of raw furs, which sent into the fur fields a grand army of new trappers. The whole world was raked and scraped for fur, good, indifferent and bad. Even the back-yards of New York City were swept clean of domestic cats whose skins were hurled into the rapacious jaws of the fur trade, at fifty cents per throw. Never in its history has Manhattan been so blissfully free of yowling cats as now; and this is no joke.

In 1919 and 1920 this wild orgy of fur-seeking culminated in a series of dramatic climaxes in high prices. The peak was reached in the sales of January, 1920, and then the bottom of the fur boom dropped out. All over America prices fell to figures that spelled ruin to many an overloaded fur buyer and the rush to liquidate immediately began. As the most cruel blow of all, Fashion, the fickle jade; turned against the "silver"-black fox, which for years had been the spoiled darling of the London fur market. We will not dwell in detail upon this harrowing episode, but we have been assured that "black fox is no longer wanted" at fancy prices.

The great drop in the price of furs caused thousands of trappers to stop in mid-career.

Some fur buyers even sent out circulars calling for less trapping.

Had the high prices continued for about five years, I think they would have finished up the fur-bearing animals of the world, excepting the rabbits, rats and mice. But now they have a little breathing space, pending the final assault.

I know of no better index of the danger now hanging over the fur animals and the fur trade than the price of fur and fur garments, and the wastefulness in designs.

We know that the one sure way to exterminate a wild animal species is to remove protection from it and place a cash price on the head of each individual. The American bison was exterminated because of \$2.50 per hide. The passenger pigeon millions were annihilated because of ten cents per dozen. The sea otter has vanished because of the awful prices paid for skins. After long years of trapping the beaver became so nearly extinct that for a dozen years beaver fur almost disappeared from the fur markets of the world.

It is impracticable to quote here a long list of prices of fur garments, but we can show in one table an excellent exhibit of the prices at which

AMERICAN FUR PRICES, HIGH AND LOW, 1920 AND 1921

PRICES QUOTED ARE FROM FUR AUCTION CATALOGUES, FOR FIRST AND SECOND QUALITY SKINS, SIZES "EXTRA LARGE" AND "LARGE." ABOUT 15% OF THE DIFFERENCES BETWEEN NEW YORK AND MONTREAL PRICES IS DUE TO DIFFERENCES IN EXCHANGE

	HIGH PRICES New York Feb. 16, 1920	HIGH PRICES Montreal Mar. 22, 1920	FALLEN PRICES New York Jan. 17, 1921	FALLEN PRICES Montreal Jan. 31, 1921
Otter	\$31.00 to \$76.00	\$54.00 to \$105.00	\$10.00 to \$33.50	\$16.00 to \$35.00
Mink	10.00 " 35.00	14.00 " 75.00	2.50 " 9.00	3.00 " 18.00
Marten	35.00 " 113.00	79.00 " 201.00	15.00 " 51.00	21.00 " 73.00
Fisher	72.00 " 305.00	150.00 " 345.00	36.00 " 100.00	50.00 " 125.00
Weasel ("Ermine")...	1.20 " 2.80	2.20 " 2.80	.30 " 1.25	.80 " 1.05
Skunk	2.00 " 10.10	2.50 " 10.00	1.00 " 4.30	.95 " 4.55
Raccoon	6.20 " 18.75	6.20 " 30.00	2.10 " 5.20	3.50 " 6.80
Opossum	1.92 " 3.70	2.62 " 3.90	.70 " 1.39	.82 " 1.02
Muskrat	3.10 " 5.00	4.60 " 7.50	.75 " 1.75	1.50 " 2.20
Beaver	46.00 " 60.00	56.00 " 106.00	17.25 " 28.50	22.00 " 32.75
Lynx (Canada).....	12.00 " 66.00	51.25 " 62.50	23.50 " 28.50	24.00 " 32.00
Lynx (Red).....	2.80 " 18.00	 " 15.25	.75 " 4.50	 " 6.00
Bear, Black.....	21.00 " 24.00	25.00 " 45.00	10.75 " 15.50	12.00 " 16.50
Bear, Brown.....	15.00 " 18.00	 " 13.00	6.25 " 6.75	 " 11.00
Bear, Grizzly.....	17.00 " 17.50	 "	6.75 " 19.75	 " 26.00
Bear, Polar.....	41.00 " 66.00	 " 240.00	7.00 " 52.50	 " 100.00
Fox, Black ("Silver")	400.00 " 720.00	400.00 " 1225.00	100.00 " 310.00	150.00 " 565.00
Fox, Cross.....	25.00 " 242.50	35.00 " 280.00	16.00 " 120.00	17.00 " 100.00
Fox, Red.....	12.00 " 63.50	26.00 " 51.00	4.00 " 25.50	7.75 " 30.00
Fox, Blue.....	40.00 " 270.00	 "	24.00 " 130.00	55.00 " 73.00
Fox, White.....	36.50 " 63.00	69.00 " 70.00	16.00 " 29.50	22.00 " 30.00
Fox, Gray.....	4.40 " 6.70	 "	1.80 " 3.30	 "
Wolf (Coyote).....	8.75 " 21.50	25.00 " 32.00	1.50 " 11.00	2.75 " 13.00
Wolf, Timber.....	20.00 " 60.00	14.50 " 45.25	7.00 " 23.00	5.00 " 17.50



THE CHINCHILLA OF SOUTH AMERICA

From "The Animal Kingdom: Mammalia," by permission of D. Appleton & Co.

American raw furs sold in New York and Montreal in 1920 and 1921. Does anyone believe that our fur-bearing animals can long survive even the reduced prices prevailing today?

THE EXTRAVAGANZA IN FUR GARMENTS

I now come to a feature of the story of the fur trade that few persons will believe, because it is so wildly fantastic. It concerns the absolutely unbelievable prices of real fur garments that have been charged and paid, here and elsewhere, in the year of grace 1920.

In the winter of 1919-20 an old friend in the fur business casually remarked to me:

"I am now busy making five hundred dollar fur coats for stenographers."

We laughed at the idea, but later on it struck me seriously. It became apparent that the wild orgy of high prices had not neglected the fur business. We will pass over the common items and show only a few samples of the high lights.

First, we read of a Russian sable coat that sold for \$10,000; and we gasped with astonishment. Close upon that came an extravaganza chinchilla wrap (see frontispiece) of which the head of a great fur house said:

"That must have cost \$50,000."

While we were reeling from this stunning blow, he added the knockout thus:

"Last year we made up a cloak of dark Russian sables, from skins furnished us, which was worth, at the market price of those skins, \$125,000."

While the tidal wave of high prices was receding and furs were being "sacrificed at one-half their value," a reputable New York fur manufacturer, for the first time dealing directly with consumers, advertised the following garments, at 50 per cent discount, at the prices set opposite their names:

"REDUCED" PRICES OF FUR GARMENTS IN NEW YORK ON JANUARY 18, 1921

After 50 per cent reduction

Coats and Wraps

Hudson Seal (Muskraat)...	\$185	\$245	and	\$565
Mink	1,500	1,850	"	2,850
Mole	285	375	"	500
Squirrel	415	550	"	675
Genuine Seal (Alaska)....	425	565	"	735
Beaver	435	485	"	565
Muskraat	175	235	"	325
Marmot	45	65	"	85

Neckpieces

Natural Black Foxes, a pair.....	\$750
Silver Fox, each.....	275
Russian Sable, each.....	150

Now, I ask, with prices as they are, discounted 50 per cent, and with the trapping grounds of the world wide open to unlimited trappers of all nations, and no volume restrictions whatever, what has the future in store for the fur-bearing animals of the world save quick and sure ANNIHILATION?

THE DEATH RATE PER GARMENT

To all conservers of wild life, the death rate of fur-bearers per coat will be of at least momentary interest.

Will the human (and humane?) wearer of fur coats and wraps pause for a fleeting moment and consider the number of animals blotted out for each of the garments illustrated herein.

The memoranda covering the number of skins and value of the fur garments reproduced in this BULLETIN, with the sole exception of the frontispiece, were kindly furnished by Mr. Lorillard de Lancey, fur expert of the firm of C. G. Gunther's Sons, New York City.

The following figures have been supplied through the courtesy of Kohn & Baer, Inc., manufacturing furriers, New York.

"The amount of skins required in the making of various garments naturally varies according to the size of the skins and the length, and the



DOMESTIC CATS

Killed while hunting birds. When dyed and dressed for the fur market they appear under the trade name of "genet."

figures we submit to you can fairly be called average."

Beaver coat.....	8 to 10 skins
Mink wrap.....	80 skins
Squirrel coat.....	200 skins
Black Mole coat.....	280 to 300 skins

How is it that any humane person, full of human kindness and fruitful in good works, can order the killing of a family of ten wonderful beavers, or a herd of eighty mink, or a drove of 200 harmless and diverting little squirrels—just for one coat or wrap, when the wool of the black sheep is just as fine and will keep out the cold just as well?

NAMES INVENTED BY THE FUR TRADE

For reasons of their own the fur trade has elected to invent a number of trade names for dyed and manipulated skins of muskrat, rabbit, coypu rat, otter, mink and some others. With the most responsible dealers this practice is by no means concealed and it is known to many fur wearers about as long as the misnaming of furs has existed as a prominent feature of the fur industry. I have observed that in New York responsible dealers do not hesitate to inform a possible customer what the trade name of a fur

under consideration really means and from what animal it came. Personally I have always regarded these trade names as having been invented chiefly to describe certain grades of fur and to cover all those which correspond sufficiently to be described in the finished product by one trade name.

But there are exceptions to the conditions we have suggested above. Mr. A. L. Belden, the author of a book entitled *The Fur Trade of America*, published by the Peltries Publishing Company of New York, has this to say (pp. 474-475) on the subject of the deceptions practiced by irresponsible dealers through the misnaming of furs:

"Sundry manufactured furs are misnamed for various reasons, conscienceless retailers being the principal offenders. There is no justification for the custom even when the particular act constitutes nothing worse than a mild deception, for while it is true that 'a rose by any other name would smell as sweet,' it is also true that coney fur foisted upon the unsuspecting under any other name wears neither better nor worse than coney.

"Furs that are misnamed are always inferior to the articles under whose titles they masquerade."

rade—a high-grade fur is never offered under the name of a common or low cost peltry.

"Misnaming is done to increase sales, secure larger profits than could be obtained in selling the fur under correct representation, to gain the reputation of dealing in goods of better quality than are actually handled, and definitely as an effective bait for catching gudgeons—snobs for whom nothing ready-made is good enough, and who proudly 'give up' an excess of twenty per cent over value for a garment 'to order,' and unwittingly receive a drummer's sample slightly changed to fit; and others who are eager to emulate the overdressed, and who would consider themselves grossly underrated if the tradesmen offered them a coat of rabbit fur for fifty dollars, but who cheerfully surrender one hundred and twenty-five dollars for the same garment when represented as French sable.

"England has enacted a drastic law against this form of deception, and it is effectively enforced through the Fur Trades' Section of the Chamber of Commerce. In some parts of the United States laws governing the misnaming of articles offered for sale are upon the statute books, and a few convictions have been secured. There should be many."

In view of the foregoing testimony from a member of the fur trade, does it not seem quite time for the responsible fur dealers of the United States to clean house in the matter of misnaming furs?

There are certain animals whose real names actually have disappeared from the nomenclature of the fur trade. The following are good examples:

Coypu rat (*Myopotamus coypus*), always known as nutria.

Red sable or Siberian mink (*Mustela sibericus*), always known as kolinsky.

European polecat (*Mustela putorius*), always known as fitch.

Koala (*Phascogaleus cinereus*), always known as wombat.

Little striped skunk (*Mephitis mephitis*), always known as civet cat.

Domestic cat (*Felis domestica*), listed as genet.

From the volume referred to above we quote the following list of misnamed furs as used by the fur trade of North America:

American sable, sold as Russian sable.

Fitch, dyed, sold as sable.

Goat, dyed, sold as bear or monkey.

Hare, dyed, sold as fox, lynx or sable.

Kid, sold as lamb or broadtail.

Marmot, blended, sold as mink or sable.

Mink, blended, sold as sable, and un-haired and dyed, sold as seal.

Muskrat, un-haired and dyed, sold as mink, electric seal, Hudson seal, Red River seal, and many other kinds of seal, none of which exist.

Muskrat, sheared, sold as mole.

Nutria, un-haired and dyed, sold as beaver, seal, electric seal and Hudson seal.

Otter, un-haired and dyed, sold as real fur seal and electric seal.

Raccoon, dyed, sold as lynx.

Rabbit, dyed, sold as sable or French sable; un-haired and dyed, sold as electric seal and sundry other seals not found on land or sea.

White rabbit, sold as ermine, and dyed, represented as chinchilla—rabbit, twenty-five cents, real chinchilla, ten dollars per skin.

Hares, foxes and other dyed skins pointed with white hairs, sold as natural furs.

Dyed skins of many kinds, sold as natural.

Wildcat, sold as genet.

Opossum, blended, sold as stone marten.

Muskrat, natural and blended, sold as water mink, or brook mink.

THE WASTE OF FUR

Concerning this subject a volume might be written, but what is the use? In all probability there is nothing that can be said by an outsider which reasonably could be expected to effect the slightest practical result on the wasteful use of fur. People of means have grown into the habit of being most kind and generous with themselves. In the matter of wearing apparel the fancy of the moment is immediately gratified. The closets, the packing trunks and the cold storage rooms of New York City are crowded full of perfectly unnecessary and useless fur garments, and particularly fur-lined overcoats of heavy weight, the majority of which are 90 per cent useless to their owners.

There are places and times wherein warm and heavy fur overcoats and fur-lined overcoats are both desirable and necessary. To the Dakota farmer, the Montana stockman and the Saskatchewan wheat grower who in every winter drives his high-powered car over thousands of miles of wind-swept country at a temperature below zero, the fur coat is a necessity. To the New York gallant in evening dress who rides in a tightly closed and luxurious limousine from hotel to theatre and ball, the heavy fur overcoat is just about as necessary as a caribou-lined sleeping bag would be in the Waldorf-Astoria. In New York a universal object of commiseration



A SPECTACULAR CREATION IN SCOTCH MOLE AND
SIBERIAN GREY SQUIRREL

It contains about 64 squirrel and 309 mole skins. Value, \$675.

tion is the man with the fur-lined overcoat riding in the subway bravely striving to bear up under the burden of unnecessary fur. The chauffeur is practically the only man in city or suburban life who really needs a fur overcoat and has one. The vast majority of the men and women who need them most are too poor to purchase them. The idea that wool can take the place of fur does not seem to enter the mind of the man who has in his bank account the price of the latter. Having myself faced Mon-



COAT OF NATURAL RACCOON, ABOUT 25 PER CENT
WASTEFUL

It contains about 28 skins. Value, \$275 to \$475.

tana gales in a short chinchilla coat when the temperature was ten degrees below zero, I can testify that fur is not the only thing that can keep a man warm.

A survey of some of the illustrations reproduced hereafter will reveal the fact that great quantities of fur are wasted by making cloaks and wraps unnecessarily full, and collars and capes ridiculously ample. It is not an uncommon sight to see a fur-wearing lady so loaded down with skins that she stands forth as a moving mountain of fur, often devoid of feminine shape because her form is completely masked by a superabundance of skins. Is it not strange that this condition is not recognizable at a glance by every feminine fur wearer?



COAT OF BOB-CAT (LYNX), WITH COYPU RAT
(NUTRIA) TRIMMINGS

It contains about 11 bob-cat and 12 nutria skins.
Value, \$195 to \$225.

It is a common sight in the streets of New York to see fur garments that contain fur that in quantity goes 50 per cent beyond the dictates of good taste and artistic form. In the wearing of jewelry such offenses against good taste seldom occur, for now even the dumbest mind is aware of the fact that a human being overloaded with diamonds, pearls, sapphires and rubies is a living advertisement of bad taste.

But these observations are purely academic and a waste of space. Just so long as there are rich men and women they will envelop themselves in fur far beyond their needs and far beyond what the traffic can stand.



SIBERIAN ERMINE WRAP

It contains about 300 skins. Value, \$3,000.

WASTE IN TRIMMINGS

The crowning wickedness of fur fashions is found in fur trimmings, for the bottoms of coats and gowns, for sleeves, for extravagant collars, and to a small extent even upon hats.

It would be interesting if some fur manufacturer or dealer in fur garments would take the trouble to make a calculation of the percentage of fur that annually is wasted from the annual product used in fur garments.

It is unnecessary to dwell at length on the so-called "summer furs," because they repre-



ANOTHER EXHIBIT OF WASTEFULNESS IN FUR
 Wrap of Eastern Mink, containing twice as much fur as necessary
 for legitimate use. It contains between 125 and 150 skins. Value,
 \$2,250 to \$4,000.

sent nothing but a moment of hysteria in fur fashions. The instant that Dame Fashion waves her hand in a deprecating way and announces that "They are not wearing summer furs," down go the summer furs forever. At present, however, the up-to-date young lady feels that they are necessary to the preservation of feminine life in hot weather, and for a brief season they will remain.

It is worse than useless to seek to impress the buyers of fur garments with the necessity of conserving fur. The only remedy lies among the designers and makers of fur garments. They, and they alone, have it in their power to check the reckless and wicked waste that now is going on. Concerted action on the part of the fur trade might easily effect, through this channel, a real result in conservation. Thus far, however, we have not been able to observe the slightest sign of awakening to the realities of the situation.

THE FUTURE OF THE FUR TRADE

The future of the fur trade industry rests wholly in the hands of the fur trade and those who are engaged in it. By them it either will be saved on a continuing basis, or practically exterminated. The conservers of general wild life are entirely out of this field. They will not elect to take up arms to save the fur industry from itself, or to enter into any contest with wasteful extravagant fashion.

The fur dealer, the manufacturer and the trapper either can organize themselves and conserve the fur-bearing animals on a sensible basis, or they can let them alone and see them quickly follow the bison, the passenger pigeon and the great auk into oblivion.

There are ways and means by which the fur industry can save the source on which it feeds. All that is needed is combination, co-operation, intelligence and work. There is no one all-sufficient remedy, no single panacea. There are numerous things that must be done, not one of which must be neglected. Let us briefly note a few of them.

THE WORTHLESS PRODUCT

The catalogues of the fur auctions show an appalling proportion of skins at prices so far below the prices of first and second quality pelts as to suggest the idea that they are worthless. Beyond the possibility of dispute they represent a great loss to the fur trade. These worthless and nearly worthless skins are those of young



COYPU RAT OR "NUTRIA" OF THE FUR TRADE
From "*The Animal Kingdom: Mammalia*," by permission of
D. Appleton & Co.

and very small animals, pelts taken out of season, or damaged in curing or shipment.

In actual number, in the catalogue before me, these derelict pelts, below the third grade, seem to represent about 60 per cent of the total!

Now, herein lies an enormous annual loss. Are the fur dealers blind to it, or merely indifferent? If they are awake, then why do they permit this annual waste to continue? Surely they are not powerless to check or reduce it, even though they cannot wholly prevent it.

REFORMS THAT CAN BE MADE

Here are a few measures that the fur dealers could adopt to prevent waste, check unnecessary slaughter and preserve the fur industry from soon becoming extinct:

1. Resolutely regulate the quantity of fur, species by species, that the trade may buy each year.
2. Stop the waste in the taking and marketing of small, young, and unprime (i.e., unseasonable) skins, by flatly refusing to buy them at any price.
3. The complete closure of depleted areas, to provide long close-season periods for the recovery of the fur-bearing species.
4. The prohibition of the use of fur of all grades as trimmings for garments or hats.
5. The discouragement of the use of the so-called "summer furs" that are worn for ornamental purposes only.
6. Finally, the fur trade should establish and maintain a code of morals prohibiting the handling of wild animal skins that are not "fur," the use of which tends to exterminate species without justification.

PROSPECTS FOR BETTERMENT!

Just at present there are no prospects for the betterment of the fur trade situation.

The trade is a great mass of uncorrelated, uncontrolled and uncontrollable units that it would be a work of years to pull all together into one organized body. The effort involved would be very great, and what is everybody's business is nobody's. There are now four keen rivals for "the fur market of the world"—London, New York, St. Louis and Montreal. Ask for information from the Hudson Bay Fur Company at Winnipeg and they refer your inquiry to London for reply.

Great industries rarely put hobbles upon themselves. The feather trade slaughtered wild birds until outside people stopped them. The salmon canners of Alaska will go on joyously exterminating their industry until outsiders call a halt. The fur trappers and fur dealers will do the same; and no conservationist in his senses will take up arms against that grand army of extermination in the belief that he can win a substantial and worth-while victory. The odds against him are too great, the possible reward too small.

Regarding the future of the world's fur-bearers, we are distinctly pessimistic. The logic of the situation points to their general destruction at a date comparatively early. Once that is accomplished, the people of cold countries will come down to two resources—wool and leather.

Will the federal and state governments of the United States, either unitedly or separately, assisted by the fur dealers, frame, adopt and enforce the very drastic and far-reaching restrictive and regulatory measures that now are absolutely necessary to put the fur industry on a sound and continuing basis?

Most assuredly *they will NOT*, unless the fur trade asks for it and frames the necessary legislation.

We fear that the fur trade will not save the fur animals. We fear that nothing will avail to save the stock of fur producers except prices so profoundly low, and so long continued, that one-half of the grand army of trappers will quit their trap lines in disgust, and engage in other employment.

The legitimate need for warm furs will continue.

The demands of Fashion for the ornamental use of fur will continue. With the return of general prosperity, up will go all prices for fur and pseudo-fur; and is there anyone who cannot foresee the result?

In order to ascertain how the fur situation appears to some of those whose fortunes are embarked in it, we have requested statements from four leading fur houses, two in New York, one

in St. Louis and one in Montreal. Their letters are shown herewith, and all of them merit the most thoughtful consideration. The writers are thoroughly qualified to speak for this industry.

THE FUR FARMING EXPERIMENTS

With perfectly commendable enterprise, and a desire to develop a new and valuable fur industry, many good men have made studious and determined efforts to breed and rear fur-bearing animals in captivity. We have hoped for the success of these efforts, until hope seems to be in vain.

One by one the fox, skunk, mink and marten have been tried, and the efforts with black, cross, red and blue foxes have been partially successful. The black fox industry on Prince Edward Island has attracted wide attention, but it has been almost wholly on account of the high prices charged and obtained for breeding pairs. Very few black foxes ever have been killed for their fur. Some dealers say that fur raised on fox farms is not popular in the fur trade because it lacks the brilliant lustre of the wild fur, and therefore must sell accordingly.

The fur farmers who have tried skunks, mink and marten have encountered a long series of obstacles and discouragements, based chiefly upon the temperamental idiosyncrasies of those very difficult animals. The devouring of the young is the chief curse of this business, but there are others.

I advise no one but my enemies to go into fur farming. Much as we would like to think otherwise, it is our opinion that with the exception of the beaver it never can amount to anything worth while. I think that as a factor in the maintenance of the supply of furs it should be set down as absolutely nil.

Under certain conditions, beaver farming can be made successful—but I wish to give notice that I will *not* answer letters calling for the writing of letters of instruction on this subject. I am tired of replying to fur-breeding inquiries, and am entitled to a respite from them.

NEWS FROM THE FUR TRADE

Although "the fur trade" is showing a few signs of uneasiness regarding the future fur supply, I think that about 95 per cent of the dealers are asleep on the job. Funsten Brothers of St. Louis seem to be the men most widely awake on this subject, and most anxious to do something to stop waste and promote conservation. They have issued some excellent warning circulars, all quite good as far as they go; but considering the subject of fur conservation as a

whole, no man will dispute me when I say that thus far the surface of it has not even been scratched.

In order to ascertain how the trade regards the subjects of fur extermination and conservation, we called for expressions of opinion from four representative houses, and their replies are published herewith. They are valuable contributions to the scanty literature of this subject.

BRINGING BACK THE FUR-BEARERS

A letter from the Ganss Fur Company of New York, specialists in raw furs of North America, dated March 5, 1921.

The subject of the conservation of fur-bearing animals is a very important one, both as regards the interests of the country at large and the interests of the fur trade.

For years fur dealers all over the country have been favoring intelligent laws limiting the time of the trapping of fur-bearing animals, but unfortunately the legislators of the different states have ignored the advice and suggestions given to them. To give you an instance, I would point to the efforts made by the Raw Fur Dealers' Association of the State of New York two years ago when a new law was passed authorizing the hunting of raccoons on October 1st instead of November 15th. The Raw Fur Dealers' Association of the State of New York employed counsel and went to considerable expense to defeat this legislation, but their efforts did not avail and hunting of raccoons is now authorized to begin on October 1st.

As the pelts of raccoon skins taken during the month of October are practically valueless, you can see what a useless waste has resulted from such legislation.

Some of the Northwestern states, like Wisconsin and Minnesota, passed laws last summer establishing a closed season on muskrats. I happened to read in a Western newspaper last week that in some of the counties of Minnesota the Game Wardens had decided to lift the restriction on account of a very considerable increase in the number of muskrats which did considerable damage to the crops.

In my opinion, a limiting of the time of catch of practically all fur-bearing animals is absolutely necessary in order to insure their permanency, and I think that no fur-bearing animals should be shot or trapped before November 15th and after February 15th. The only exception to this rule should be the catch of the spring muskrats, which means an additional hunting time for this animal toward the

end of April for probably two weeks, which is all the time required for the catch of the spring muskrat.

At the present time there should be an absolutely closed season on beaver, otter and mink for at least three years in our Northern sections, because these animals have almost completely disappeared in the Northern part of the country. Mink seem to be very plentiful in the South and such legislation there seems unnecessary.

Raccoons and muskrats are also disappearing very fast in the Northern States and the least that should be done for them should be a much shorter time of hunting.

Trusting that this information will be of some help to you, I remain, with kind regards,

Very truly yours,

GANSS FUR CO., INC.

(Signed) H. GANSS.

NEED FOR CONSERVATION, AND THE ELIMINATION OF WASTE

A letter from C. G. Gunther's Sons, specialists in high-grade fur garments, dated New York City, February 24, 1921.

In replying to your favor of the 16th inst., would say that high prices such as have prevailed of late would cause the extermination of many species of American fur-bearing animals in less than ten years.

The great slump in markets, not alone in furs, has forced unemployment all over the United States. Immigration is also an important factor. This season has proven that the average man was not fitted to catch raw furs. The price lists sent forth by United States dealers were low in comparison with other years purposely to discourage the catch, which had a marked effect, hence this year's supply was very small. The farmer and the schoolboys did not think it worth while to waste their time. These are true facts that we hear direct from many trappers in our own state. The future of our fur-bearing animals depends entirely on the vigorous work of our many zoological societies and the attitude taken by our dealers in sending out price lists, and the amount of fine or penalty on each head caught before or after the various seasons in each prescribed district. There never was a large catch of beavers in the United States, the majority coming from Canada. On account of the small catch of muskrat this season we believe next season's catch will be greater than ever. If public sentiment is

against a certain fur that kills it at once. Take, for instance, pony's which are used for coats; the dealers tried to force it on the market the season of 1920. The public absolutely refused to buy them, therefore what merchant will buy them except at a ridiculously low figure, and naturally this will discourage the future breeding of this particular fur. If you should start a crusade against waste of furs for trimmings and summer wear and try to prevent the extinguishment of our American fur-bearing animals, this can be done without causing loss to our many dealers or manufacturers. We still, however, could go ahead with our trimmings and summer fur business, using skins imported from Canada, Russia, China and many parts of Europe. We are now using seventeen different furs for spring wear that are not American.

We firmly believe that the extermination of our American fur-bearing animals can easily be prevented through a national body of men on the order of the United Board of Trade of the Fur Industry, representing all manufacturers, skin merchants and dealers, dressers and dyers, and, in fact, all kindred lines.

Very truly yours,

C. G. GUNTHER'S SONS.

(Signed) LORILLARD DE LANCEY.

NEED OF EDUCATIONAL EFFORT TOWARD CONSERVATION

A letter from Funsten Bros. & Co., of St. Louis, pioneers in the preservation of the fur trade, dated St. Louis, March 9, 1921.

We have just finished our 1921 winter auction sale, and all things considered, the result was very satisfactory, although prices of all kinds declined very considerably from last sale, and even more from the winter sale of a year ago.

I enclose you a memorandum of quantities offered and the declines reported on the different articles as compared with last May. The total of the sale was \$11,000,000. Answering your request for our figures of the fur sales of 1919 and 1920, they are as follows:

Winter,	1919.....	\$7,924,330
Spring,	1919.....	10,046,779
Autumn,	1919.....	15,298,287
Winter,	1920.....	27,102,588
May,	1920.....	21,812,270
Febr.,	1921.....	11,000,000

It might be of interest to you to know that we have been advocating the conservation of fur-bearing animals for a number of years,



AMERICAN BEAVERS IN THE ZOOLOGICAL PARK

A successful breeding colony, representing one of the very few fur-bearing animals that breeds in wilderness surroundings under protection on a commercial basis.

working along educational lines, and we are very well pleased with the result.

We enclose herewith one of our fur circulars in which you will note that we try to appeal to the trapper and fur shipper through his pocketbook, and point out the advantage of only trapping the animals at the right time, as you no doubt know it is quite impossible to make game laws that will operate to the best advantage for all concerned in every section. We, of course, advocate proper and sane game laws, but the point that I am trying to make is that the principal thing is to get the co-operation of the man in the country, and to have him friendly to the fur bearers and protect them the same as he would his own live stock, regardless of the fact that his game laws allow him to trap. The idea of considering the fur bearers the same as live stock has met with a great response from the people in the country. We have received numerous letters promising co-operation along these lines and stating that they had never thought of fur-bearers in just that light before.

We are also enclosing several articles which we had our advertising agent send out to the

different farm papers entitled "Lend your aid in protecting the fur crop next year."

We also enclose you our fur circular sent out this season in which we advised the trappers and fur shippers of the country not to trap. As a result of this, trapping is from 60 to 70 per cent short of normal, and this fact alone will be a tremendous help to the entire situation.

As our business is the fur business, we are naturally very much interested in keeping it a going industry, therefore we have advocated the conservation of fur-bearing animals and proper trapping for a great many years. It is our opinion that fur-bearing animals are on the increase, and that the educational matter that has been sent out by our organization and the Department of Agriculture has done more to conserve and increase the fur supply than any other one thing. This year has been the smallest trapping year for the last decade. This was due to the fact, as stated above, that we advised the country not to trap on account of conditions in the fur trade, with the result that the catch was 60 to 70 per cent below normal.



THE BAY LYNX OR WILD CAT
Often called the Bob-Cat.

It is our opinion that fur-bearing animals are on the increase, and will continue to increase. There are some sections where the fur bearers have almost disappeared, but this is not the result of trapping. It is usually the result of some vast drainage project, which does away with a large area of swampy country and turns it into farm land. Fur-bearing animals leave these sections, but as a rule usually show up in some other section of the country.

We do not believe that the fur supply of the country will ever be materially affected by legitimate trapping. It is only in sections where entire ponds or lakes are drained in order to get the muskrat, or where their houses are destroyed, that any great damage is done, and these cases are comparatively few and far between.

The bulk of furs are taken by the man or the boy in the country who sets out a dozen steel traps, and his catch amounts to a half dozen to a dozen skins a season. These are the people that we urge and whom we are trying to educate up to protecting the fur-bearers in their immediate vicinity, and, as stated above, we believe we have accomplished a great deal along this line.

If at any time I or my firm can be of any service to you, please do not fail to call on us.

With kindest personal regards,

Very truly yours,

FUNSTEN BROS. & Co.,
International Fur Exchange.

(Signed) A. M. AHERN, *Vice-Pres.*

THE OUTLOOK IN CANADA HOPEFUL, PROVIDED
THE FUR SUPPLY IS INTELLIGENTLY
CONSERVED

Letter from Holt, Renfrew & Company, of Montreal and Quebec, dated Montreal, March 23, 1921.

In regard to your request for a general statement as to the prospects of a continuance of the fur supply of Canada, we do not feel that there is any grave cause for alarm in regard to this matter, providing proper game and trapping laws are continued in force.

We think the Provincial Government is making a much closer study of the proper way of conserving fur-bearing animals than formerly, and the percentage of unprime furs taken is now very much less than in the past.

A proper understanding of the prime seasons, on the part of the legislators, and prohi-

Fisher
Otter

FOUR FAMOUS AMERICAN FUR-BEARERS

Mink
Marten

These four animals, with the American beaver, constituted the foundation on which the fur industry of America rested for more than a century. Unfortunately, however, there does not seem to be the slightest possibility of multiplying any one of them by any known process of fur farming. They must breed, live and thrive in an absolutely wild state or perish, and it is now for the fur trade to determine whether it is possible to throw around them sufficient safeguards to permit them to exist on a continuing basis.

From the "*American Natural History*", by permission of Charles Scribner's Sons.

bitive laws thoroughly enforced, are all that is necessary in the writer's opinion to conserve fur-bearing animals for any definite time.

There are periods, such as the last three or four years, in which a great incentive is given to trapping by the high prices which are offered, but on the other hand, there are periods

of depression, such as are taking place at the present time, going a great deal towards conservation, by lessening the incentive to trap.

Yours sincerely,

HOLT, RENFREW & COMPANY, LTD.

(Signed) R. S. COLTART.

Vice-Pres. and Managing Director.

AQUARIUM NUMBER

FISHES IN THE HOME—PART I

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ZOOLOGICAL SOCIETY BULLETIN

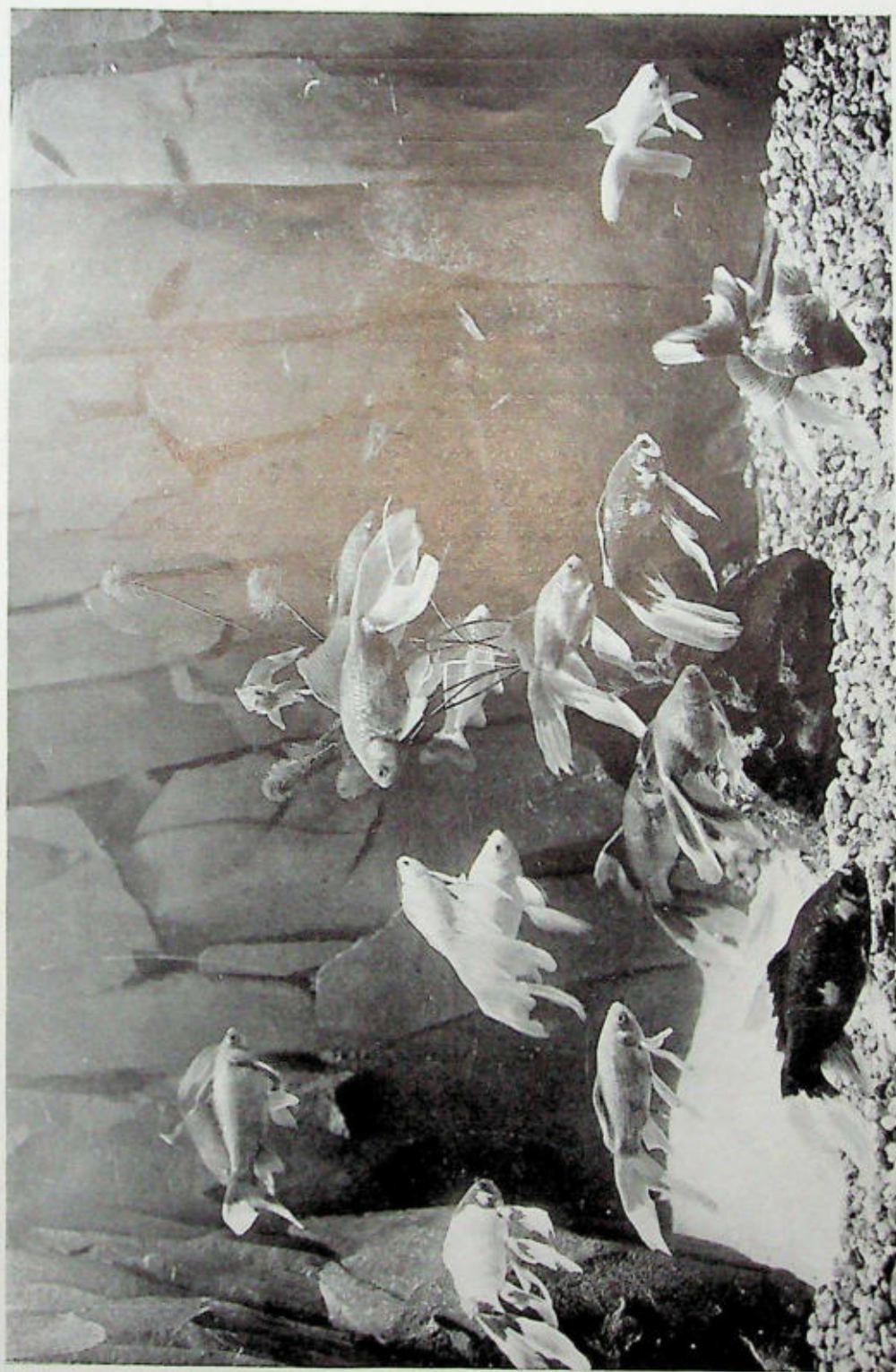
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Photograph by Elwin R. Sanborn

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FISHES IN THE HOME*

By IDA M. MELLEN

S MALL fishes have taken so definite a place in the home that a living-room without an aquarium is almost as desolate as a fire-side without a cat. The aquarium is also a popular and valuable adjunct to the sickroom, and a boon to the invalid. No human being is too young or too old to enjoy it, scarcely a purse too poor to buy it. Unlike most animals in captivity, fishes do not return their owner's affection, and it is therefore possible to enjoy them while they live and refrain from mourning when they die.

One may trace a fairly definite evolution of taste in the maintenance of small aquatic animals in the home. Some people begin and end with goldfishes, while others admire different species and maintain more than one aquarium, or have a "happy family" tank. As a rule people start with turtles or newts, tadpoles, snails, and common goldfishes. They next become enamoured of the fancy goldfishes that have been known in the Occident for two or three hundred years and were previously bred for centuries in China and Japan, just as pigeons have been bred in England, by artificial selection. They learn to distinguish and wish to possess, different types. This stage sometimes passes into the desire to breed goldfishes, resulting in the sale of surplus stock—a pleasing and not unprofitable avocation. Later the beautifully colored and easily bred tropical toy fishes win a place in the home, despite their minute size. And lastly the enthusiast dis-

covers that he can go out to the ponds with a net and capture for himself indigenous wild fishes as beautiful and interesting as any.

SETTING UP THE AQUARIUM

The most helpful motto in dealing with man or beast is "Put yourself in his place." It is the very best guide in the care of fishes, also.

If you have a large fish in a small globe, ask yourself how it would seem, after having a lake to swim in, to be placed where it was just possible to turn around, impossible to swim at all.

If you think it a good idea to empty the entire contents of your aquarium daily and replace it with cold water from the faucet, consider how it would agree with you to be instantaneously transferred, without clothing, from a temperature of 70 degrees to one of 39 degrees, and how long you would be likely to survive such treatment.

If it is your impression that a fish needs to be fed but once a week, and with dry prepared food, reflect how enjoyable it would be to be served but one day in seven, and with ground shrimp, dried flies, or puppy biscuit as the sole item on the bill of fare. But remember also that if your exercise is limited, overfeeding is rather more dangerous than partial starvation, and fishes, like other folks, are subject to fatty degeneration.

"One inch of fish to a gallon of water" is an excellent rule for judging the swimming space proper for a goldfish, and in a healthy aquarium may occasionally be stretched a little. Tropical fishes require less room, and as many as seventy-five inch-long fishes can be kept in health and comfort in a fifteen-gallon tank.

*Acknowledgment is made to Mrs. E. K. Bruce of Thorburg, Iowa, for her very kind reviewing of the chapter on goldfishes. Mrs. Bruce is one of the foremost experts of the world on the care and breeding of goldfishes.



HORNWORT

TAPE GRASS

MYRIOPHYLLUM

ANACHARIS

CABOMBA

Plants suitable for the Aquarium.

One light meal daily is sufficient for captive fishes, though they should have plenty of plants to browse upon when so inclined. They will live for a long time on the algae growing on aquarium plants, and there is no need to worry about them if one wishes to go away for a week-end or slightly longer. Use a food ring and always feed in the same place, not only in order that the fishes may know where to seek food, but that, in siphoning, you may be better able to remove any food particles that have become secreted.

The aquarium should be made ready for its occupants a day or two in advance of their coming, if possible. For goldfish a spot should be chosen where the winter sun will shine upon the aquarium for an hour or two a day, and where in summer it receives strong light but little or no sun. For tropical fishes more sun is necessary, and if possible the aquarium containing them should be placed where it will receive a little sun every day in the year.

The breathing surface of a fish globe is not suitable for a goldfish, and globes are suitable only for the fry of tropical toy fishes. An all-glass, straight-sided aquarium or one with metal frame and slate bottom is best; those with tin bottoms are not durable, but can be improved by placing a thin layer of putty on the tin and pressing it down securely with a strip of glass cut to fit. Such putty as oozes out around the edges can be cut away with a knife. A glass-bottomed tank made in this way gives good service.

A layer of an inch or more of pebbles should be introduced, banking them up on the side nearest the light in a round aquarium, or at each end in a square one. In the banked-up areas the plants may be set. Or, a layer of an

inch or more of garden soil may first be introduced, with a similar layer of clean sand or pebbles on top of it. This affords the best foundation for plants to take root in. Select dry soil, pack it down well, and place only thoroughly washed pebbles on top of it. With the finger bore a hole here and there for the plants, and pack the pebbles well about their roots. Lay a saucer or piece of glass in the center of the jar and pour the water directly onto it. An aquarium thus started will be clear as crystal from the beginning, with no mud or sediment and a minimum of air bubbles.

It is well to plant a couple of sprays of straight-leaved tape grass (*Vallisneria*) or arrowhead (*Sagittaria*) for oxygen; and such other plants as one pleases for ornament. Among rooted plants fanwort (*Cabomba*), milfoil (*Myriophyllum*), hornwort (*Ceratophyllum*), willow moss (*Fontinalis*), *Anacharis* or *Elodea*, pondweed (*Potamogeton*), stonewort, (*Nitella gracilis*), and many others make a pleasing addition to the straight-leaved species, although most of them are subject to degeneration in the limited space of a home aquarium. Bladderwort (*Utricularia*) may also be used, but this carnivorous species with bladders that catch small live animals, should be avoided in stocking the aquarium for infant specimens, or the plant may capture most of the fry. For floating plants one may select crystalwort (*Riccia*), our common pond plant *Salvinia natans*—usually found with duckweed (*Lemna*) the Florida floating ferns (*Ceratopteris pteridoides* or *C. deltoidea*), or the beautiful water hyacinth (*Eichhornia*) that florists often have for sale in the spring.

The floating fern is the only strictly aquatic fern, and reproduces by the formation of small

leaves along the edges of the old ones, the new ones breaking away and forming independent plants. One should therefore place only one plant of this kind in the aquarium to begin, for in a few months in a good light it will spread over the entire surface.

Pondweed, *Sagittaria* and other rooted plants reproduce rapidly in a bright light, sending out green rootlets over the surface of the gravel or mud, which soon develop roots and leaves and form new plants.

Plants should be disinfected before introduction to the aquarium, to avoid trouble from leeches, aquatic insect larvae, fungus, or other destructive agents. For this purpose a weak solution of phenol sodique or of permanganate of potassium may be used, or a tablet of bichloride of mercury to a gallon of water. All traces of the disinfectant should be washed off before placing the plants in the aquarium.

Goldfishes like to clean their gills with fine sand, and a place where they can always find clean bird gravel will help keep them well and happy.

In setting up an aquarium it will be noticed that water drawn fresh from the faucet produces oxygen bubbles. It is unwise to allow these bubbles to collect on fishes, and they should be carefully removed from plants and glass with a slender stick before the fishes are introduced.

An aquarium thus begun need not be reset oftener than once in six months, half an hour's attention each week being sufficient. The program for this half hour should be about as follows:

With a glass siphon, procurable at any bird store, siphon off the sediment and refuse. While the water is lowered, clean the inside of the jar with a bit of felt or cloth fastened about the end of a stick. If algae has formed on the glass it can be scraped off with a bit of cuttlefish, but if one has snails they can be afforded a browsing ground by leaving untouched a space of a couple of inches in breadth from top to bottom of the aquarium, behind the plants, where algae may grow undisturbed. In replacing water siphoned off, use water that has been standing until of the temperature of the room. Some aquarists strain back the same water that has been withdrawn.

For replacing water in an aquarium of three gallons' capacity or over, nothing is superior to a small watering can, which disperses it evenly over the surface, like rain. Another excellent method is to hold a tumbler over the aquarium in one hand, allowing it to rest just

below the surface of the water, and pour the new water into the tumbler from a pitcher held in the other hand. If water is poured directly into the aquarium, its violent entry will uproot the plants and be likely to necessitate entire resetting.

To replace the salts and lime of the natural pond, salt and plaster of paris or cuttlefish are generally employed. A pinch of table salt, sea salt or epsom salt, with a bit of ground cuttlefish, are used by some aquarists; or a mixture of one or two kinds of salt with an equal amount of plaster of paris. Salt does not evaporate, but plaster of paris does, and more of it can be added from time to time.

A still-water aquarium can be a success only when a perfect balance is secured between its plant and animal life. It is hardly possible to have too many plants, but too many fishes in a jar are like too many people in a room. They soon use up the oxygen given off by the plants, the plants cannot take up all the carbon dioxide thrown off by such a superabundance of fishes, with the result that the animals die off until a proper balance is established.

Goldfishes habitually come to the surface and blow bubbles or suck in air, and this need occasion no alarm except when they suck audibly. When they can be heard across a room—and a small fantail can "cluck" loud enough to be heard twenty feet away—it is a plain call for oxygen.

A fish's distress signals should be heeded by opening a window and allowing a draft to play across the surface of the water, also by siphoning off a quart or two—in this instance a small rubber tube is the quickest way—and replacing with cold water from the faucet.

Like the bowl of water on the old-fashioned "parlor stove," the aquarium absorbs the poisonous gases of the room, and does this work best in a warm room in winter, when many homes are improperly ventilated and rooms are allowed to become overheated. The proper temperature for a normal human being is 68 degrees, and if this is maintained the fishes do not suffer.

One of our frequent inquiries at the Aquarium is "Does tobacco smoke injure fishes?" Chemists' experiments show that in addition to marsh gas, carbon dioxide and other gases, an ounce of burning tobacco gives off three pints of carbon monoxide gas—all poisonous gases, soluble in water. The water absorbs these gases so slowly, however, that the general belief is that smoking in a room with open windows that allow a free circulation of air over



RED RAMSHORN SNAIL AND YOUNG

The young—greatly enlarged—shows marked difference in shape of shell and size of eye and siphon.

Drawn by Ida M. Mellen

the surface of the aquarium, is not harmful to fishes. Ashes or stumps of cigars or cigarettes falling into an aquarium, however, prove speedily fatal, a mere scrap of tobacco containing sufficient nicotine to kill a large number of fishes. Valuable specimens are not infrequently lost at exhibitions in this way, and hundreds of fry in open troughs are sometimes thus killed at the Aquarium—such vandalism being no doubt due more to ignorance than malice.

Most fishes should be handled with a net, though the smallest fry and also tropical fishes of small size are best transferred with cups or spoons.

The principal instruments that one will need, therefore, in the management of the home aquarium, are a small net, a long stick with a broad end covered with felt or cloth, a glass siphon, and a feeding stick. For the feeding stick a twig, whittled to a point at one end, is as good as anything.

A fish's gills are for breathing oxygen in the water; just as human lungs are for breathing oxygen in the air. Gills in the air and lungs under water, are in the same sad predicament. We have known people to remove their fishes from the water to pet them, and then wonder why they died. Fishes are not meant to be kissed, and caressing is likewise dangerous. The less frequently a fish is removed from the water, the better for it.

Special advice on feeding aquarium fishes and the care of sick specimens, will be found farther on.

TADPOLES AND SNAILS

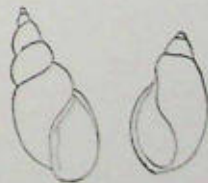
Tadpoles and snails are commonly used in the aquarium as scavengers and for the pleasure derived from watching them. The tadpole is omnivorous and will nibble the fine growth of algae off plants, pebbles and glass, and pick up such scraps of food, both animal and vegetable, as the fishes leave. The tadpole is what alienists would call a manic-depressive—one subject to opposite moods of joy and depression; for

at one time he appears listless and depressed, as though tired waiting to grow legs or wishing he could sleep like a butterfly through his metamorphosis, and anon dashes madly about the aquarium as fast as though he already had four good legs to carry him. It is safe to say that he is more popular with his owner than with his aquatic companions. Fishes do not relish being run into by a crazy runaway, and snails abhor being butted against.

One tadpole, therefore, is sufficient for any aquarium of from three to fifteen gallons' capacity. It is well to buy the smallest specimen possible in the fall, and by spring it probably will have legs and be ready for liberation in a pond or lake, where it can procure flies, worms, aquatic insects, and other living foods, for with the advent of legs it becomes strictly carnivorous, and unless live food can be plentifully supplied, a frog cannot be maintained in the home. It is against the law to destroy a frog.

Those who wish to keep a frog, should provide it with a terrarium in which it can stay on land or take to the water, at will. Small earthworms, mealworms, angleworms, flies, beetles, bugs, caterpillars, etc., will be eagerly accepted. Some frogs will take a bit of beef or liver swung before them on a slim stick.

Snails are as interesting as any aquatic animals, and their life history easy to study. Most American pond snails—*Physa* and *Limnaca* with pointed spirals, the brown ramshorn, the minute *Ancylus*, etc.—lay eggs in gelatinous masses, and the developing young can be seen under magnification. This is true also of the European red ramshorn. In most aquatic snails hermaphroditism prevails, both sexes being present in each individual and cross-fertilization taking place; but our Potomac green snail, like the black Japanese snail, is separately sexed and brings forth its young alive, and these two are the only common species with shells too hard from birth for fishes to chew. All other common snails form an important item in the natural



Left: POND SNAIL Right: PHYSA

Physa is a near relative of the Pond Snail. When held in the same position, one shell opens to right and the other to the left.

Drawn by Ida M. Mellen

FRESH-WATER LIMPET, *ANCYLUS*

Smallest of fresh-water snails.
 Drawn by Ida M. Mellen

food of fishes, and if the shells are too large to tackle, the fishes will nibble off the tentacles and kill the snails.

Potomac snails are short-lived in captivity, and the most desirable of all aquarium snails is the Japanese, commonly sold in bird and animal stores. Once fertilized the female is said to be fertile for life and reproduces at odd times during the year. One owned by the writer produced fifty-four young in a year, and when she died, thirteen young were cut out of the mantle and placed in a tumbler of water. In a few hours twelve were climbing up the side of the tumbler and continued to thrive. These young snails began to breed when three years old, but at four years are not yet half the adult size, though it is hardly to be supposed that their growth is so slow in a state of nature, but rather that, like fishes, with a limited space to live in, they tend to become dwarfed.

The Japanese snail has a remarkably small appetite and does not damage the plants. It refuses to eat lettuce, of which all soft-shelled snails are so fond. It eats the fine algae that forms on plants and glass, and seems to prefer prepared fish foods to fish and meat, though it will on occasion consume the latter. It must be provided with shell-making substances, such as powdered cuttlefish or plaster of paris; otherwise the shell becomes perforated and death ensues. The Japanese snail, being provided with a strong operculum, completely closes the shell with it and may go to sleep for a week at a time. Relaxation of the muscles is the first evidence of death, and if a snail, lying with the operculum open, does not contract when touched, it is time to remove it from the aquarium. The sexes are easily distinguished when the snail is crawling. The male carries his right tentacle curled, whereas the female carries both her tentacles straight.

THE GOLDFISH

Animals that are produced by artificial selection tend to revert to type; and with all their fantastic shapes and glorious colors, goldfishes, so far as we know, are descended from plain blue-brown carps (though some aver from the yellow crucian carp), just as fancy pigeons are descendants of the modest gray rock pigeons,

and domestic fowls descendants of the jungle fowls of India.

If man's continuous artificial selection is removed, goldfishes finally return to type just as pigeons and fowls do, and those who would breed fancy types must weed out all but the best, in the same manner that Burbank weeds out all but the best of his artificially produced varieties of plants and trees. Only strict elimination of the young that fail to resemble their parents in all expected points, will keep the type true.

Fishes lay a great many eggs, just as plants produce many seeds, and breeders can afford to be ruthless, though of course specimens not strictly true to type are as satisfying as any to a beginner, who does not care about possessing valuable breeds.

SPAWNING

Goldfishes begin to breed when in their second year, and continue six or seven years, being at their best when from three to five years old. Young males are considered more fertile than older ones, and two or three are generally allowed to fertilize the eggs of one female. The sexes are readily distinguished in the breeding season, the male by his little white tubercles dotting the gill covers and pectoral fins like decorative beading, the female by her enlarged dimensions when swollen with eggs.

All fishes should have richer foods during the spawning season.

A general belief prevails among aquarists that fishes become roebound and will die unless relieved; but specimens that appeared to us at the Aquarium to have died from being roebound, proved, on examination, to have parasitic or other troubles from which death might quite as readily have ensued. If it appears that a choice specimen is going to die anyway, there may be some satisfaction in having at least tried to strip it. This may be accomplished by placing the thumb in front of the vent and exerting pressure toward the tail, until the eggs are pressed out. Sometimes goldfishes have been treated in this way merely until the oviduct protruded.



POTOMAC SNAILS AND NEW-BORN YOUNG

American counterparts of the Japanese black snail.

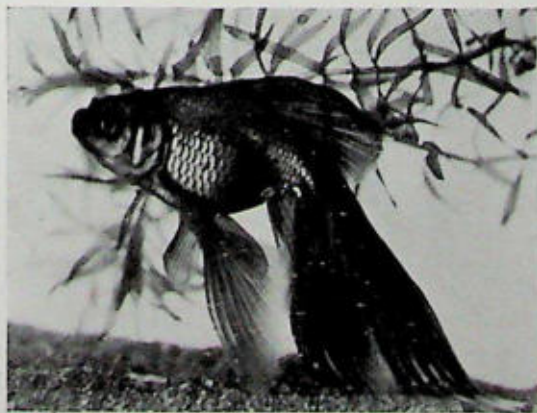


COMMON GOLDFISH
Photograph by H. V. Letkemann.

when, on being returned to the males, they spawned normally, the operation seeming to hasten the process.

They naturally spawn in spring and summer, and the young of a May spawning are hardier than those produced by forced spawning earlier in the spring, which is accomplished by raising the temperature of the water. They spawn several times in a season, from March to July, or May to September.

Some breeders separate the sexes in January or February in order that the females may be rested for the spawning season, the males being likely to drive them about before that time. Driving may look like play, but is exhausting to a driven fish, which may soon be reduced through nervous excitement, to a gasping, prostrated condition. Mere chasing away from the site of food, however, must not be confused with driving. Goldfishes and killifishes, mud minnows and others, are prone to greediness, and chase off their companions from a prospective meal, and jealously drive them around even after the food is gone. Some of them, like turtles, would rather pull the food out of a neighbor's



VEIL-TAIL GOLDFISH
Photograph by Dr. E. Bade.

mouth than help themselves, so great is their anxiety to secure the first morsel their eye lights upon.

The signal that spawning is about to commence is conveyed by the males beginning to drive the females about the tank persistently and vigorously. When this begins, spawning may be expected in the early hours of the following morning.

The fishes may be allowed to remain in their customary tank and the eggs removed later; or they may be transferred to another tank especially prepared with plants to catch the eggs. After they have begun to spawn they will continue spawning when placed in another tank. The eggs are adhesive and become attached to the plants on which they fall, *Myriophyllum*, water cress and water hyacinth roots being preferred by breeders for this purpose. The Japanese also use willow roots.

The parents will immediately eat such eggs as fall to the bottom, and if allowed to remain with the other eggs will consume them also. It is thought good policy to permit them to eat a few for stimulant.

The spawning usually proceeds from daylight till the middle of the morning, though some specimens spawn in the afternoon.

From ten to fifty eggs are laid at a time, with intervals of rest, until all are spawned. Five hundred or more may be laid in one day.

Dr. Hugh M. Smith estimates that at two years of age the goldfish lays 2,000 eggs; at three years 25,000; at four and five years 70,000. At each spawning the eggs are laid in from three to ten lots during eight or ten days, the first laid being the best, the last most likely to be infertile.

The receptacle containing the eggs should be placed in a strong light or where the sun will strike it for a short time each day. They hatch in from three to six days at a temperature of from 60 degrees to 70 degrees, in less time if the temperature is higher. In cold water they do not hatch for two weeks.

The eggs are about one-sixteenth of an inch in diameter, and when fertilized resemble tiny bubbles, transparent or temporarily tinged with amber. On the second or third day, two tiny black spots appear, and they are now popularly called "eyed eggs." After the eyes appear, hatching is practically assured. The unfertilized eggs or those attacked by fungus, turn white and should be removed as speedily as may be.

Great care must be taken, in transferring the eggs and young, to place them in water of the



LIONHEAD GOLDFISH

Photograph by Dr. E. Bade.

same temperature as that from which they are removed. White enamel pans for hatching are favorites with breeders, who find it easier to watch and care for the young in receptacles of this order. The hardest specimens emerge from the egg tail first, and the fry at birth are about three-sixteenths of an inch in length.

THE FRY

Like most fishes hatched from eggs, goldfishes are provided at birth with a yolk sac that nourishes the young fish until the sac is absorbed, which occurs in about three days. When no longer encumbered with the bag of food, the young fishes, which have until now been lying quietly near the surface, or clinging to the plants or glass, begin to swim about and are ready for such nourishment as they can find in the water. They look and act not unlike mosquito larvae.

Snails can now be safely introduced to clarify the water, but sharp watch must be kept for enemies in the form of aquatic insects, worms, etc.

Sorting is necessary, since the eggs, being of different ages, hatch at different times. When two weeks old the larger ones commence to eat the smaller and they must therefore be sorted according to size. The transfer from one receptacle to another can be best effected with a small cup or dipper, or a large spoon.

Embryo goldfishes are very delicate little creatures, cannot endure much water pressure, and live close to the surface for some time. They thrive best in shallow water, not over a foot deep. Drops of water falling on them will destroy them, and care must be taken to protect them from rain in out-door pools.

Like all very young animals, they must be fed often—six or eight times a day at first—and the question of proper foods is naturally an

important one. Indeed, it is believed that the food determines the shape of the body, development of the fins, and colors of the fish.

In a state of nature they live on free-swimming microscopic organisms—plant bodies, protozoans, the young of small crustaceans, rotifers and other invisible worms, and the like. Green and pink-colored waters that we sometimes see in ponds and lakes are so full of these organisms as to be colored by them. Hundreds of thousands of protozoans and motile microscopic plants pulsate in every drop of water taken from the green areas, while in pink waters minute crustaceans known as "water fleas" are often crowded so thickly as to form an almost jelly-like mass. By green water, we do not mean green scum.

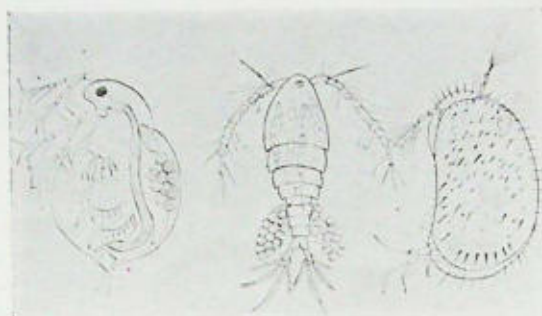
Those who have access to ponds provide food for their very young fishes by pouring occasional portions of green water into the tanks. Fishes a little older thrive on the inhabitants of the pink water. When breeders talk of "infusoria" they refer to certain common species of protozoans; and "daphnia" (often mispronounced "daphnee") are common water fleas, usually found with two other kinds—cyclops and cypris. Daphnia are the largest of the three, and are characteristically shaped like an ellipse with one side flattened, the flattened section being the back of the animal.

It is possible to provide food for baby goldfishes without visiting ponds. Preparations are on the market which produce infusoria when placed in water, or one can breed his own infusoria by making infusions of various substances. It is well to use separate jars for the cultivation of live food, taking portions from them for the young fishes as needed. Directions are given a few pages farther on, for breeding infusoria.



SCALELESS VEIL-TAIL TELESCOPE GOLDFISH

Photograph by Dr. E. Bade.



DAPHNIA

CYCLOPS

CYPRIS

Water fleas. Equalized in size for clearness. Daphnia is the largest and Cypris is the smallest of the three. All are visible to the naked eye. Drawn by Ida M. Mellen.

Some young goldfishes have been observed to feed better on bright than on dark days, and all goldfishes feed better in cool than in warm water. The infusoria may be alternated with a sprinkling of rice flour on the surface, the finest dust from soda or graham crackers, oatmeal broth, a little blood pressed from raw beef, or juice similarly pressed from a clam, oyster or mussel. Algae growing on old plants or the sides of tanks is much appreciated, also the fine dust from the various prepared fish foods such as dried ground shrimp and ground puppy biscuit. There are excellent preparations of baby fish food on the market, two different varieties of which may be bought and mixed, or fed alternately.

All foods must be given sparingly. The rule of feeding little and feeding often, cannot be improved upon.

Oatmeal broth or the yolk of a hard-boiled egg strained through cheesecloth or a fine tea-strainer furnishes a splendid food during the first three months—the most delicate period in the goldfish's life. It will find some food substances in clean earth which can be suspended in a saucer.

During the first six weeks the young fishes are a nondescript gray color, assuming the adult form and coloration at about the end of this period which is a trying one for the breeder, not so much because of the difficulty of feeding them properly, but because it frequently happens that hundreds of the fry—sometimes the entire spawning—are lost through a sickness called "gill trouble," "gill fever," or "gill congestion." The gills become inflamed and swollen and the fishes soon begin to die off. Some breeders have thought that an exclusive diet of infusoria and artificial foods during the first six weeks will prevent this sickness, others have at-

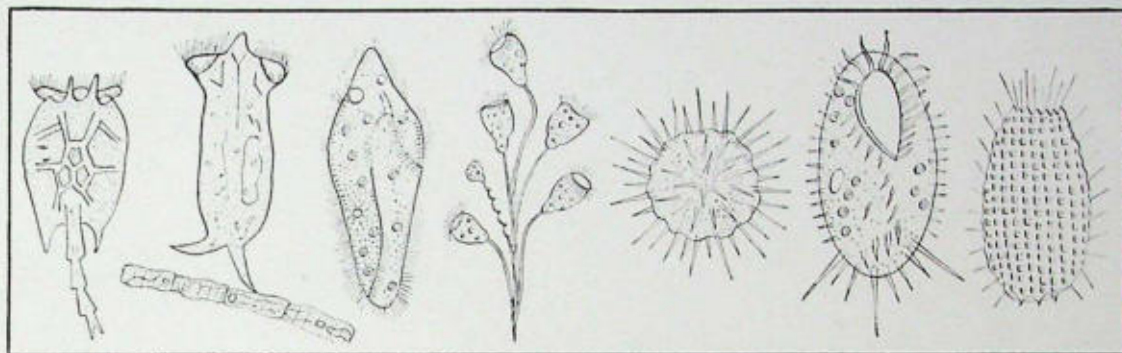
tributed it solely to overcrowding. The exact cause is uncertain, but if the food and character of the water are correct, it is believed that a draft playing over the surface where the young congregate, may chill them and bring on the condition, which corresponds, of course, to a cold on the lungs in higher animals, and is probably equally contagious. They can be protected against this source of danger by screening the top of the tank. A common window ventilator of unbleached muslin laid across the top will serve the purpose, or, for a circular tank, one can make a cover by sewing some muslin onto a pasteboard hoop cut to fit.

Prevention is worth more than any cure, but if the trouble has started, it may be checked by placing the fishes in a weak solution of permanganate of potassium (three grains to a quart of water—meaning by "grain" a particle one thirty-second of an inch long), or in a one to 10,000% solution of sulphate of copper, leaving them in the solution a quarter of an hour, then diluting it by half and leaving them in for an hour unless they begin to die or appear to suffer,



COLLECTING

Photograph by Ida M. Mellen.



THE COMMON FOOD OF BABY FISHES (MICROSCOPIC)

Beginning at left: 1 and 2 are Rotifers, 3 to 7 are Infusoria known as Slipper, Bell, Sun, Mussel and Barrel Animalcules.

Drawn by Ida M. Mellen.

when they must be removed into clear water of the same or a slightly warmer temperature.

SIX WEEKS TO THREE MONTHS OLD

If carried safely through the first six weeks, baby goldfishes may be permitted a variety of foods, such as small crustaceans and mosquito larvae. If these are collected in open ponds, it is best to strain them through a fine sieve, to avoid placing in the tanks young water beetles, fresh-water polypes (hydra), leeches, or dragon-fly larvae, which prey upon young fishes.

Strained boiled oatmeal and egg-yolk may be continued until the fishes are large enough to eat the oatmeal itself, which may be fed either cooked or ground raw.

Puppy biscuit and cereals of all sorts, vermicelli, and dry bread crumbs, all ground to a powder, dried codfish, and the common prepared fishfoods of dried shrimp, ant eggs, etc., may be fed. Chopped meal worms and earthworms are favorite foods. Very finely scraped raw beef or boiled fish may also be used.

At six weeks it is safe to place the fry in tubs out of doors. Sorting and the rejection of poor specimens may continue to be necessary, and the swimming space allotted the young fishes is now of almost equal importance with the food given them. Two or three six-weeks-old specimens for every gallon of water is a good rule, increasing the swimming space as they grow, so that fishes one inch long shall have about a gallon of water apiece.

The number of feedings should be gradually decreased so that at the end of three months there shall be but one meal a day. Goldfishes are always greedy and adult specimens in captivity will overeat and, lacking the exercise that

wild specimens have, develop indigestion, fatty degeneration, and other sicknesses, if care is not taken.

At four months the young fishes should be well formed, and the breeder will need no further advice on feeding, except a word as to common foods for adult goldfish.

ADULTS, THEIR FOOD, ETC.

Adult goldfishes should be fed daily, or six days a week, and it is entirely possible to give them something different each day of the six. To a goldfish, variety is as much the spice of life as it is to other folks. Scraped raw beef, raw fish, oyster, mussel or clam, chopped mealworms or earthworms, small crustaceans, mosquito larvae and the red water-worm *Tubifex* where procurable, toasted breadcrumbs, boiled or baked white potato, cereals powdered raw or cooked, yolks of hard boiled eggs, ant eggs, boiled roe of marine fishes, dog biscuit ground in a coffee mill, finely crushed or boiled vermicelli, and the prepared fish foods—all are wholesome and much relished. A goldfish, like a cat lapping a saucer of milk, likes to rest when half-way through the meal. Its teeth are in its throat, and it will be observed to chew its food thoroughly before swallowing. Sometimes it takes so much that one feels sure there is a reserve supply held in the mouth while the teeth are working on the first morsel taken. After one mouthful is disposed of, a second is greedily sought and the fish works industriously, literally standing on its head to gather up such foods as falls to the bottom of the tank.

The Japanese, feeding goldfishes in open ponds, sink food in porcelain dishes to prevent contamination of the water, one-half foot below the surface for adult fishes, and about two inches below for larval fishes.

ZOOLOGICAL SOCIETY BULLETIN

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ELWIN R. SANBORN, *Editor*

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MAY, 1921

Goldfishes have lived more than twenty years in captivity. The natural term of their existence is unknown. Longevity depends on health and proper environment; freedom from the diseases that are caused by handling, overcrowding and overfeeding, and by the introduction of new fishes that are infected; a well-balanced tank reset not oftener than twice a year, and water not too warm summer or winter. Adult goldfishes can stand almost any degree of cold, but lose both health and appetite in water that is too warm. In hot weather a little of the water removed from the aquarium and replaced with water from the faucet is much appreciated. Like human beings, fishes may be cooled off a little without necessarily being chilled.

There is on record the case of a "silver fish" that lived in an aquarium in England for thirty years. It was fed three times a week on raw meat—beef and mutton. This specimen may have been a silver or pearl goldfish, or it may have been a roach or minnow.

Goldfishes are subject to variation in color, and one may find his scarlet fishes turned to white, his silver specimens become black and yellow, or his black specimens pure gold or even red, white and blue. The only "fast black" goldfish is the Moor.

Goldfishes belong in the group of carps and minnows, are of the genus *Carassius*, and each variety has its own specific name, the common, straight-tailed goldfish being *Carassius auratus*. This is procurable for five or ten cents in any bird store. Fantails, costing from twenty-five cents up, are equally common. Comets, calico telescopes, Chinese Moors or black telescopes, Japanese nymphs (a cross between comet and fringetail), lionheads, fringetails and orandas are also commonly reared in this country;

Comets, deriving their names from the long forked tail, telescopes from their protruding eyes, moors from their blackness, lionheads from the hood-like protuberances on the head. Orandas are much the same as lionheads excepting that they possess a dorsal fin and longer tail. Rarer species are occasionally imported from the Orient, such as celestials (with eyes that can look only upward), Chinese egg-fish (an egg-shaped fish with no dorsal or anal fins and a long flowing tail), Chinese tumbler, tailless goldfish, etc.

Some of these rarities bring fabulous prices.

WHAT TO PLACE WITH GOLDFISHES

Tadpoles and snails have already been discussed.

Other fishes that can safely be placed with goldfishes are carps, roaches, shiners, dace, suckers, minnows, chubs, and small specimens of catfishes, sunfishes and crappie. Black-banded sunfishes never molest goldfishes, nor do black-nosed dace.

New fishes should be isolated for a week and, if they show signs of disease give them a mild bath for fifteen minutes to half an hour, several days in succession, in a solution of permanganate of potassium, five small grains to a quart of water.

Turtles and newts should not be placed with goldfishes. Newts and other small salamanders should be cared for in a terrarium, the same as frogs. Turtles are best kept in a shallow bowl with stones placed in the center, upon which they may crawl out of the water and bask in the sun. Without provision for this basking, their shells become soft and they die.

HOW TO BREED INFUSORIA

There are several ways of succeeding with infusoria. Experiments made by the writer, with all kinds of fruit and vegetable skins, corn husks, lettuce, peanut shells, dried garden fertilizer, etc., showed that there are three infusions that can be pronounced the best: hay, prepared infusoria culture (put up by various concerns and sold in bird stores), and aquatic plants laid thickly in a shallow dish and allowed to break down gradually.

Most cultures are richest from the fifth day on, but show some signs of life on the second or third day.

Hay Infusion.—Place a little hay in an open receptacle any kind of a dish or jar will do, but a basin with a broad surface area is probably best. Cover the hay well with water,

setting it aside in a place not too light. In a few days a scum will form on the surface. Infusoria breed slightly faster if the infusion is placed in the dark than if set in the light, even though shielded from a glare. The mixture darkens as it ripens. In two days a few thousand infusoria have appeared, in four days myriads. In seven days their number is legion. As time passes they become thick an inch or two below the surface, and various species appear, including the swan, bell, and slipper animalcules. About the ninth day the scum may be full of common rotifers also.

Rotifers are microscopic animals sometimes called animalcules, because no larger than protozoa. They are properly grouped with the worms. Many have little shells; all are possessed of definite organs, with an alimentary tract, nephridia, eyes as a rule, and are separately sexed.

In an infusion of dried lettuce, one may look for rotifers on the ninth day also, but infusoria are never as thick as in a hay infusion.

Infusoria Culture.—Various powdered preparations are now on the market which, when placed in water, generate infusoria. Use generously, doubling or tripling the prescribed amount, and in six to eight days the infusion will be teeming with minute infusoria.

It is hoped that our aquarist friends will not make the mistake made by some of the manufacturers of infusoria culture, who call it "A culture for producing a minute water insect to feed baby fishes." An insect is an organized animal with six legs, eyes, alimentary tract, etc., more highly developed than worms, starfishes, corals and sponges; while infusoria are one of the five classes of protozoa—smallest and simplest of all known animals, having but a single body cell and no organs whatever, and all being microscopic.

Infusoria differ from other protozoa in that their bodies are provided with cilia either when young or throughout life. Cilia are fine threads of the body plasma, resembling hairs, and are useful for locomotion and for whirling smaller animals and plants into the gullet, where there is a gullet. Some of the protozoa merely pass over their food and secure it by pressing it into their soft bodies. They are cannibalistic, having no compunction about consuming their own kind if small enough to be engulfed. When the protozoan's body becomes uncomfortably fat, it remedies the situation by constricting itself in the center until it breaks apart, each half taking up existence as an independent animal. This

is its common method of reproduction, though it also reproduces by spore formation.

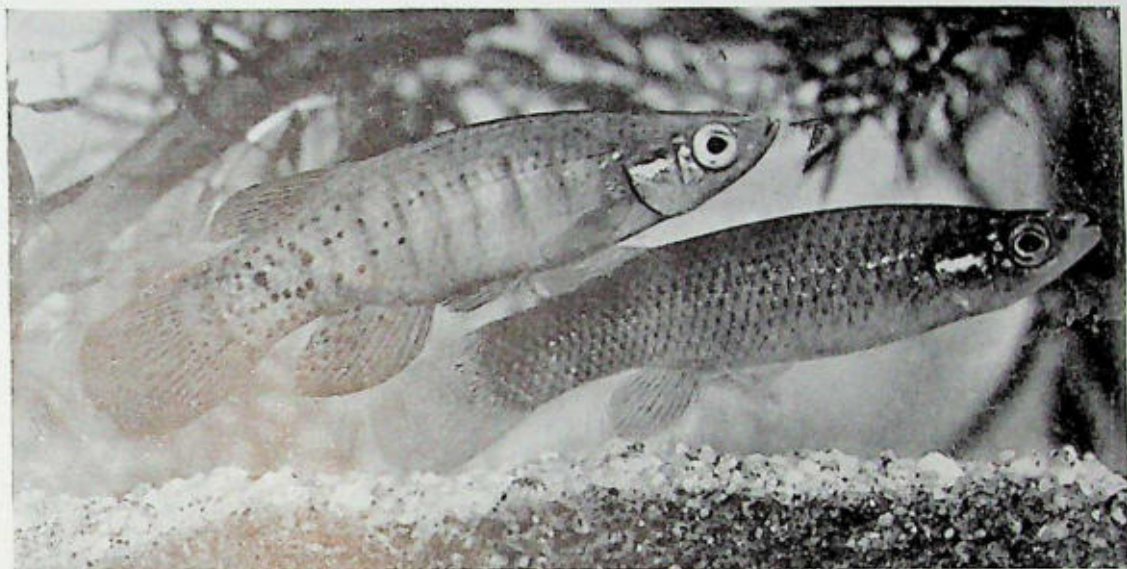
Aquatic Plants.—These may be packed in a shallow dish with a broad surface and just enough water to cover, and allowed to decay. Numerous protozoa appear within a week, and in ten days the largest sizes of protozoa appear in the surface film—paramoecia (slipper animalcules), mussel animalcules, and rotifers; and sometimes blood worms develop, which are excellent food for all fishes with mouths large enough to take them in. Blood worms are small, scarlet, squirming creatures, not really worms but the larvae of gnats having no common name. They are the common food of young brook trout in the wild state.

It may be easy enough to understand the occurrence of protozoa in decaying aquatic plants, since they would be living among the plants anyway and as the plants decayed and bacteria gathered in the dish the protozoans would find more to eat and would grow and reproduce faster. But the question may well be asked, Why do protozoa appear in dried hay infusion, or in the infusoria culture now on the market, which is made, probably, of dessicated grasses, lettuce, hay, etc. The only explanation we can offer of this is that protozoans and rotifers both have power to resist dessication; that they become encysted and blow about (eggs of rotifers do the same) till they strike a moist place like wet grass, when they break through the cyst and swim about, becoming encysted again when the grass dries. Bacteria, of which the air is full, would naturally appear in any of the infusions, and on these the protozoans and rotifers would feed, growing fat and reproducing more rapidly than if undernourished.

NATIVE FISHES

Our native fishes suitable for home aquaria are comprised principally of minnows, dace, sunfishes, sticklebacks, chubs, catfishes, crappie, eels, suckers and darters. The most showy are the red-bellied dace and rosy-sided minnows, the sunfishes, darters, and some of the Southern killifishes. They all live well in balanced aquaria except the darters, which really require running water and are generally short-lived in the home aquarium. No fish taken from a cool, running brook, will do as well in still water as those taken from ponds and lakes.

One "happy family" tank of small native fishes is maintained at the Aquarium for the observation of those interested in collecting such specimens. We have been unable to keep darters very long in standing water, and have

KILLIFISH, *FUNDULUS CHRYSOTUS*

Photograph by Dr. E. Bade

never attempted to place the little sticklebacks—so murderous in breeding season—with other fishes. All the others mentioned are maintained very well in a fifteen-gallon tank, to the number of thirty small specimens. Only very young catfishes, both bullheads and stone cats, are used, and like crappie, eels, bass, perch, roach and most sunfishes, they will outgrow the home aquarium and need transferring to larger quarters after a year or two. Very young pike and pickerel have been kept in "happy family" tanks, though not at the New York Aquarium. They are never too young to exercise the family characteristic of pugnaciousness and cannibalism, and will ere long make the tank a happy one for themselves only.

One may, of course, place together very young specimens of almost any of our native fishes such as yellow perch, rock bass, bowfin, etc., and to those who are equipped to do their own collecting there is a large variety possible.

For best results one must endeavor to have the fishes inhabiting one tank of approximately the same size.

All of our small native fishes in the north lay eggs, and in most species the male constructs a nest and guards it jealously from all intruders including his spouse. Some nests are scooped out of sand, others are fashioned more like birds' nests, among the aquatic vegetation.

All are partial to fish, shellfish, meat and live food, though all except the sunfishes and their allies will accept dried prepared foods.

MINNOWS AND KILLIFISHES

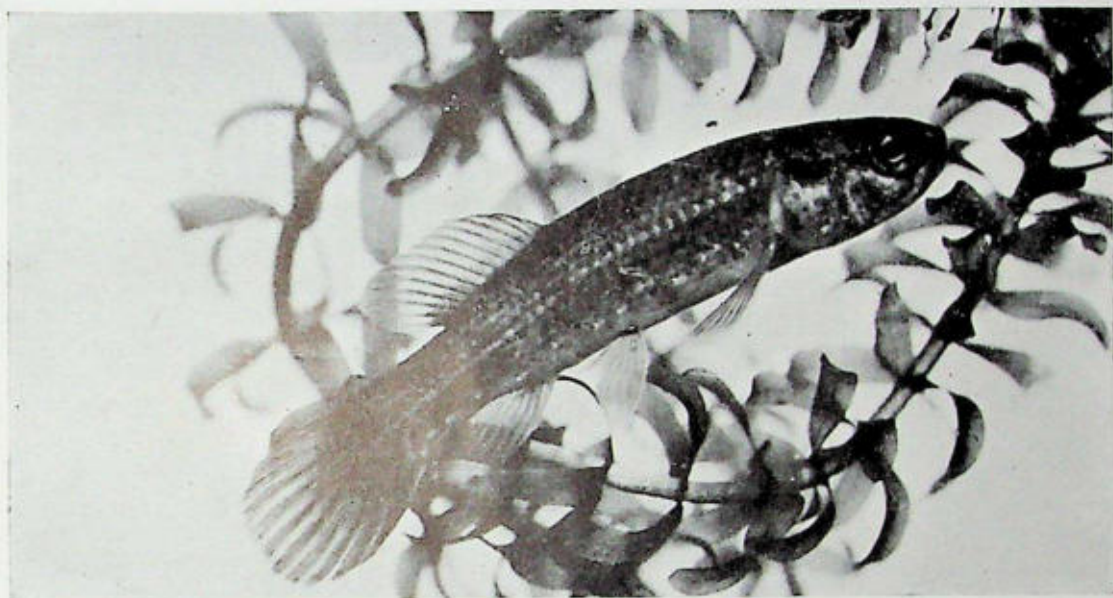
The northern fresh-water Killifish (*Fundulus diaphanus*), famous as a destroyer of mosquito larvae, is much sought after by owners of mosquito-breeding ponds. Its maximum length is four inches, though in the abbreviated swimming space of the home aquarium it rarely attains more than three inches.

The male has a blue-gray body dotted with green and is marked with about twenty pale vertical bars, while the female, which is plain fish-gray, has fifteen or twenty transverse bars. On the whole the killifish is without color attraction, its body being of that fish-grayness commonly called "olivaceous"; but its "pep" cannot help winning favor. It is abundant in lakes throughout New York State.

The killi soon learns to leap more than an inch out of the water for food placed on the end of a stick, and as it is obsessed with perpetual hunger, is always ready to "do the trick."

Like the goldfish, it will eat almost anything—crustaceans, flies, boiled cereals, worms, chopped raw beef or lamb, fish, shellfish, prepared fish foods, etc.

As soon as it learns that it must depend upon its owner for its food supply, it watches for his coming, dashing back and forth at the front of the tank every time he heaves in sight and begging as frantically as a fish knows how to do, for something to eat.



MUD MINNOW OR ROCKFISH

Photograph by Dr. E. Bade.

The killifish is one of the hardiest in captivity, specimens being on record as having lived for thirteen years in a balanced aquarium.

The killifish here pictured (*Fundulus chrysotus*) is common in swamps from South Carolina to Florida, prettier than our northern species, and adapts itself well to home aquaria. The male's rich green body is flecked with dots of dull red and brown, while the female displays a bluish green sheen with silver spots. They have been bred in captivity, the adhesive eggs hatching in a couple of weeks.

Still more beautiful is the Star-headed Minnow (*Fundulus notii*), found commonly in swamps and streams of Florida and nearby states and only an inch and a half in length. Its orange-yellow breast and jaws, its glistening silver sides with six longitudinal black stripes running from head to tail, and the star of silver green shining at the back of its head, are indeed striking.

MUD MINNOW OR ROCKFISH

The Eastern Mud Minnow or Rockfish (*Umbra pygmaea*) can usually be purchased in bird and animal stores, and is hardy and entertaining. A pleasing little fish in its warm browns, with sad eyes that seem to peer out pensively and questioningly at what is happening in the room, though actually seeing nothing. It is tenacious of life and will live a considerable time out of water.

It attains its maximum length of four inches in captivity, and is amiable until it grows to maturity, when it will select one corner of the tank for its very own and chase away all who presume to swim into that territory. This tyranny is not directly harmful to other fishes excepting that it may prevent smaller specimens from getting a proper food supply, and when the mud minnow grows large at the Aquarium we place it, for the good of all concerned, in a tank with no fishes of other species except common sunfishes and chub suckers of approximately its own size. The common sunfish being a worse scrapper than the mud minnow, will play Petrucio if necessary, and henceforth Kate is tamed.

The chief charm of the mud minnow is its uncommonly graceful body, which it is able to bend in the form of a rainbow, remaining in this languorous attitude for half an hour at a time, either suspended in the water, gracefully resting among the plants, or, characteristically, with its small, prognathous snout pressed against the glass.

It moves quickly when snatching at its food and driving off other fishes.

In the ponds, the mud minnow, true to its name, lives among the plants or in the mud at the bottom. It is almost wholly carnivorous, but will accept prepared fish foods when nothing else is available. The sexes are similar, both having a black vertical line or two black dots at the base of the tail.



NINE-SPINED STICKLEBACK

Photograph by Dr. E. Bade

They are found from Connecticut southward to South Carolina.

There are but four or five cases on record of the spawning of European or American species in captivity. The latest that has come to our attention was observed in an aquarium of Mr. W. L. Paullin, recorded in *Aquatic Life* for September, 1918. A pair of mud minnows was captured while in the act of spawning in a bed of algae, and deposited in a densely planted aquarium, where they resumed spawning in a hollow they had formed in a mass of algae, closing the nest from the side when the eggs were in it. It was the female, curiously enough, that remained on guard. The young hatched on the sixth day and left the nest about six days later. They reached a length of one and a half inches in four months.

DARTERS

Darters are characterized by their slender, graceful bodies, and their ungraceful, jerky movements.

Among the darters are some of the most attractively colored of our small native fishes; but they do well only in cool, running water. If this can be provided, they may be cared for the same as other native fishes. The hardest in captivity is the Fantailed Darter (*Etheostoma flabellare*) from Kentucky, which unfortunately is not as beautifully marked as most of the others.

STICKLEBACKS

The interesting nest-building habits of the sticklebacks have won them a merited place in many home and school aquaria.

Most of the sticklebacks are commonly found in brackish water. A few fresh-water species exist in the northeastern United States, the commonest of these being the Brook Stickleback

(*Eucalia inconstans*), found in small brooks and sometimes in stagnant water. It is a small species rarely longer than one and a half inches, though said sometimes to attain two and a half inches. This species has lived in the New York Aquarium for four years.

Some of the marine species seek fresh waters in which to breed, and nearly all can be gradually adapted to a fresh-water existence. Boulenger says that the European Three-spined Stickleback (*Gasterosteus aculeatus*) can be "transferred suddenly from fresh to salt water without appearing in the least inconvenienced."

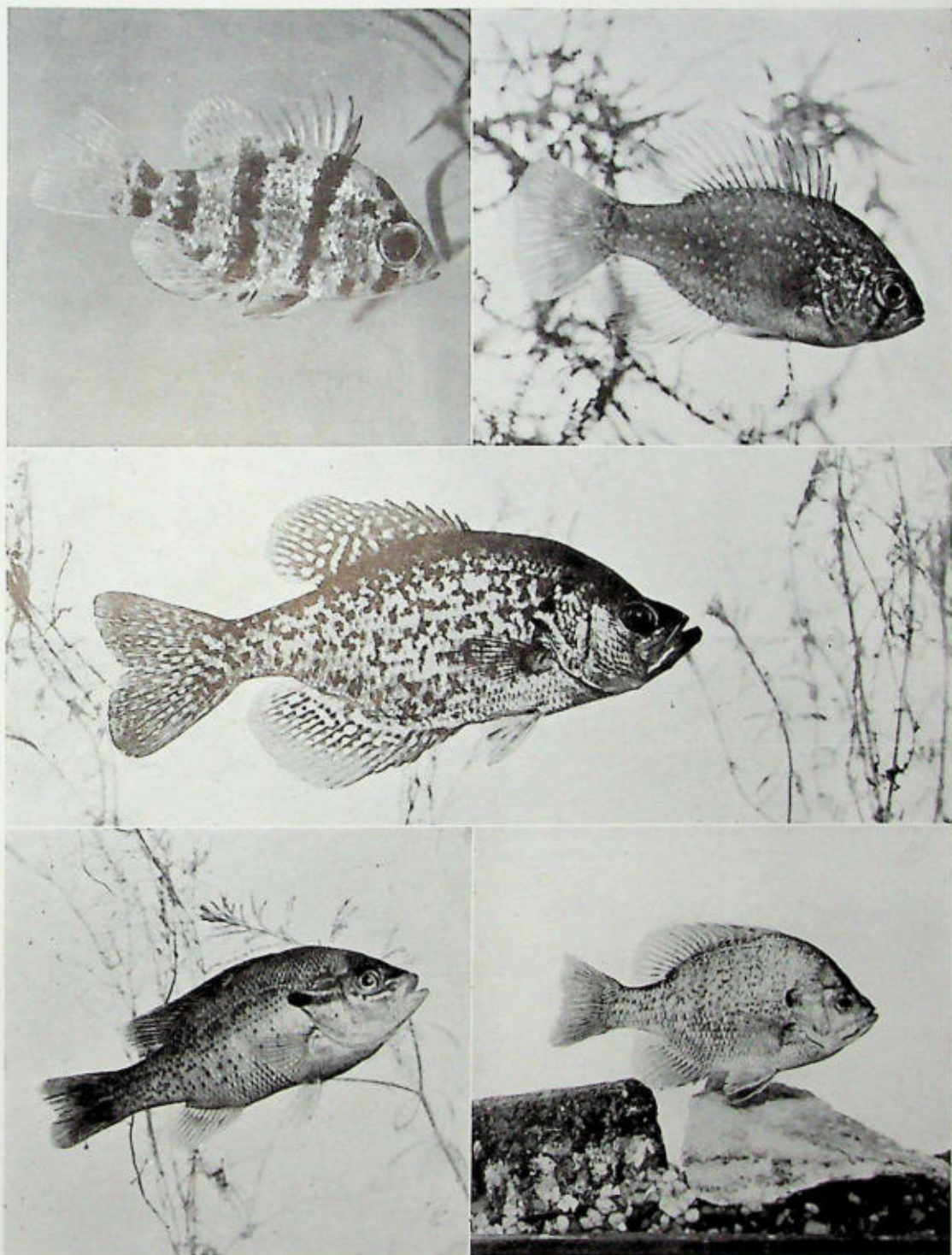
The Nine-spined Stickleback (*Pygosteus pungitius*), attains a length of two and a half inches. It has survived captivity for two years in the Aquarium, as has also the Two-spined Stickleback (*Gasterosteus bispinosus*), though both were kept in brackish water in this institution.

The Four-spined Stickleback (*Apeltes quadracus*) will live for four years in captivity in brackish water, this species not being found in fresh water.

The nine-spined stickleback, common on both Atlantic coasts, constructs his nest among the plants in such wise that it bears a resemblance to an oriole's nest hanging from a tree. The four-spined stickleback constructs a barrel-shaped nest with an opening at both ends.

The nest-building habits of the various species are similar. The sticklebacks are typical fish-gray in color, but at the approach of the breeding season the ventral fins or under portions of the body of the male assume a brilliant red color, with blue and green above, and he begins to build a nest of odd bits of vegetation glued together by a secretion from the kidneys which has been found to develop in the fish coincidentally with the ripening of the milt. The shape of the nest varies in different species from a small structure like a sparrow's nest

JOHNNY DARTER, *BOLEOSOMA NIGRUM*From *The Fishes of Illinois* by Forbes and Richardson.



SUNFISHES AND CRAPPIE

Upper: Black-Banded Sunfish and Little Sunfish. Photographs by Dr. E. Bade.
 Center: Crappie. Lower: Red-Breasted Sunfish and Common Sunfish. Photographs by Elwin R. Sanborn.

in miniature to a spherical nest with one or two holes for entrance and exit.

When the nest is complete, a female is coaxed in to deposit her spawn, which the male immediately fertilizes, afterward driving off this mate and perhaps seeking another, whose eggs are added to the first and also fertilized. A nest may contain the eggs of three or more females, and each female may lay eggs in more than one nest. In any event the females are not allowed to approach the nest again after spawning, the male taking up his station near at hand and rushing furiously at any living object that so much as peers at the nest through the stems of a neighboring plant. He will kill any female that dares to approach after the eggs are ready for incubation.

His chief duty is the defense and aeration of the eggs, and this he performs with extraordinary valor and labor, his eyes ever alert for foes, his pectoral fins kept rapidly fanning the tiny living jewels nearly every minute of the day and night.

The young hatch in from eight days to two weeks, and require infusoria and later daphnia and prepared foods.

Like other fishes that guard the eggs and young, the male, after his charges hatch and seek to leave the nest, will pick them up in his mouth and place them in the nest again and again, until the time is ripe for them to set forth in search of their own fortunes. And like other fishes, the male, when his offspring are at last ready to shift for themselves, may suddenly abandon his parental instinct and gobble them up, though cases are recorded where he has cared for his young for a month after hatching. While reasonable care should be taken to remove him at the crucial time, it must be remembered that if there are other fishes present and the parent is removed too soon, they will immediately proceed to feast upon the helpless young.

The sticklebacks prefer chopped fresh meat and shellfish, insects, worms, small crustaceans, etc., but will accept boiled cereals and other foods.

They are said to breed more than once in a season, though this has not happened at the Aquarium.

THE SUNFISHES AND THEIR ALLIES

Common Sunfish—*Eupomotis gibbosus*

Little Sunfish—*Enneacanthus obesus*

Spotted or Diamond Sunfish—*E. gloriosus*

Long-eared Sunfish—*Lepomis megalotis*

Red-breasted Sunfish—*L. auritus*

Blue-gill Sunfish—*L. pallidus*

Black-banded Sunfish—*Mesogonistius chactodon*

Red-Eye or Rock Bass—*Ambloplites rupestris*

Crappie—*Pomoxis annularis* (and various others)

Large sunfishes of all species except the black-banded sunfish are notoriously pugnacious, and only small specimens are therefore suitable for the home aquarium. Among the most beautiful of our small native fishes, their bodies glisten as though set with gems, in which emeralds and pearls predominate in the common and spotted sunfishes, with garnets set in the iris.

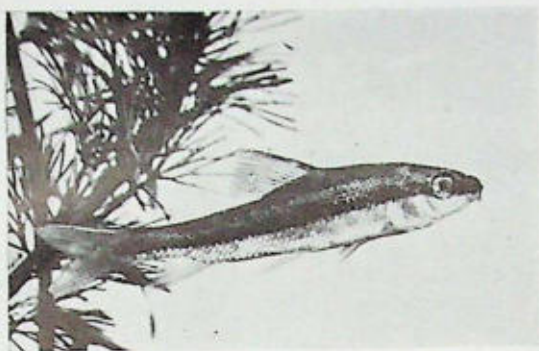
The beautiful red-eye and black-and-white crappie, nearly related to the "sunnies," agree very well with sunfishes of approximately their size.

The black-banded sunfish, easily the aristocrat of the tribe, and somewhat less hardy than the others, can be maintained with the others but really deserves a tank all by itself or shared only by the little sunfish or spotted sunfish, since they attain about the same size.

A dozen black-banded sunfishes, sedate, exquisite little creatures with their pearl-gray bodies richly striped with black and their ventral fins of black and orange, make as handsome an array as one could hope for. They have even been mistaken, when very small, for the rare Brazilian half-moon fish. They are so docile that they can be kept with fancy goldfishes, never offering to nibble their long tails.

The sunfishes do not care for prepared fish foods. Some specimens will take a little boiled or baked white potato or hard boiled egg-yolk, or chopped fish. All accept minced shellfish and raw beef or lamb, and are partial to flies, mosquito larvae, small crustaceans, white worms (*Enchytraeids*), etc.

Most sunfishes grow to be eight inches long, but the spotted sunfish measures at full maturity only four inches. The black-banded sunfish attains a length of but three or at most four inches and is most attractive for the home aquarium when about one and a quarter inches long. The same may be said of the little sunfish. It is said that the black-banded sunfish breeds when ten months old, constructing a hollow nest among plants or in the sand, the eggs numbering upward of a hundred and



CHUB SUCKER OR BLACK-NOSED DACE



RED-BELLIED DACE

Photographs by Dr. E. Bade.

hatching in two to five days. The parents have been known to spawn again in the same nest within a few days. The male eats the young as soon as they are able to leave the nest (when about five days old) and must be removed. The fry can be reared on infusoria, hard-boiled egg-yolk, juices of meats and shellfish, worms chopped fine, and small crustacea if available. At five weeks they are the exact miniature of their parents and measure one-half inch in length.

The eggs of the spotted sunfish are laid among the aquatic vegetation and hatch in a couple of days. The adults will eat the eggs at once if not removed.

Most sunfishes can be found commonly throughout the east in brooks and ponds from Maine southward, but the black-banded sunfish makes its home in cedar swamp sections of Southern New Jersey and Delaware and ranges from Pennsyl-

vania south to Maryland, while the spotted sunfish's range is approximately from New Jersey to Florida. In North Carolina it is said to be common in the rice ditches, creeks and ponds connected with Cape Fear River. The little sunfish ranges from Massachusetts to Florida.

DACE AND CHUB SUCKER

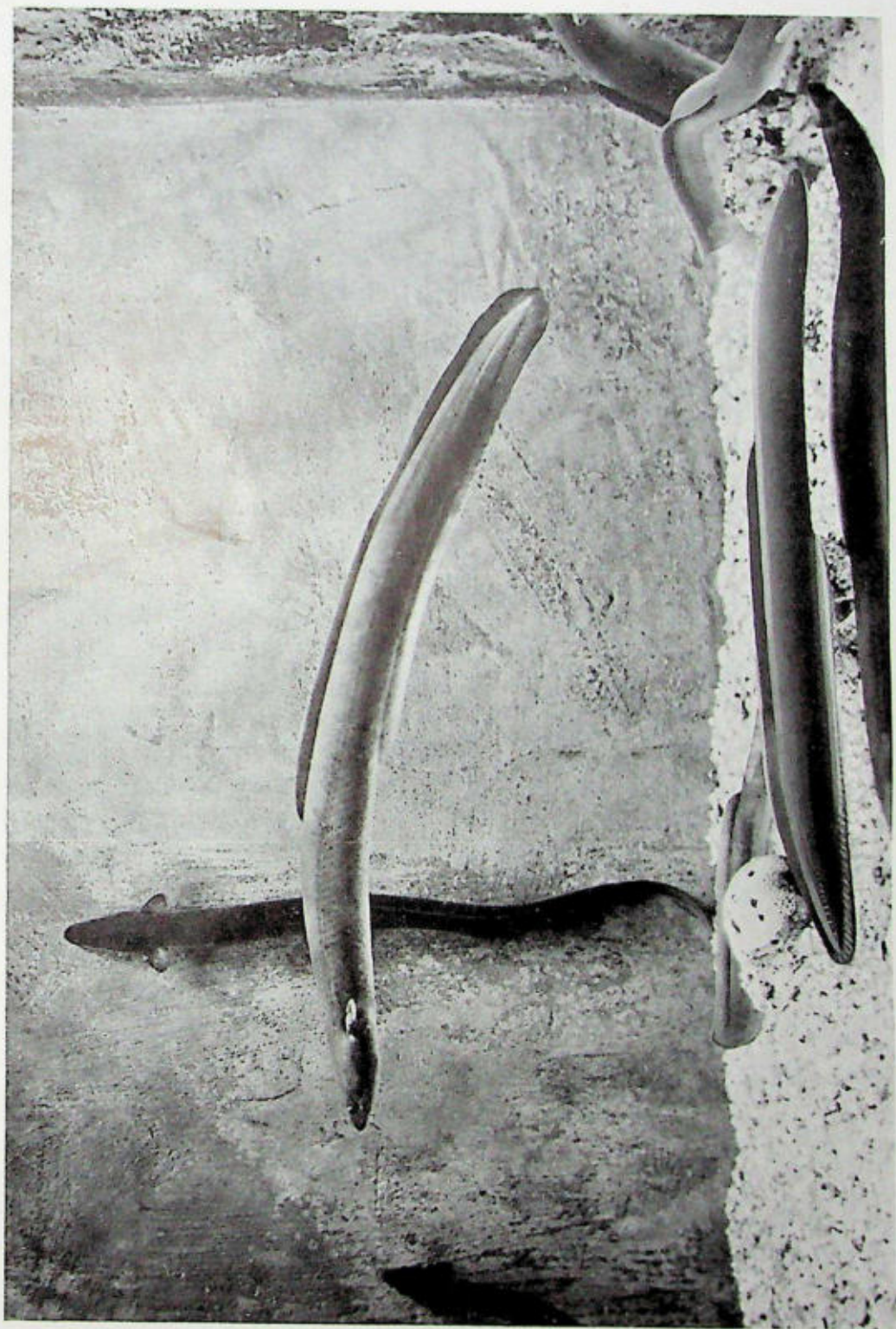
Difficult to distinguish apart when of small size, the Black-nosed Dace (*Rhinichthys atronasus*) and Chub Sucker (*Erimyzon sucetta*), with their long, slender bodies, marked by a conspicuous black band from snout to tail, make an interesting adjunct to the "happy family" tank. The black-nosed dace have been found excellent fishes to place with goldfishes, being one of the few species that will not nibble their fancy tails. They are hardy and are

known to have lived eight years in the small quarters of the home aquarium. They do not grow beyond three inches in length, and the



BOWFIN

Photograph by L. B. Spencer.



EELS IN THE NEW YORK AQUARIUM
Photograph by Elsie R. Sanborn

males in the spring are handsomely marked with a lateral band of crimson which sometimes suffuses the entire body.

Chub suckers, on the other hand become too large for the home aquarium, sometimes attaining ten inches in length. The chub sucker loses its lateral band before reaching full growth, while the black-nosed dace retains the band through life. Chub suckers can also be distinguished from dace by the polly-wog-like mouth, pointing downward and as typically fitted for bottom feeding as is the upturned mouth of the killifish for surface feeding.

Both dace and chub suckers will eat the same food as goldfishes and are therefore easily maintained in the home.

The Silver Dace or Shiner (*Notropis cornutus*) is reputed to be most abundant of all pond fishes throughout the eastern states, and can easily be differentiated from the common roach (also called shiner) by the narrowness of its body.

The Red-bellied Dace (*Chrosomus erythrogaster*), found in various parts of the country from Maine to Alabama, is as attractive as any native fish, and a happier addition to a fifteen-gallon tank with other native specimens could not be made. It is hardly, but no record exists of its having bred in captivity. No fish takes its food so gracefully. Instead of rushing at the food as most fishes do, it takes it in passing, as a bat takes a mosquito on the wing, merely opening the mouth and swimming on.

THE BOWFIN

From the Great Lakes south to Florida and Texas ranges the Bowfin (*Amiatus calva*) a fish of ancient origin—one of the famous ganoids whose skeletons are found in Palaeozoic and Mesozoic remains. It has a variety of common names—dogfish, mudfish, lawyer, John A. Grindle, and others varying with the locality in which it is found.

At the end of its first year, the bowfin measures ten inches and is therefore suitable for the home aquarium only in its babyhood. It is a hardy little fish, however, and the colors of the young are not surpassed in beauty by any other native fish. Specimens of from three to five inches in length charm the eye, their exquisite fins tinted with bright green, yellow and red, and bordered with black; orange bars running along their mottled sides, their gills suffused with scarlet, and the gracefully waving dorsal fin extending from just behind the pectorals

to the root of the tail, where the characteristic round black spot is one of the most striking of their markings. In captivity the bowfin naturally grows more slowly than in the open lakes, and if captured when quite young, furnishes an attractive feature in a small aquarium for an indefinite length of time.

The thin lips of the fish, the knowing cast of the eye, and the two tiny barbules rearing themselves like mustaches from the ends of the nostrils, give the Bowfin a peculiarly human expression.

Its natural food consists of small fishes, aquatic insects and crustaceans, and it has thrived for twenty years at the New York Aquarium on small live fishes and chopped beef, with an occasional change to minced clam. The air-bladder acts as a lung, and the fish can live a longer time out of water than any other native fish.

For those who capture their own specimens, it may be interesting to know that male adult bowfins are easily distinguished by their green fins and the yellow or orange circle around the tail spot. The male cares for the young, which envelop him in a swarm or swim beside him till able to look after themselves. Females reach a length of twenty-four inches, but males rarely exceed eighteen inches.

EELS

No fish presents a more interesting life history than the Eel (*Anguilla chrysypa*) which is found in all waters that lead to the sea. The only known fresh-water fish that spawns in the ocean, it will live many years in fresh waters without breeding, but soon attains a size too large for accommodation in the home. When very young it is a graceful, fascinating animal, soon becoming tame enough to eat from one's fingers, and is likewise a wonderful scavenger, overlooking nothing that has escaped the other fishes and working assiduously with its pointed snout among the pebbles for anything it can find to eat. It does well with killifishes and minnows, but is inimical to goldfishes and will destroy snails indiscriminately.

Worms and snails constitute its chief diet in a state of nature, but in captivity it readily takes almost any food that is offered.

The same family is known throughout the world, though some of its members are strictly marine.

CATFISHES

These nocturnal fishes are desirable for the home aquarium only in their early stages, and



COMMON ROACH



PEARL ROACH OR RUDD

are never especially pleasing, since they hide in the vegetation by day, coming forth by night to forage. A little boy related to us last summer that when out nature-studying with his father, he gathered both hands full of catfishes so tiny that they seemed like toad pollywogs, and the parent fish that was guarding the youngsters leaped clear out of the water in his anxiety to rescue them. The common Horned Pout or Bullhead (*Ameiurus nebulosus*) is remarkable for its ability to live a long time out of water.

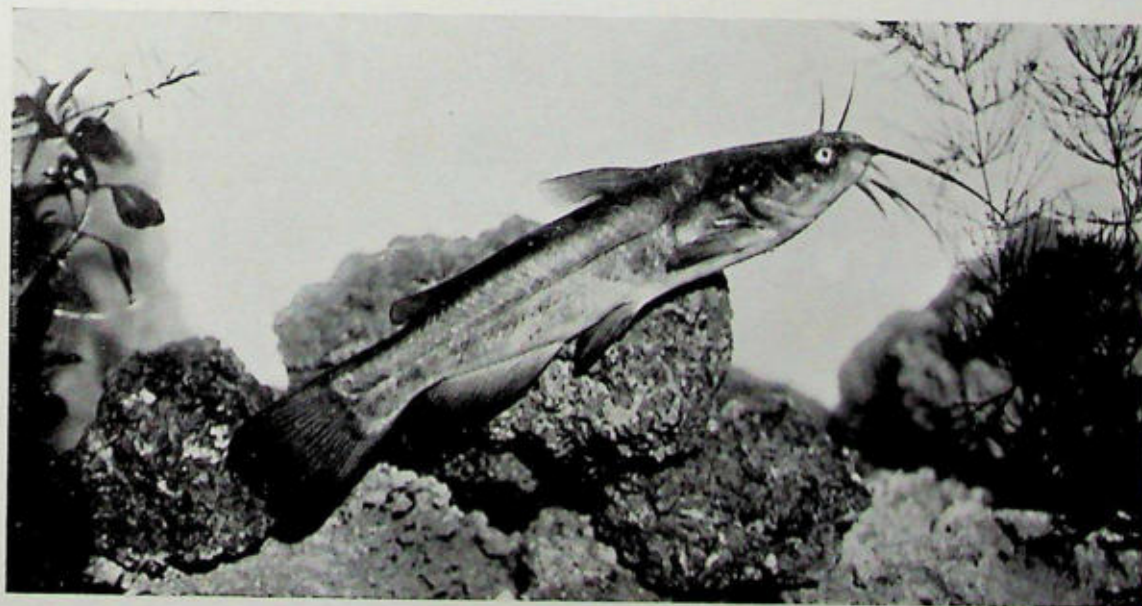
COMMON ROACH OR SHINER

This little fish, glistening like bright new silver, is so common in all our ponds and lakes that almost anyone can collect it. It can be kept with any other of our native fishes, including goldfishes, and is one of the most de-

sirable species for a happy family tank. In nature it preys upon mosquito larvae and other aquatic insects, and in captivity will accept all the foods offered commonly to goldfishes. Its scientific name is *Abramis crysoleucas*.

THE PEARL ROACH

There are so many inquiries at the Aquarium regarding the possibility of keeping Pearl Roach (*Scardinius erythrophthalmus*) in captivity, that a few words respecting this fish are opportune. The pearl roach—known in Great Britain, where it is indigenous, as the rudd or red-eye—would make an admirable addition to a tank containing goldfishes and common roach, were it not for its vegetable-eating habits. Its handsome silver, set off by the scarlet edges of fins and tail, together with its customary failure to grow large when con-



YOUNG BULLHEAD CATFISH



SPINED LOACH

Photograph by Dr. E. Bade

finned to small quarters, would make it one of the most desirable fishes for the home; but no plant is safe in the receptacle with it.

The facts concerning the date and circumstances of its introduction in the United States, where New York Aquarium collectors discovered it in 1894 in the lake of Central Park, New York City, are unknown to science; but the fish has been transplanted by the Aquarium to other lakes as far west as Ohio, and as it is a prolific species, it will no doubt eventually become common in this country and possibly become a food species, as it has long been in Europe. The name "pearl roach" was given this fish at the Aquarium, before it was recognized as the rudd.

Its food in a state of nature consists of aquatic plants of all kinds, insects, snails and worms—especially the red worm, *Tubifex*. In captivity it will eat almost anything offered—yolk of hard-boiled egg, baked or boiled white potato, ant eggs, ground or boiled vermicelli and cereals, chopped clams, beef, fish, etc. Normally it attains a weight of two pounds and its scales become rough in the breeding season. It is a favorite morsel for the pike and other large fishes.

Our experience with the pearl roach at the New

York Aquarium indicates that it can be maintained satisfactorily only in the home that can provide running water for it, doing away altogether with plants except such as are thrown in for food. We have found it destructive to the plants commonly used in balanced aquaria, such as *Sagittaria*, *Myriophyllum* and *Cabomba*.

EUROPEAN FISHES

(Bitterling, Loach, Tench and Golden Ide.)

One of the most interesting aquarium fishes is the Bitterling (*Rhodeus amarus*) of Europe, sometimes brought to this country, and

famous for its strange habit of laying its eggs, which are few and large, within the shells of fresh-water mussels. Without mussels, it cannot be bred.

There seems actually to exist an interchange of service by which the parasitic young mussels, liberated at the proper moment by their mother, become attached to the bitterling while she is depositing her eggs in the shell of the mussel, the young fishes and mussels leaving their respective hosts coincidentally, in about one month. American mussels, as a rule, become parasitic upon larger fishes than the bitterling, and there is no American fish that lays its eggs in the mussel's shell. The bitterling is therefore of



BITTERLING

Photograph by Dr. E. Bade.

peculiar scientific interest—a real anomaly among fishes.

Several loaches besides the Japanese Dojo are brought to the United States, and Europe provides three common species: the Marbled Loach (*Nemachilus barbatulus*), with green and yellow body marbled with black, and six barbels, all on the upper lip; the Weather Fish (*Cobitis fossilis*), adorned with ten barbels, four on the upper lip, four on the lower, and one at each angle of the mouth, and dressed in brown and orange with a lateral black band from gills to tail; and the Spined Loach (*C. taenia*), smallest and prettiest of all, not reaching over four inches in length, its mouth beset with six short barbels, and its fish-gray body painted with black spots, curves and lines.

Loaches should have an aquarium to themselves, which they may roil to their heart's content without disturbing other fishes; and it would be cruel to deprive them of the delight of wallowing in mud or sand, and, indeed, to deprive oneself of the pleasure of watching them taking mouthfuls of sand and squirting it back-

ward through the gill openings, for this is their favorite pastime; and it makes one feel that gills so frequently cleaned must be uncommonly free from parasites. Loaches thrive best in shallow water.

The weather fish is so called because of its increased restlessness for hours before a storm, when it more frequently visits the surface of the water. According to the Cambridge Natural History its air bladder may become so altered in its functions as to serve for a sensory organ connected with the skin in such a way as to convey "thermo-barometrical impressions to the auditory nerves."

Other European fishes of interest, but more desirable for the out door pool than the home aquarium, are the European Tench (*Tinca tinca*), and the beautiful Golden Ide (*Idus melanotus*). They may be maintained in the same manner and on the same foods as goldfishes.

The July Number of the BULLETIN will be devoted to Tropical Toy Fishes, with a chapter on the Care of Sick Fishes.

THE PRINCE OF MONACO RECEIVED BY THE SOCIETY

NOTED ROYAL SCIENTIST VISITS THE ZOOLOGICAL PARK AND AQUARIUM

ALUNCHEON was given in honor of His Serene Highness, the Prince of Monaco, on Sunday, April 17, 1921, at the Zoological Park. The Prince was attended by his Aide-de-camp, Commander H. Bourée and Dr. F. Louet. They arrived in the car of Mr. Madison Grant. Those present were, President Henry Fairfield Osborn, Mr. Madison Grant, Dr. William T. Hornaday, Dr. Charles H. Townsend, Messrs. Robert S. Brewster, W. Redmond Cross, William W. Niles, Percy R. Pyne, De Forest Grant and Park Commissioners Francis D. Ballatin and Joseph P. Hennessy.

An informal reception was held at the Aquarium on Tuesday, April 19, 1921, at five o'clock

in the evening, in honor of His Serene Highness, the Prince of Monaco, who was attended by his Aide-de-camp, Commander H. Bourée and Dr. F. Louet. They arrived in Mr. Grant's car and were met by members of the Board of Managers and others.

The Prince spent an hour and a half going over the Aquarium, expressing himself as greatly pleased with its large and varied collections.

Those present were Dr. Charles H. Townsend, Messrs. Madison Grant, W. Redmond Cross, Mortimer L. Schiff, Henry D. Whiton, Robert Cushman Murphy, Austin G. Fox, H. DeB. Parsons, J. Stanley Brown, A. H. Baldwin and Dr. C. Stuart Gager.

Tea was served at six o'clock.

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BRAZILIAN HALF-MOON OR SCALARE
Photograph by Elwin R. Sanborn.

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TROPICAL TOY FISHES *

By IDA M. MELLE

BECAUSE of their handsome colors and great fecundity, various species of minute tropical fishes have become popular for the home aquarium. Some of these little fishes will live in water of the temperature of the living room, provided the heat is maintained steadily throughout the colder seasons, and they do especially well when the aquarium is protected by a sheet of glass laid upon the top. This is always a desirable provision, as most fishes are apt to jump out.

For the special heating of a tank in the home where a proper degree of warmth is uncertain, aquaria are manufactured with a metal sleeve built in, into which a tubular incandescent lamp may be inserted; but if one does not wish to purchase a special tank for his tropical fishes, he can provide himself with a water-tight brass sleeve, *nickel plated*, made for the same kind of bulb, and place the whole apparatus in the water by suspending it over the side of the aquarium whenever extra heat is necessary. The suspension of an incandescent lamp in the aquarium is also effective, care being necessary to prevent any metal parts from striking the water.

Nearly all tropical toy fishes will breed in a temperature of from 68 degrees to 75 degrees, and they breed during the better part of the year. In live-bearing species the female remains fertile for some months after giving birth to one family, producing more young from time to time, though there is no male in the aquarium with her.

Like goldfishes, they require a well-balanced tank, with plenty of plant life and an hour or

two of sunshine daily; but must not be given cold water from the faucet. Water, to replace evaporation and siphoning, should stand until of the temperature of the room. Siphoned water may be used again by straining back through cheese-cloth.

Most tropical toy fishes are destructive to snails, eating off their tentacles down to the eyes and killing them, and tadpoles are too large and boisterous to be placed with them. Most species will forage for such food as falls to the bottom, but for their complete well-being siphoning must be resorted to for clearing the tank of uneaten food and debris.

Sagittaria is the best of rooted plants for oxygenation, but for live-bearing species the tank should also be stocked with bushy plants of the order of *Myriophyllum* and *Cabomba* for the shelter of the young against their cannibalistic parents. For this purpose nothing is superior to floating *Riccia*, masses of which, hanging several inches down from the surface, form a dense aquatic jungle in which the fry are safe.

Those that lay eggs and do not care for the young will eat their spawn the same as goldfishes do; but non-adhesive eggs may be saved if they fall between large pebbles or among the roots of plants, and adhesive eggs may be saved by removing them with the plants to which they are attached. Various sieve-like devices have been invented for permitting non-adhesive eggs to fall through and rest on the bottom, where the young may develop in security.

It is a wonderful experience to start with a pair of fishes an inch long and some day discover a dozen babies in the tank three-eighths of an inch long and looking like nothing but two big eyes attached to a wee gray streak

*Indebtedness is acknowledged to Mr. Richard Dorn and Dr. E. Bade for their kind reviewing of the chapter on Tropical Fishes.



GUPPY

Photograph by Dr. E. Bade.

of animated matter that can dart twenty-five times its own length in the minutest fraction of a second.

It is not possible in this paper to deal with any but the best-known varieties of tropical toy fishes. Aside from the number already familiar to aquarists in this country, dozens of others, equally attractive, have never been brought here; and one has only to consult a catalog of fresh water fishes of Central and South America and Mexico, to realize that these countries afford a happy hunting ground for the enthusiast in search of finny beauties yet unknown in the United States.

All adult tropical fishes should be fed once daily, and the fry two or three times. The young that hatch from eggs require live food—infusoria, and later daphnia, etc.—but those born alive will take the prepared baby fish foods, powdered yolk of egg, graham or soda cracker dust, oatmeal broth, juices of meat and shellfish, etc., and the adults will eat pretty much the same food as goldfishes. Wherever live food is procurable it is most desirable for all young fishes, and older ones, too; but if



MOLLIESIA LATIPINNA

Photograph by Dr. E. Bade.

collected from the ponds great care must be exercised to eliminate the natural enemies of little fishes—larvae of aquatic insects, beetles, hydra, etc.

CYPRINODONT FISHES

With a flat head and protractile mouth

RAINBOW FISH OR GUPPY

The commonest and one of the hardiest of tropical toy fishes for the home is the viviparous rainbow fish, commonly called Guppy because of its former scientific name, *Girardinus guppyi*. It is now called *Lebistes reticulatus* and is highly prized as a destroyer of mosquito larvae in its native waters of Trinidad, Venezuela, Jamaica, Surinam and Barbadoes, where its occurrence is in sufficient numbers to have earned it the epithet of "million fish."

TOP MINNOW, *GAMBUSIA HOLBROOKI*

Photograph by Dr. E. Bade.

The plain fish-gray female measures at full growth about one and a half inches. The male measures slightly less than an inch in length and his colors are beautiful beyond description. No two are alike, and rainbows seem actually to flit before one in aquatic miniature, in the combination of orange, light green, pink, deep purple, pale blue and magenta, with black spots and lines irregularly disbursed, as the male guppy indulges in his tireless occupation of courting the female in the most brilliant array that he is capable of assuming. The colors are best seen with the light falling over the observer's shoulder. The young are fish-gray like their mother, males not acquiring their colors until a couple of months old.

They will breed at about six months, when half grown. The male parents appear not to eat the young fish, but will fatally bite them, gouging out their eyes or stomachs. The females feast on their offspring as they would on mosquito larvae, swallowing them whole with

apparent relish. As with other animals, interbreeding is not desirable, and an exchange of males with someone else who is breeding guppies is always profitable for both breeders, infusing new blood into the strains and producing finer colors in the males.

Warm water stimulates their reproduction, and a dealer, finding that in his store there was a section of stove-pipe continually warm, set his guppy tank above it, and said his supply of guppies soon exceeded the demand.

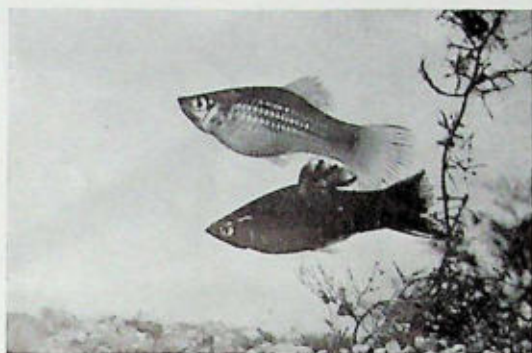
The number of young at a birth varies, but if nine are saved from their pursuing mother, the beginner is doing too well to complain. If he saves twenty, he is lucky indeed. One common practise is to place the gravid female in a small globe or jar thickly stocked with plants in which the young may hide, removing her after they are all born and leaving



MEXICAN SWORDTAILS
Photograph by Dr. E. Bade.

them until large enough to be safely returned to the tank with the others. One young man prepares small separate jars for the gravid females, arranging a strip of copper mosquito netting in each jar to divide it, much as a breeding cage is divided. The mother fish is placed in the side away from the light. He finds that the new born young will dart through the holes in the netting toward the light, and stay there in safety. They well know their own danger. After all are born, he removes the mother and the netting, keeping the fry apart from the adult fishes for several weeks. In this way he has frequently saved more than twenty young.

At the slowest rate of breeding, let us say once in six months, it will be seen that one should have at least fifty-six guppies at the end of the year, starting with a single pair. (This is figuring on the pair producing two lots from which eighteen are saved. If there were four females among the nine from the



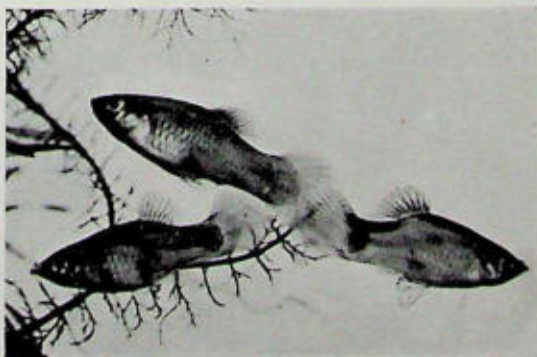
HYBRIDS
From *P. rubra* (male) and *X. helleri* (female).

first lot, these, reproducing at the end of six months, would add thirty-six to the number, making in all fifty-six. If the aquarium is kept in a warm place, this number may be doubled or tripled.)

Both young and old will browse on the minute algae of the aquarium, and the young should be fed as already prescribed for fishes born alive. The adults are voracious and will clean up all foods thrown into the tank provided the pieces are not too large for their throats. They will eat yolk of hard-boiled egg, baked or boiled white potato, prepared fish foods of all sorts, chopped fish, meat, shellfish, and will greatly appreciate live food when this is procurable—daphnia, mosquito larvae, white worms (Enchytraeids) etc.

A common custom is to hang a piece of raw beef in the guppy tank for a few hours, and let them pick at it.

Enchytraeids can be purchased from some dealers with full instructions for breeding them, and though there is some slight suspicion that they contain parasites which eventually



PLATYPOECILUS MACULATUS
Photograph by Dr. E. Bade.

prove injurious to the fishes, many breeders still use them.

TOP MINNOW OR LEOPARD FISH (*Gambusia*)

In Louisiana and Florida and Cuba and in fact pretty generally from Illinois to Mexico, top minnows inhabit the brooks and ponds, and *Gambusia holbrooki* is the proper toy fish for those who admire jet black or the combination of black and white, so striking in any animal. In this species the males are wholly black or black and white, while the females are plain fish-gray. (It is said that an occasional male is found lacking color like the females.)

Another common species, found in Mexico, our own southern states, and even as far north as Delaware, is *G. affinis*, which does well in a "happy family" tank of native fishes. Both sexes are gray. Some specimens have a dusky band on the sides, others are faintly peppered with black.

Neither of the species mentioned exceeds two inches in length and in most collections the males are but one inch long, the females one and a half inches.

In the top minnow the embryos develop in the ovisacs, where, as a rule in viviparous species, they are fertilized, and develop in the ovarian cavity. It consequently happens that the dark area which indicates gravidness in most other small live-bearing species, is present at all times and may mean nothing in *Gambusia*. It is therefore not so simple to make special preparations to save the young, which the parents mercilessly pursue and devour. The tank should be uncommonly well stocked with plants in which the fry may hide.

Food for young and adults should be the same as for the rainbow fish.

THE MUD-EATERS

The Mud-eaters (*Mollienisia latipinna* M. velifera, and *M. formosa*), ranging from the Carolinas to Mexico, accommodate themselves to either fresh or brackish water and bring forth their young alive. One brought to New York from Key West gave birth to seventy-five young, and another that died was opened and found to contain one hundred and twenty-eight embryos.

They are large at birth—about three-eighths of an inch long—and so far as has been observed, the parents do not eat them. For safety's sake, however, it is customary with aquarists to separate the young until six or eight weeks old, since a suspicion of cannibalism attaches to fishes in general.

Altogether, the mud-eater is one of the most satisfactory of toy fishes, accepting almost anything offered—prepared foods, boiled egg yolk, chopped meat, fish, shellfish, etc., and the males are exceedingly attractive in the breeding season, adding orange tints to the head and breast that contrast handsomely with their steel-gray bodies trimmed with black lines, and frequently exhibiting for the female's admiration their beautiful, sail-like dorsal fin. They are fond of vegetable foods also, and a dense growth of algae in the tanks suits them to perfection.

They grow slowly in captivity—more slowly in brackish than in fresh water—but breed when about two years old, even though they have not yet attained half their growth. As with most fishes, there are fewer young in the first than in subsequent births, especially so if the mother is not half grown.

The sex of the mud-eaters can be told from birth by the intromittent organ of the male.

The mud-eater's flat head gives it a peculiarly unintelligent expression; but except for this, the little fish has a comfortable, matronly look, which makes it appear to accept captivity with genuine contentment.

MEXICAN SWORDTAILS AND HYBRIDS

Except for the rainbow fish it is probable that no tropical toy fish has met with so much favor among American aquarists as *Xiphophorus helleri*, the only species of the three handsome Mexican Swordtails (found in Mexico and Central America) that is commonly brought into the States.

The male has a long, green or yellow sword-like tail edged with black, and a red stripe adorns his body. The female's shape is similar to that of the female rainbow fish, but she is twice, sometimes three times as large, and much more beautiful, having an orange-red band running the length of her body.

The two other species of swordtails are *X. jalapae*, found in the streams of Vera Cruz up to an altitude of five thousand feet and attaining a length of four inches, and *X. montezumae*, found in the basin of the Rio Panuco and having about the same length as *X. helleri*—about four inches.

Their habits are similar to those of rainbow fishes, the females having been known to remain fertile for over a year after one impregnation, normally producing a dozen young about every six weeks in water of summer temperature, and eating their own young unless the latter are protected.

Like most small tropical fishes, they prefer a diet of raw meat, live worms and crustaceans, but will take other foods on occasion.

Cross-breeding of *Helleri* with other fishes has been tried with much success and the offspring are not always sterile, though they have the reputation of being shorter lived than the pure stock.

The Red *Helleri*, which brings high prices and the exact parentage of which has not been revealed by its producers, is acknowledged to be a hybrid. Crosses between *X. helleri* and *Platy-pocilus rubra* have been frequently made, and the *Helleri* has also been crossed with the rainbow fish. Handsome hybrids are produced by crossing *X. helleri* with *P. pulchra*, the offspring being beautiful black fishes with sides of burnished blue and green satin.

PLATYPOECHILIDA

The *Platy-pocilida* come from South America and Mexico, and are commonly called by their specific names of *maculata*, *rubra*, *pulchra*, etc. All are viviparous, and the female, kept quite alone, may surprise her owner after producing one family, by giving birth to another when a number of weeks have elapsed. A female *rubra* at the Aquarium gave birth to eighteen young in two days.

The delicate, blue-tinted *Platy-pocilus maculatus* from Central America and Mexico, in which the female's anal fins are edged with black, is most timid; and the *P. rubra*, with its scarlet color and occasional black specks and green-tinted scales, the most handsome. The male *rubra* is about half the size of the female and more brilliantly colored. Both sexes have a black spot at the root of the tail. In the coloring of *P. pulchra* a rich, satiny black predominates.

All are partial to raw meat and live crustaceans, but most will take prepared foods by way of variety, and they are always hungry.

If the aquarium is covered with a strip of glass during all but the warm months of summer, artificial heating of the water is unnecessary, a room-temperature of 68 degrees being entirely suitable.

HAPLOCHILUS

Half a dozen species of *Haplochilus* have been introduced into the United States and have found popularity because of their attractive shapes and colors, beautiful fins and tails being a common characteristic of the males. All are egg-layers, and all prefer live food though they will take other foods, even the dried kinds. The

eggs are adhesive and are laid among the aquatic plants, where they hatch in from ten to fourteen days. It is well to remove the adults to another tank after they have spawned; also to watch and sort the young so that the larger may not feast upon the smaller. Young and old may be fed the same as goldfishes.

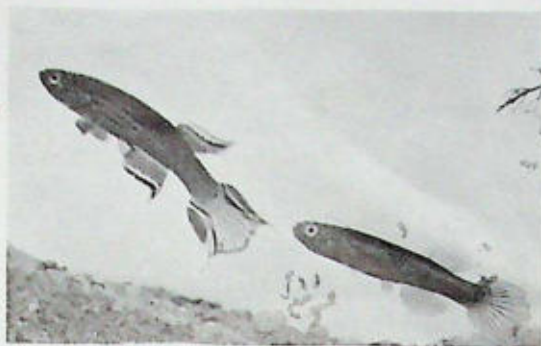
Some of these fishes come from Africa, others from India. Among the former are *H. spilargyreus* with six black vertical bands and a red and yellow spot on the gill cover, and the allied *H. chaperi*, similarly banded and measuring about two and a half inches. The best-known *haplochilus* of all comes also from Africa and is one of the smallest of the species, attaining but two inches in length. It is called the Ribbon-tailed *Haplochilus* (*H. cameronensis*), and the beautiful tail, shaped like a lyre in the male, adds to the attractiveness of a delicate body of blue, spotted with rows of scarlet, and red-striped fins.

From India comes the Red-spotted *Haplochilus* (*H. lineatus*), the male having green and blue sides, his body and fins spotted with scarlet, his tail bordered with red, black and white, the female having a black stripe from head to tail. This species has been kept for two years at the Aquarium, and is the largest of the group, attaining four and a half inches in length. Other species from India are *H. fasciatus* in which the female is smaller than the male, and the male's yellow-blue body is dotted with seven rows of scarlet specks, his tail being enhanced by two long central rays; the *H. panchax*, of which several varieties are known, also called the Red-tailed *Haplochilus* which attains a length of three inches, has bluish sides and in the male a tail bordered with red and black, in the female with red only.

RIVULUS

Several species of the hardy *Rivulus* are imported from Brazil and Central America. *R. poeyi* being perhaps the commonest, the entire length of its plain, fish-gray body offset with rows of scarlet and the fins with yellow and red. As in many small fishes, the fins of the male are more highly developed and colored than those of the female. The body and fins of *R. flabellicauda* are similarly dotted and marked with red, and it has a red throat. The Golden *rivulus* is a variety of *R. Poeyi*, the dots and markings of scarlet being the same but the body color being golden instead of gray. The average length of *Rivulus* is about three inches.

Rivulus are noted for their capacity for jumping out of the water. They will lie for hours



RIBBON-TAILED HAPLOCHILUS

Photograph by Dr. E. Bade.

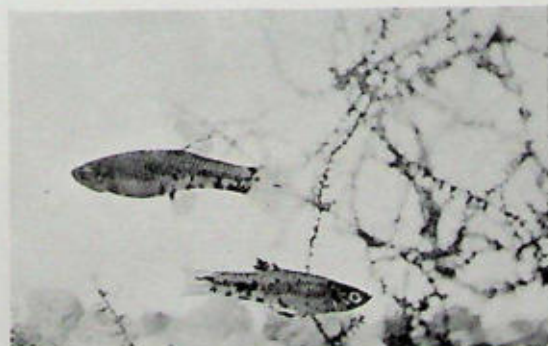
among the floating plants with half their bodies out of the water, and Mr. Richard Dorn has observed specimens in his aquarium adhering to the sides of the jar or to the glass cover, out of water, for a long time. The species is supposed to be minus an air bladder, but Jordan and Evermann did not find this true in the case of some *Rivulus* from Cuba.

They are egg layers, and the parents or eggs should be removed after spawning occurs. The young may be expected to hatch in two weeks' time or slightly sooner.

Rivulus have lived for three years at the Aquarium, and showed a preference for live food, meat, fish and shellfish, though on occasion they would accept dried shrimp and other prepared foods.

JANUARIUS

A little, grayish-yellow fish with black spots, *Januarius* has been introduced into the United States and also into Europe, from the West Indies and Central and South America, where it inhabits streams. The sexes are similarly marked, and it thrives under conditions suitable for our



JANUARIUS

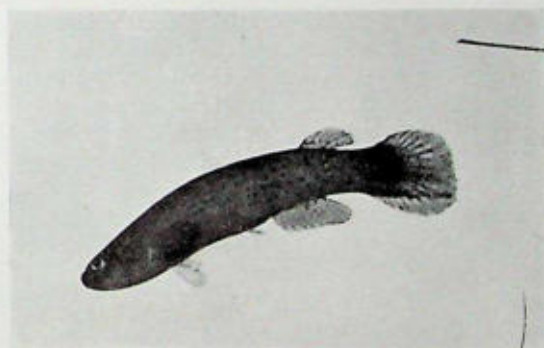
Photograph by Dr. E. Bade.

native fishes. Its breeding habits and food are about the same as those of the rainbow fish.

Scientifically it was long known as *Girardinus reticulatus*, then as *Phallopterychus januarius*, and now labors under the title of *Phalloceros caudomaculatus*—all very heavy names for such a tiny and innocent creature.

TOP MINNOW (*Heterandria formosa*)

Found in company with the top minnow *Gambusia*, in the swamps and ditches of our southern states, with a range approximately from South Carolina to Florida, *Heterandria formosa* long had the reputation of being the smallest known fish. Though it has been obliged to yield that title to a goby inhabiting a lake in the Philippine Islands, it still lays claim to being the smallest viviparous fish, the Philippine species being oviparous.



RIVULUS FLABELLICAUDA

Photograph by Dr. E. Bade.

JORDANELLA FLORIDAE

Abundant in the streams and swamps of Florida, this little fish, as yet lacking a common name, has frequently been shipped north. The body color of green is spotted with black in both sexes, and in the male with red. The food consists of both vegetable and animal matter, like that of the rainbow fish. The eggs are adhesive, and the parents cannot long be trusted with them.

CICHLIDS OR CHROMIDES

In some species of which both parents care for their young

THE CHANCHITO

(*Cichlasoma facetum* or *Heros facetum*)

This little fish, sometimes called the Brazilian Zebra-fish but usually referred to as Chanchito, meaning pig, from its habits of fighting like a young pig and of uprooting plants, especially

when excavating its nest in the sand, has still a third name, for the English call it Chameleon-fish because of the remarkable changes of coloring it exhibits during the breeding season. The male is a fighter, and even the female stoops to bullying; but notwithstanding their quarrelsome dispositions, the Chanchitos have won their way into the affections of aquarists by their fascinating breeding habits. The male, which, like the male paradise fish, mates only with a female to whom he takes a fancy, forces his lady by bites and shoves into the spot where the eggs are to be laid and fertilized, and generously permits her to join with him in caring for the eggs and young—a privilege granted to very few mother fishes by their despotic lords.

The eggs are conveyed to a nest scooped up in the sand, and the little ones hatch in from five to ten days and begin to swim around after their



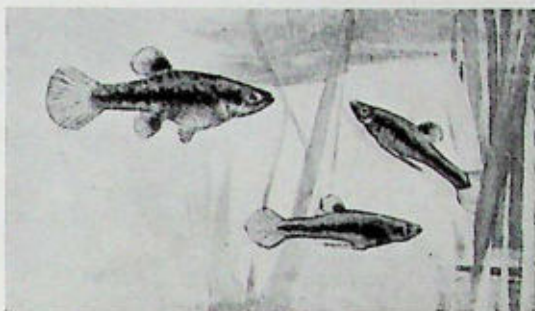
JORDANELLA FLORIDAE

Photograph by Dr. E. Bade.

parents in an interesting procession, the female acting as advance guard and the male bringing up the rear. This procedure is allowed by the devoted parents only during the day, for on the approach of evening the precious babies are safely stowed back into the nest for the night and the parents keep vigilant guard over them, transferring them from one hole or nest to another from time to time as their judgment dictates. This anxious watchfulness continues until the offspring are about two months old, and even then the parents do not as a rule turn cannibal,—another unusual feature among fishes. There have been occasional exceptions to the rule, however.

They breed when about nine months old, and have not infrequently spawned in captivity, seeming to have a preference for flower pots by way of nesting places.

In a state of nature they are carnivorous, subsisting on worms and other small forms of



TOP MINNOW, *HETERANDRIA FORMOSA*

Courtesy of Aquatic Life.

aquatic life. In captivity they can be fed the same as guppies, with live food, meat, prepared foods, etc.

Eighteen species of Chanchito are found in Mexico, ranging from five to fourteen inches in length, the species with which we are familiar in North America being one of the smallest. Found in ponds and slowly moving streams tributary to the La Plata River in South America, it grows to be four and a half inches long.

ACARA BIMACULATA

The habits of *Acara bimaculata* of Brazil, Guiana, Trinidad, etc., are somewhat similar to those of Chanchito, in that it will spawn on an old flowerpot, laying upwards of one hundred and fifty eggs which are fanned and guarded by both parents. The fry are transferred occasionally from one place to another, and are cared for by both parents for some weeks.

This fish attains a length of four inches, and changes color rapidly, assuming green, yellow and blue markings interspersed with black, and always showing a black spot near the center of the body and another at the beginning of the tail.



CHANCHITO

Photograph by Dr. E. Bade.

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ELWIN R. SANBORN, *Editor*

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JULY, 1921

As in numerous other species of small fishes, the fins of the male, notably dorsal and anal, are projected to a point, while those of the female are slightly rounded.

This species has lived for two years at the Aquarium, and responds to the same treatment and care as that applied to the Chanchito.

BRAZILIAN HALF-MOON OR *Sealare*

This alluring fish of the Amazon, Essequibo and other South American waters, commonly called Sealare from its scientific name, *Pterophyllum sealare* (ter-o-fil-lum sea-la-re), is sought by fish fanciers on both sides of the Atlantic, yet it is said there have been few successful breeders of the species.

The fish requires heated water in winter in the climate of New York, and unless one has a conservatory or is willing to install a heating system, is not suited to the home.

At the Aquarium it has been exhibited in water artificially heated in winter to 68 degrees or 72 degrees and has lived for two years, though no attempt was made to breed it.

The breeding of this fish, which may occur several times in one year, has been described by various experimenters as a most interesting process. The eggs are deposited on the glass sides of the aquarium, or, preferably, on broad-leaved plants, the male fertilizing them as rapidly as they are laid; and both parents keep the supply of oxygen fresh over them by fanning them constantly for from two and a half to four days, when the young may be expected to hatch.

The fry cling to the plants and the parents move them about from one leaf to another. The male, which can be distinguished by his longer dorsal fin, and also by the strange fact

—for a fish—that he is of inferior beauty to the female, digs a hollow in the sand, and both parents transfer the young to it. Some say the babies swim in seven days, returning every night to the hollow.

Some breeders have found the parents safe with the fry for eight days; others found cannibalism commencing before that time and removed the parents on the sixth day.

All agree that these fishes prefer live food and will eat beetles and bugs, worms, flies, etc. At the Aquarium we fed them on minced beef and shellfish, which they ate ravenously.

In about five weeks the young resemble the parents in form, and if the water is kept at the proper temperature they generally prove hardy. They will eat infusorians, canned shrimp, prepared foods, etc. They are also plant-eaters and like *Riccia*, *Salvinia* and other floating plants.

The form of the male is highly attractive, all of his fins except the pectoral being drawn out in long filaments, while those of the female end in a sharp point.

Adult half-moons grow to be the size of a man's hand. Even Europeans come to the Aquarium to inquire where they can be bought. So far as we know in New York, the only successful breeders of half-moons in this country are Mr. William L. Paullin of Prospect Park, Pennsylvania, to whose accounts of his experiments, published in *Aquatic Life*, we are indebted for some of the foregoing statements, and Mr. Franklin Barrett of Philadelphia, who succeeded in raising one hundred specimens in the spring of 1921.

THE RED CHROMIDE

The Red Chromide (*Hemichromis bimaculatus*) is one of the handsomest of the toy fishes coming to America from African waters, the female being quite as brilliantly colored as the male. The rich reddish brown and blue of the back and sides is enhanced by a scarlet throat, and three characteristic black spots appear, one on the gill cover, another at the base of the caudal fin, and the third in the center of the body. *Trimaculatus* (three-spotted) would be a more appropriate name.

The eggs are adhesive like those of the Brazilian half-moon, and the parents take turns in guarding them, removing the babies in their mouths to hollows scooped in the sand. Like Chanchitos, they dig up plants in their efforts to scoop these hollows. At almost any time after the young are five days old, one may ex-

pect to see them following their parents about and searching for food, which should be the same as that used for baby goldfishes.

THE BLACK-BANDED CHROMIDE

A specimen of Black-banded Chromide (*Cichlasoma nigrofasciatum*) from Brazil lived in the Aquarium laboratory for a year or so. A fish of exquisite coloration, it is nevertheless of an inordinately pugnacious, not to say ferocious, disposition. The male, in the breeding season, changes his rich brown coat for a deep black, beset with turquoise gems, and his pectoral fins become suffused with red. The breeding habits of this fish are the same as those of the red chromide.

THE MOUTH-BREEDER

Haplochromis strigigena is an interesting mouth-breeder of the diminutive size of one and three-fourths inches, which comes from Africa and Egypt to delight the eye of the American aquarist, who knows it also by a former name—*Paratilapia multicolor*.

The colors of the fish are brown, burnished gold and blue, the male having a red-tipped anal fin.

As in all mouth-breeding species observed from Africa, it is the female that carries the eggs in her mouth during incubation, the young in early infancy swimming back again for safety. The eggs are first laid in a hollow scooped in the sand, and then picked up by the female, whose mouth becomes distended to accommodate them. No food is taken by mouth-breeding fishes while the eggs are hatching, but fortunately for this little fish it is not obliged to abstain from food as long as are some large fishes of similar habits, the young, which may number from one dozen to six dozen, hatching in two weeks or less. It is customary among fishes for the male to care for the young when they receive any care, and the little male of this species resents very bitterly the assumption of maternal duties by his spouse. First being an anti-suffragist, he takes the next logical step, and when his mate gathers up the eggs, becomes a wife-beater. At this juncture solitary confinement is the very best thing for his soul. Unfortunately it is necessary to remove the mother, too, when the young become free-swimming, for, forgetting her maternal instincts, sacrifice and all, she will make a meal off them.

Live foods are best if procurable, but the young of this species will sometimes take artificial foods. The adults, which are hardy in captivity, appreciate a meat or fish diet, but will

take foods similar to those prescribed for the rainbow fish.

CHARACIN FISHES

One of the species lays its eggs out of water

PYRRHULINA

A curious fish whose eggs are hatched out of water, is occasionally brought from South America—*Pyrrhulina filamentosa*. Gracefully formed, though not brilliantly colored, it is prized chiefly for its peculiar habit of fastening its eggs an inch above the water, where the male keeps them moist by squirting water upon them at frequent intervals. Luckily they hatch within two days, or his exertions might become wearisome. Once the eggs are hatched and the fry drop down into the water, the parents take no further care of them.

The species here pictured, *P. australis*, though a near relative of *P. filamentosa*, and strongly resembling it in other ways, lays its eggs in the water like other fishes.

*GOBIES

A large and varied family of fishes, comprising 600 species, found in both fresh and salt waters, ranging from half an inch in length to three feet, and among which are some of the Walking Fishes. Most of the gobies kept at the New York Aquarium inhabit warm, brackish water; but the hardiest of our gobies is

THE SLEEPER

These beautiful fishes, ranging from the Carolinas to Brazil and the West Indies and also found on the Pacific Coast, thrive better in standing fresh water than in brackish water, though they have the disadvantage of out-growing the home aquarium. They also come as near to eating their owner out of house and home as a fish very well can; and they are happiest in muddy water. But their lovely colors—rich shades of blue and yellow—compensate for most of the disadvantages.

Just why the fish is called Sleeper (*Dormitor maculatus*) is not quite clear, but it has two unusual habits, either of which may have given rise to the name. When first taken into captivity it has a trick of fainting from fright whenever a person moves before the tank or disturbs the water in it, and will lie on its back gasping for some time. An occasional specimen will die of fright, but as a rule sleepers recover from this habit after a few months in captivity and specimens well acclimated to confinement never faint. The sleeper also has a way of poisoning itself in the water for a considerable time as though medi-

*For Walking gobies, see Walking Fish.



ACARA BIMACULATA

Photograph by Dr. E. Bade.

tating, either resting against the floating plants or balanced at the top or against the glass. Even the mud minnow does not remain motionless for such a long time. Seeing it thus poised for an hour or so, one naturally begins to wonder if the fish is dead, and might conclude, as it darts away, that it was only sleeping.

In a native state the sleeper eats mud and vegetation, and at the Aquarium seems to enjoy aquatic plants, beef, shellfish and fish.

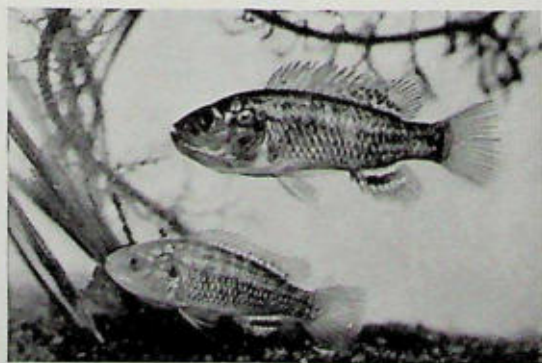
The sexes are distinguishable, the coloring of the male being richer, his dorsal fins much closer together than those of the female.

OSPHROMENIDAE

Fishes that build bubble nests. Also called labyrinth fishes

THE PARADISE FISH

A boarder that is both beautiful and intelligent and that will eat anything is the most satisfactory kind to have; and in this respect the Paradise Fish (*Macropodus viridi-auratus*) can hardly be surpassed. Anything that a goldfish will eat suits the Paradise fish, it is always



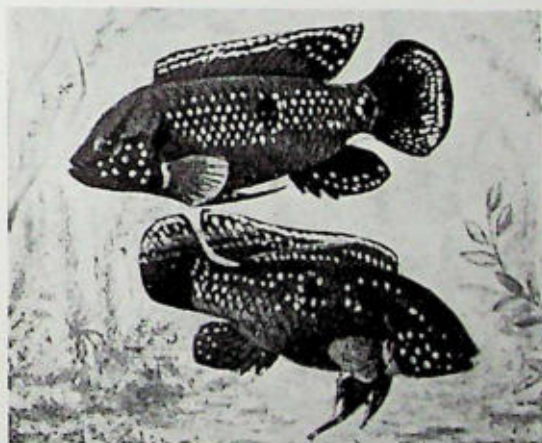
MOUTH BREEDER

Photograph by Dr. E. Bade.

hungry, and will take amazingly large mouthfuls for a fish of its size.

No fish presents more beautiful and interesting color changes, the customary warm brown with the conspicuous vertical bars giving place to flesh color, red, green, blue, and other handsome hues according to the fish's moods. Temperature, food, the introduction of a mate into the tank, excitement, and various other causes may operate to effect a rapid change in color.

It is one of the so-called labyrinth fishes, in which accessory breathing organs are developed in connection with the branchial arches, enabling the animal to breathe air like the climbing perch; but unlike the perch it does not leave the water, its fins not being similarly adapted to maintain the body on land in an upright position. It has been our experience with one specimen at the



RED CHROMIDE

Courtesy of Aquatic Life.

Aquarium that jumping out of the tank was disastrous for though picked up within a few minutes and replaced, it died soon after. Mr. Lee Crandall, however, describes a specimen of his that fell down stairs without sustaining injury, and Mr. Richard Dorn tells of one that jumped out of a container and laid on a city sidewalk for several minutes with no harm accruing.

Its breathing facilities are such that it has been known to survive foul water, to say nothing of close quarters, saving itself from suffocation by rising and taking air at the surface. It cannot live in cool running water, but will stand considerable variations of temperature, surviving the extremes of 50 degrees and 90 degrees. Mr. Dorn, accidentally overlooking a specimen when removing the fishes from an outdoor tub to his house one fall, was surprised to discover that it had survived the winter in the tub, at temperatures often near the freezing point.

Southeastern Asia and Africa have supplied the Occident for fifty years with this interesting species, which naturally inhabits the swampy bottoms of rice fields and evidently feeds on flies and such other insects and live food as are available, since its preference is for fish and meat.

The paradise fish is hardy and breeds often in captivity, sometimes rearing several broods in one season. It is one of the most captivating of nest builders. Some received from abroad last summer began to build a nest the very next day after arrival. This feat is accomplished in a curious manner, the male fish blowing a bubble nest at the surface of the water, held intact by a buccal secretion and anchored to the floating plants. It may be a quarter of an inch thick, and measure six inches in circumference. When



PYRRHULINA AUSTRALIS

Photograph by Dr. E. Bade.

he has theretofore so jealously and fiercely guarded.

Like all fishes born with a yolk-sac, the young do better on infusoria than other foods. They should be fed the same as goldfish fry, except that as early as two weeks they can eat chopped beef, worms, small crustaceans, etc. The young must be sorted to prevent cannibalism.

The paradise fish matures at about four months, and will breed when a year old, or sooner, and often when the young of one spawning are about ten days old, a new nest is built and another family reared, so long as the temperature remains favorable. The male, the larger of the two, attains a length of three and a half inches.

Like killifishes, they watch for their owner, peering through the glass and following his movements with lively curiosity, prompted, of course, by an ever-present hunger.

They have lived for eight years in captivity.

Paradise fishes, like angel fishes, are not blessed with heavenly dispositions, despite their sweet-sounding names. By malicious poking and driving, one will prevent another from feeding

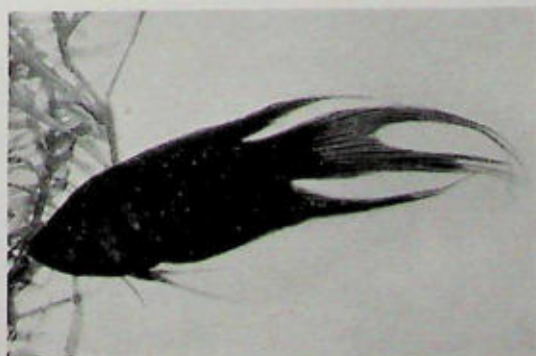


SLEEPER OR DORMITATOR

Photograph by Dr. E. Bade.

his work is complete, he urges the female under the nest, and as she lays the eggs, fertilizes them. The eggs are so light they rise into the nest. In all there may be from two to five hundred eggs, and to preserve the female from the vigilance and ferocity of the male it will be necessary to remove her as soon as the spawning is completed. Occasionally a male will eat the eggs, but as a rule he is safe with his offspring until they become free-swimming, when from five to eight days old. The female becomes almost white during the spawning operation.

The eggs hatch in from twenty to thirty-six hours, according to the temperature of the water, and with a magnifying glass the fry can be seen emerging. They retain the yolk-sac for several days, and require a little sun daily. The father fish keeps the nest in constant repair until it becomes necessary for the fry to seek food. At this juncture he must be removed, else he will break the fast he has maintained while on duty, by feasting upon the very babies.



PARADISE FISH

Photograph by Dr. E. Bade.

and a male will kill a mate to whom he does not happen to take a fancy. Breeders have handled this situation by placing the pair in a tank with a glass partition, it having been observed that when a male watches a female in this manner for a time, he is more likely to accept her with amiability. Males will kill one another, and females are not always averse to bullying other females and killing specimens smaller than themselves.

Most breeders transfer paradise fishes with a cup if possible, as a net has sometimes proved injurious to their delicate fins.

If the male happens to be of the sort that eats his eggs, the eggs can be removed with a cup to a well-stocked tank, where the young, on hatching, may attach themselves to the vegetation till their yolk-sacs are absorbed.

These fishes, being equipped with air-breathing facilities, do not require a great deal of water, two gallons sufficing for a pair three to four inches in length; but if one wishes to breed them, an aquarium that will accommodate a six-inch bubble nest must, of course, be provided.

THE GOURAMI

Dwarf Gourami—*Trichogaster lalius*

Striped Gourami—*T. fasciatus*

Thick-lipped Gourami—*T. labiosus*

Spotted Gourami—*Osphromenus trichopterus*

These various species of gourami, kept in home aquaria, are of similar habits. The dwarf gourami is not uncommon, and the striped, spotted thick-lipped and other species have been introduced from India and the Malay Peninsula.

No fish presents a more self-satisfied appearance than the chunky dwarf gourami, with a total length of one and a half inches and a pretty blue body offset with orange-red vertical bars. The striped gourami attains a length of four or five inches and is adorned with alternate stripes of red and blue in brilliant array. The spotted gourami is least attractively marked, with its plain gray body and dark-spotted sides. Some other species of gourami are said to weigh as much as twenty pounds.

Several species have been bred in captivity, building a nest of bubbles, five or six inches in diameter, which the male jealously guards, even killing the female in his feverish anxiety to protect his offspring. She should be removed immediately after spawning. The gourami are peculiarly subject to being preyed upon by the carnivorous plant, *Utricularia*, which catches the new-born young in its bladder-like traps, and ere long transforms them from living, moving animals into immobile plant tissues. Several

hundred eggs are laid and the young hatch in from one to three days according to the temperature of the water, which may range on an average from 65 to 80 degrees. They breed several times during the summer, at a temperature of about 75 degrees. The dwarf gourami uses both plants and bubbles in the construction of his nest.

When the fry leave the nest a few days after they hatch, it is time to remove the father, who, fish-like, suddenly shifts his unstable instinct for the preservation of his species to a shameless appetite for his own babies.

The food of the gourami is more varied than that of most fishes of its class, aquatic plants, worms, insects and crustaceans supplying its nourishment in a state of nature, to which, in captivity, a diet of scraped beef, fish and shellfish, and the prepared fish-foods, may be added.

Like paradise fish, the gourami has accessory breathing organs, adapted to air breathing. It does not quit the water, but frequently visits the surface for oxygen, of which its gills seem unable to extract a sufficient quantity from the water.

FIGHTING FISHES

Siamese Fighting Fish—*Betta splendens*

Red Fighting Fish—*B. rubra*

Fighting Fish—*B. pugnax*

Man has not exercised his brutal betting instinct solely on the result of fights between dogs and cocks with their kind, bulls with man, and men (so-called) with men. He has found a subject even in fishes, and gambled away immense sums upon the outcome of aquatic combats fought to a bloody end, his pleasure in the spectacle not having been diminished by the diminutive size of the combatants, but, rather, heightened by the wonderful colors their excitement causes them to assume.

The King of Siam, as is well known, was at one time the recipient of considerable revenues from licenses granted for such fights, in which one fish is said always to be killed, sometimes both.

Betta splendens and *Betta rubra* are handsomely colored, excitement causing the assumption of most brilliant flashes of color. They live in shallow waters and, like the paradise fish, build a bubble nest among floating plants, to which the male carries the eggs, which hatch in about twenty-four hours and the young leave the nest in a few days. The mother fish should be removed after spawning, permitting the jealous father to guard his young without murdering lookers-on. He destroys the nest when the young are hatched, and cares for them for some

days. The male *rubra* is red-brown and black with a blue-green sheen, the female plain brown. In *B. splendens* the rays of the tail are red.

Betta pugnax is a species regarding which we feel that "the least said, soonest mended." It has not been kept at the Aquarium, and there is no agreement among aquarists regarding its habits. Some say it never fights, while the Cambridge Natural History mentions it as the species most commonly used in the Siamese fish-fights; some say it builds a bubble nest, others that the male carries the eggs in his mouth till they hatch; some say it lives in warm water, others that it inhabits cool stream; some affirm that they have had it in their aquariums in the United States, others declare that the species has never been brought to this country. It is evidently a matter of confusion regarding the identity of the species.

Fighting fishes are partial to mosquitoes and other live foods, and the young have been reared on infusorians, daphnia, encyrtids, raw beef or other scraped meat, hard-boiled egg yolk, the inside of meal worms, cracker dust, etc.

Like climbing perch, the fighting fishes are adapted to air-breathing.

In this group of fishes belong also *Polyacanthus cupanus* and *P. dayi*, bubble nest builders, with habits similar to other labyrinth fishes.

ANABANTIDAE AND WALKING GOBY

The question is often asked at the Aquarium, "Are there really fishes that walk and climb trees?" The answer is that there are several species of fishes that leave the water and work their way across land for limited distances, and that they have been seen to go up the roots and trunks of trees. One, the walking fish, is said to lie on the low branches of trees for a considerable time, entirely away from the water.

THE CLIMBING PERCH

The commonest of the walking fishes is the fresh-water Climbing Perch (*Anabas scandens*), imported from India and Africa and found also in Ceylon, Burma and the Malay Archipelago. It will live a number of years in captivity, and though not handsomely built or colored, proves an interesting animal in the home. It does well in water of the temperature of the living room and will thrive for years in captivity. On being removed from the water it does not lie helpless on one side or flop about like ordinary fishes, but balances its body upon its strong pectoral fins, maintaining an upright position. Provided with accessory breathing organs which supplement

gills, the fish can live a considerable time out of water. Its gill covers and ventral fins are armed with short spines, which assist it to clamber over the land, and by hooking its pectoral fins around clumps of grass and plant stems, it secures a leverage and makes a certain amount of awkward progress.

This fish has never spawned at the Aquarium. The male is darker than the female, and the eggs are said to float loosely at the surface of the water, where they hatch in two or three days. In the natural state the young, like the adults, thrive on live food. In captivity the climbing perch takes mealworms and earthworms, chopped fish, meat and shellfish. It is shy and will hide in the vegetation of the aquarium until lured forth by the introduction of food into the water.

THE WALKING FISH

Another fish given to disporting itself on dry land and occasionally imported from Africa, Asia and Australia—and also another without brilliance of coloration or beauty of form, is the Walking or Jumping Fish (*Periophthalmus koelreuteri*), sometimes called by the English the Mud-Skipper, because of its habit of skipping about on the mud flats, but known to the African natives as the Bommi. It is one of the gobies.

The projecting eyes, set close together like twin barnacles on the top of its head, and turning in every possible direction, give the fish a droll appearance. The pectoral fins are fan-shaped and bent at an angle so that they can be used like feet, and support the weight of the body very well on land. These fishes spend much time out of water and are said to be partial to "roosting" on the branches of trees. They also remain for long stretches of time with the tail immersed and the remainder of the body out of water, which has given rise to the theory that the highly vascular tail acts as a respiratory organ.

In captivity, Mr. Walter Brind describes the bommi as thriving without sea water but requiring a liberal mixture of sea-salt or table salt in the water, and as being carnivorous, enjoying snails, worms and insects of various kinds, also accepting raw meat and chopped clam. Like most fishes, it is fond of the yolk of hard-boiled egg and of scrambled egg.

PANTODONTIDAE

BUTTERFLY FISH (*Pantodon bu-hhoki*)

One of the most pleasing of all tropical toy fishes, if proper food can be provided for it, is the butterfly fish from West Africa—one of



DWARF GOURAMI

Photograph by Dr. E. Bade.

the few fresh-water flying fishes known. It will live for several years in captivity in the temperature of the living room, and spends its time entirely at the surface, never descending for the most tempting worm that may drop. Special care must be taken to keep a cover over the tank containing the butterfly fish, which will avail itself of any opportunity to use its wing-like pectoral fins and fly out on the floor, where it soon dries up.

It will sometimes take worm-like strips of fresh beef dangled before it, but prefers live food, and when meal worms are fed, it will take only those that happen to float. In summer time flies and other insects can be fed to advantage.

The butterfly fish has been bred in home aquaria, the eggs floating loosely at the surface. The young hatch in about a week and require minute living organisms like other tropical fishes born from eggs—infusoria at first, followed by

almost invisible crustaceans, and later mosquito larvae if procurable, and small worms, such as enchytraeans; and finally are able to take meal-worms.

As with other species where the parents do not guard the eggs, it is well to remove the parents or eggs after spawning.

The large pectoral fins and long rays of the ventral fins readily distinguish the butterfly fish from all other fishes, the sexes being distinguished by the anal fin, rounded in the female, notched in the male, and the dorsal fin, pointed in the male and rounded in the female.

CYPRINIDAE

Fishes with barbels.

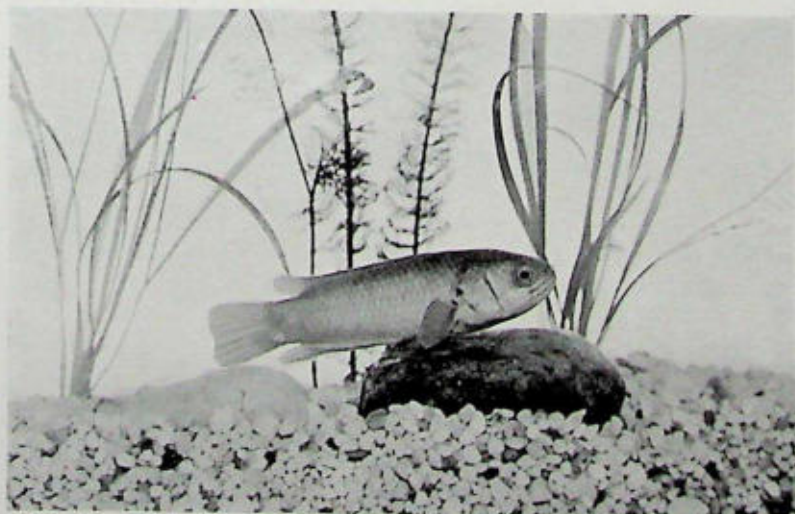
THE DANIOS

*Danio albolineatus**D. analipunctatus**D. malabaricus**D. rerio*

The *Danios*, from India and Ceylon, are among the most beautiful of tropical toy fishes, and not difficult to rear if one can save the non-adhesive eggs, which, falling among the roots of plants and gravel, are eagerly sought by the parents. Some aquarists have succeeded in rearing the young by the invention of devices for saving the eggs, and it has also been found that the packing of large, smooth pebbles or marbles in the tank, permits the eggs to fall between them where the parent fishes cannot reach with their busy little snouts. Trays of sieve-like design have been used successfully; also trays made of strips of smooth, sloping wood or glass, which permit the eggs to fall through and onto the bottom out of reach. A dense stocking with plants has also proved an egg-saver, the eggs, or some of them, finding protection among the roots.

The young hatch in from one to three days and require infusoria, baby fish-foods, rice flour, etc. The adults favor white worms, meat, fish, chopped shellfish, etc. It is necessary to sort the young at regular intervals, or they will prey upon one another.

Danios thrive very well in the temperature of the ordinary living room. Specimens of *D. rerio* have lived at the Aquarium for three years.



CLIMBING PERCH

Photograph by L. B. Spencer.

The appearance of this species can be judged from the fact that a lady once asked if some *D. rerios* at the Aquarium were baby striped bass! One and a half inches is their maximum length, and they are sometimes called zebra fish.

D. rerio from Ceylon, and *D. malabaricus* from the Malabar coast region of India, both show blue coloring, *D. rerio* having broad stripes of brilliant blue across a ground color of yellowish in the male, and silver in the female, the dorsal and pectoral fins of the male being gold, of the female colorless. *D. malabaricus* has a blue body with salmon stripes and is the largest *Danio* brought to this country.

In *D. analipunctatus* the male has blue and yellow borders on his fins. *D. albolineatus*, as its name suggests, is striped with white. Some regard it as the handsomest of all, while others deem *D. malabaricus* the handsomest.

The males of all species are smaller, more slender and more highly colored than the females, and all of the *Danios* are provided with two long, hair-like barbules on the lips.

THE BARBELS

The fishes of the genus *Barbus* are chiefly remarkable for their large and handsome scales, seemingly so disproportionate to the size of the fish. This is so characteristic of the genus that one very large species, *B. mosal*, common to the mountains of Asia and attaining a length of from four to six feet, develops scales as large as those of the tarpon—the size of the palm of one's hand. All have breeding habits similar to the goldfish excepting *B. viviparous* from Natal, which, as indicated by its name, brings forth its young alive.

A half dozen or more toy species of *Barbus* from India are familiar to American aquarists, *B. conchoni* being one of the largest and attaining three inches in length. They are all hardy in captivity. The adhesive eggs laid among aquatic plants, hatch in from thirty-six to forty-eight hours in a temperature of from 70 to 75 degrees and it is not safe to leave them with the parents. The young mature in from four to six months, and should be fed the same as goldfishes.



SIAMESE FIGHTING FISH, *BETTA SPLENDENS*

Photograph by Dr. E. Bade.

The distinguishing marks of a few of the commonest species are as follows:

Barbus semifasciatus, gray-green with black bars and red fins.

B. conchoni: one black spot near the tail. In the male a black spot in front of the dorsal fin. The male turns red in the breeding season.

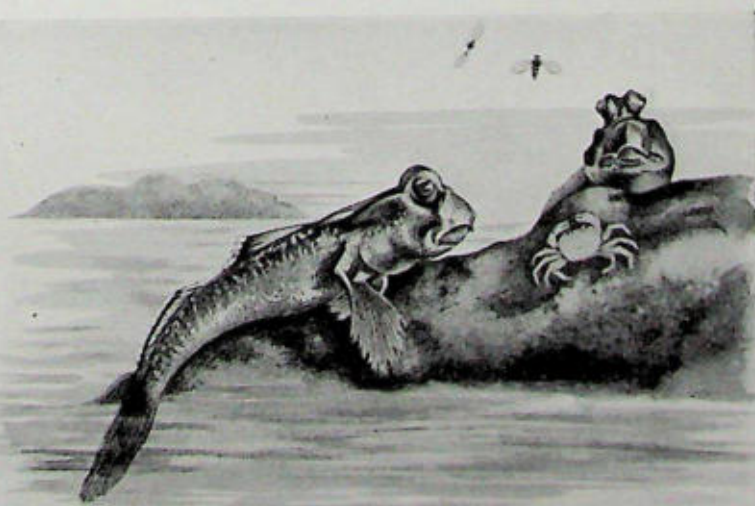
B. vittatus: black spot on caudal peduncle, and a black vertical line through dorsal fin.

B. phutunio: blue-black spots, fins orange.

B. ticto: two black spots, one near tail and one at the back of the gill cover. Fine black markings in dorsal fin of male. Otherwise this species is similar to *B. conchoni*.

JAPANESE LOACH OR DOJO

Few fishes from foreign parts are better known in this country than the long and slender Dojo (*Misgurnus anguillicaudatus*), which attains a length of about six inches and habitually



WALKING FISH

From A Naturalist in North Celebes, by S. J. Hickson.

ZEBRA FISH, *DANIO RERIO*

Photograph by Dr. E. Bade.

feeds at the bottom. It takes almost any kind of fish, shellfish or meat offered, and is a greedy eater.

There are no records of the fish having been bred in captivity, though it will live for upwards of five years in the home aquarium. Dojos are found in China, Japan, and Formosa, and their appearance and habits are similar to those of European loaches, which see.

NANDIDAE

Fishes with Transparent Tails

BADIS BADIS

From Eastern India comes *Badis badis*, with stripes of yellow on a brown and blue body, long dorsal fins and transparent tail. The ventral profile of the male is concave, of the female convex. *Badis badis* will lay its eggs in a flower pot, the male protecting them till they hatch, in about three days, fanning them with much devotion and concern. But when the young begin to move about, it is well to remove both parents, for, fish-like, they have but a fickle fondness for their offspring. Live food, meat and fish are the foods preferred.

POLYCENTRUS SCHOMBURGKI

Some species of *Polycentrus* are found in West Africa, but this species comes

from the British West Indies and South America. It attains a length of two inches, and the male is darker than his mate, shading from brown and blue to near black. The fish will lay its eggs among the plants or in a flower pot, and the male protects them during incubation, which lasts about four days. It is well to remove the female after she has spawned, and the male as soon as the eggs have hatched.

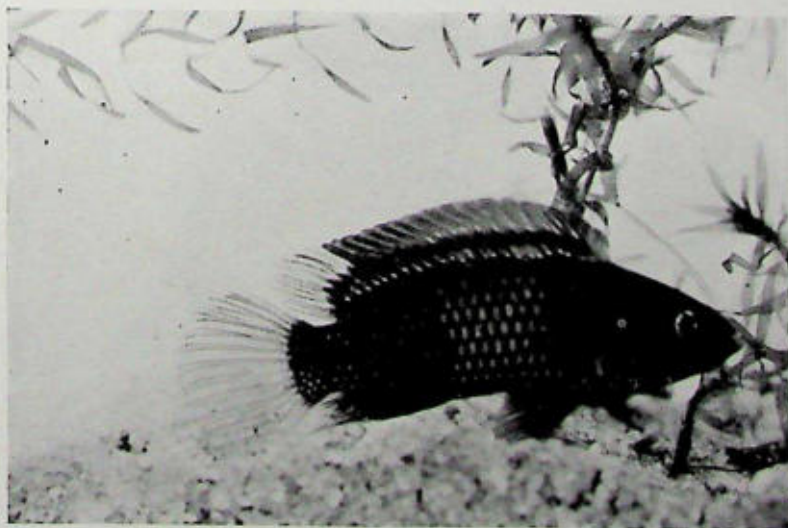
Their preference is for live food, and they require to be fed on small crustaceans, worms, flies, etc.

TROPICAL FISHES TO PLACE TOGETHER

We do not maintain a "happy family" tank of tropical toy fishes at the Aquarium, preferring to keep each species by itself. Others have found it possible to place together the following species: Guppies, Swordtails, *Platy-pocelida*, *Haplochilus*, *Danios*, Barbels, *Mollinisia*, *Gambusia* and *Januarius*.

HOW TO BREED MEAL WORMS

Meal worms, purchasable at bird and animal stores, are easily bred by placing them in malt or corn meal, in a glass receptacle with a cover. A cloth should be laid on top of the malt or meal and kept moist. The meal worm is the larva of a black beetle, and undergoes the metamorphosis common to such creatures. After feeding for a few months, the yellow worm turns into a white pupa, which sleeps for a short time and is then transformed into a black beetle. The beetle lays eggs that hatch into meal worms. If the receptacle is not kept covered, the beetles will fly away.

*BADIS BADIS*

Photograph by Dr. E. Bade.

THE CARE OF SICK FISHES

Formulae for all solutions referred to in the text:

Ammonia.—(To increase circulation.) 10 drops to a gallon of water, leaving fishes in the solution for five minutes.

Salt.—(Turk Islands' sea salt is the best.)

Weak Solution, for all day treatment:

$\frac{3}{4}$ teaspoonful of sea or table salt and $\frac{1}{4}$ teaspoonful epsom salt, to a gallon of water. (Change every 24 hours.)

Stronger Solution, for one-half hour treatment:

$\frac{3}{4}$ tablespoonful of sea or table salt and $\frac{1}{4}$ tablespoonful epsom salt, to a gallon of water.

20 percent. Solution, for sterilizing tank or treating diseased or injured spots—not to touch the gills: 6 tablespoonfuls of salt to a pint of water.

Potassium Permanganate.

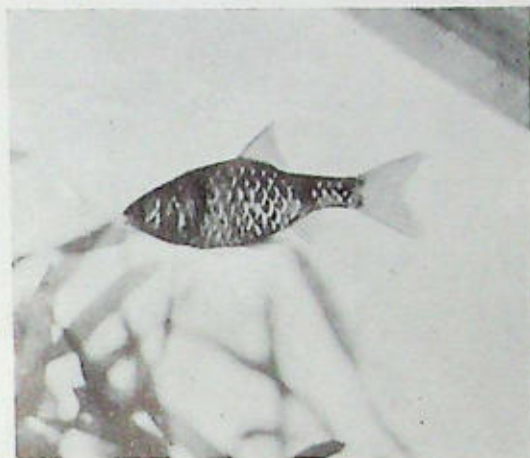
Weak Solution, for 15 minute baths:

5 small grains to a quart of water,
20 small grains to a gallon of water, or
a level teaspoonful to every 40 gallons.

Very Weak Solution, for 8-hour treatment:

2 small grains to a gallon of water.

Strong Solution, for application to injured or diseased spots. This must not touch the gills: Add just enough water to the permanganate to make a solution.



BARBUS PHUTUNIO

Photograph by Dr. E. Bade.

(For sterilizing plants, use the Weak Solution for ten minutes.)

All solutions recommended should be made up fresh for each treatment, and care should be taken, when transferring fishes from one receptacle to another, to see that the water in each is of the same temperature.

PREVENTION OF DISEASE, AND THE BEGINNING OF SICKNESS

The commonest causes of sickness of fishes in captivity are overcrowding, overfeeding, improper foods, introduction of sick specimens into a tank of healthy fishes, failure to remove uneaten food, too frequent changing of the water, too much or too little sunlight, absence of good oxygenating plants, and limited swimming space. Trouble may also ensue from the introduction of fish enemies or diseases on plants, and from the effects of chilling.

Some aquarists keep their goldfishes in health by a regular monthly bath in a weak solution of potassium permanganate, though many specimens keep well for years without this kind of treatment. All fishes are benefited by a pinch of salt in the water, either table or epsom salt. Nothing agrees so well with tropical fishes as a heightening of the temperature of the water and a pinch of salt in it.



POLYCENTRUS SCHOMBURGKI

Photograph by Dr. E. Bade.

Most diseases are contagious and sick fishes should be segregated to save the remainder. Nets should be sterilized by dipping them into boiling water or a disinfecting solution.

If a fish is ailing and the trouble cannot be readily diagnosed, regular salt or permanganate baths should be given; but if the specimen is not benefited and appears to be suffering, it is best to put it out of its misery.

Turks Island salt is generally preferable to table salt, which may contain some ingredients to prevent caking. Sick fishes can be placed in a weak solution, changed daily, and if they fail to respond, the strength of the solution may be gradually increased until double strength is used.

Shallow water, in a spot away from the bright light, is best for specimens under treatment.

INJURIES

For fishes that have received slight injuries, scales torn off, etc., it is best to remove the specimens from the water and pour on the wounds a strong solution of permanganate of potassium, returning the fishes at once to their native element and using a separate dish until the permanganate washes off, when they may be placed in their customary aquarium. Infection will not set in where this treatment is used in time.

When a fish is removed from the water its gills should be kept moist with a wet sponge or cloth, and the less handling with the fingers, the better. Removal of slime that naturally protects the scales, may ensue from the touch of a finger, thus rendering the fish liable to infection. Too little or too much slime on a fish appear to be equally dangerous. Mr. Harvey Van Cott found that a sick fish secretes more slime than a healthy one, thus allowing parasites to enter and protect themselves until they have time to bore through the epidermis. A healthy fish could brush them off.

WHITE FUNGUS—*Saprolegnia*

One of the commonest ills of captive fishes is the development of white tufts like small bunches of cotton, on various parts of the body. Fishes fed on one kind of food exclusively, unless that food is beef, seem specially liable to this disease. At the Aquarium it has been observed that if perch are fed exclusively on clams, they develop fungus; less trouble ensues if they are fed on a mixed diet of clams and beef heart, and no trouble when fed exclusively on beef heart. Fishes like common pond fishes

and goldfishes, have been kept successfully in home aquaria for many years on an exclusive diet of beef, but, like other folks, they like a variety of foods.

White fungus also results from other unhealthy conditions such as lack of oxygen, sudden changes of temperature, food decaying in the bottom of the tank, etc. If the scales are torn off or their protecting slime removed by improper handling, fungus is likely to develop. The white fungus, sometimes called water mold, has lost its color by adaptation to a parasitic existence. Dr. E. Bade has found that, as the fungus is a plant thriving only in cool bright places, the placing of an infected fish in warm shallow water in a dark place, will effect a cure.

At the Aquarium, where a collection of fishes may have become fungused through bruises caused by long journeys, we have found daily treatment in weak permanganate solution the best for soft-scaled fishes like goldfishes. For fishes with tough scales, salt treatment is most efficacious, and we inject a stream of salt water into their tank continuously until they are cured, which may take several weeks. The same effect may be accomplished in the case of toy fishes by putting them in a weak salt solution.

An effective remedy where the fungus is attached to the body away from the head, is to dip the affected part in a 50 percent. solution of peroxide of hydrogen, or a 50 percent. solution of kerosene oil. This may be repeated once or twice, keeping the fish's gills moist while the operation is in progress.

Once the fungus reaches the gills, the case is as good as hopeless. The gills soon become filled and close up.

There is a *black fungus* which we have not seen at the Aquarium but which is said to yield to the same treatment as that for white fungus.

WHITE PITS IN SCALES AND FINS THE SHAKES

This disease presents, at a superficial glance, an appearance similar to that of white fungus, but on closer examination proves to be pits and not tufts of white, on the scales and fins of the fish. It is caused by an animal parasite, one of the protozoans, by whose name it is commonly known—*Ichthyophthirius multifiliis*. It is most frequently found in fishes of the carp, trout and catfish families, the goldfish belonging to the first of these.

The life history of this parasite was studied fifty years ago, but it was not until Dr. C. W. Stiles was appointed by the U. S. Government at the time of the Columbian Exposition, to

make special studies of it, that a means of combating the pest was discovered. It is now known that the protozoan imbeds itself in the epithelial layer of the skin of its host, and after feeding on the tissues for a few days, drops to the bottom; and that it has two modes of reproduction—by fission and by spore formation. On reaching a certain stage it either divides and forms new protozoans *in situ* or it leaves the fish and drops to the bottom, where it undergoes encystment and develops spores to the number of perhaps a thousand. These make their escape in three or four days and seek a host. Their development is more rapid in warm than in cool water.

As there is nothing that can be used to reach the parasites while imbedded in the skin of the host, they must be killed during the unattached stage, which can be accomplished with solutions quite harmless to the fish.

Dr. Stiles' early experiments showed that in an aquarium at least four feet deep and supplied with a free current of flowing water, the placing of salt on the bottom of the tank, which would leave a layer of fresh water at the top and various stages of salinity between top and bottom, enabled the fish to get rid of its parasites in from one to ten days. The infected fishes were observed to dive into the salty areas at the bottom of the tank and wallow there for an instant before seeking the fresh water at the top. All parasites leaving the fish were killed on reaching the salty water.

Dr. Stiles also found that fishes could live for some days in very weak solutions of methylen blue and eosin, while parasites leaving the fish were killed in a few minutes in such a solution. These chemicals are dangerous, however, and constant aeration is necessary in employing them. Simpler and safer methods for the treatment of small aquarium fishes are therefore in use at present, and the following have been found successful.

Transfer the fishes from one to three times daily into fresh water of the same temperature. Some aquarists use two jars, leaving the patients for eight hours in one and then transferring them to the other, taking care to use jars without plants or pebbles and sterilizing each jar as the fishes are removed from it. Two weeks of this treatment are said to cure. The water in which the fishes are placed, though under any circumstances requiring to be changed from once to thrice daily, may contain a weak solution of salt or a very weak solution of permanganate of potassium.

For tropical fishes the same treatment is recommended, with the usual advice that a heightening of the temperature of the water is always beneficial to them, and it may be raised to 90 degrees for a few hours every day. (This can be done by placing an electric bulb in or under the tank.)

The aquarium should be sterilized while the fishes are out of it, with a strong salt solution (20 percent.)

Symptoms—Fishes suffering from this disease lose their appetite, appear listless, and tremble so much that the disease has been called The Shakes. The fins may also appear ragged.*

OTHER PARASITES: CRUSTACEANS, LEECHES, ETC.

The fish may be able to rid itself of most gill parasites as previously stated, if provided with fine sand. External parasites, such as the common crustacean, *Argulus*, called the carp-louse because of its great frequency on the scales of fishes of the carp family, cannot be removed in any way except forcibly. No solution that will kill this parasite will not also kill the host. Soft brushes are sometimes used to remove the parasite, but less injury to the scales will result if the pest is picked off with a slender pair of forceps. The fish should be given a salt or permanganate bath after the operation, to prevent bacteria from entering the spots where the parasite has been attached.

Leeches and flukes are usually introduced on plants, and if they have once settled in an aquarium it is best to sterilize the entire tank and destroy such plants as are in it, for the leech can hide itself most cleverly, and its new-born young can hardly be seen at all.

FIN CONGESTION AND TAIL ROT

If blood streaks become noticeable in fins and tail, farther trouble may be looked for unless the congestion is arrested at once. It usually ends in tail rot, which, if not observed and treated in time, makes the fish "of an unhand-some look." A thin white line appears along the edges of the tail, the diseased sections later breaking up and hanging in strings. It is one of the ailments most frequently met with in

*Since this paper went to press, we learn that Mr. H. L. Canfield of the Fairport (Iowa) Fisheries Station has found carbonate of soda an effective remedy for *Ichthyophthirius* in channel catfish. He places affected specimens in a bath containing five ounces of the soda in each gallon of water, leaving them in until they become uneasy. This method kills all but the large imbedded parasites, and improvement is noticed after six days' treatment.

aquarium fishes, often ensuing after the introduction of new plants or fishes into a previously healthy tank; or it may be caused by poor conditions in the aquarium,—too many fishes, or too much food given in a small tank where there is not enough swimming space for the fishes to exercise. The trouble is highly contagious.

For fin congestion give daily baths—permanganate baths in weak solution, or all day salt baths. The ammonia treatment may also be used as an adjunct to salt or permanganate baths.

When the tail is affected remove the fish from the water, keeping its gills moist with a wet cloth or sponge, and if the trouble is slight, hold the tail in a 10 percent. solution of peroxide of hydrogen for two or three minutes. If the tail is stringy, hold it for half a minute in a 50 percent. solution of peroxide, or a 50 percent. solution of kerosene oil, or a strong solution of potassium permanganate. Repeat this treatment for several days in succession. The rotted portions will drop off, or they can be removed by cutting. Mr. William E. Meehan has found an effective remedy in turpentine, dipping the affected tail into turpentine and then into phenol sodique daily until cured.

COLDS OR GILL CONGESTION (ALSO CALLED GILL FEVER)

This trouble in infant specimens has already been treated under Goldfish (The Fry).

Gill congestion in older fishes is often caused by parasites, which many fishes rid themselves of by sifting fine sand through the gills, taking it into the mouth and briskly ejecting it backward. The gills may become pale and swollen when the fish has taken cold, and a half hour's salt bath is most helpful, repeating daily or oftener. Fever may be reduced by giving the specimen a bath in a solution of eight drops of sweet spirits of nitre in a gallon of water.

Feed ailing specimens twice a day with nourishing foods such as scraped beef or lamb, or chopped oyster, and, if procurable, small pond snails or crustaceans.

Any serious affection of the gills is fatal, but a valuable fish is always worth bothering with, and there is some satisfaction in knowing that one has not allowed an animal to die without earnest effort to save it.

INDIGESTION

The fish may become dizzy, lose its equilibrium, and stand on its head indefinitely, or lie on the bottom of the aquarium; and its

abdomen may appear swollen—all symptoms of digestive disturbances.

For this trouble, all day salt treatment has been found beneficial; also ammonia baths and a slight raising of the water temperature. Castor oil may be given by soaking some food in the oil or removing the specimen and dropping four or five drops down its throat. Otherwise, food may be omitted for three days, or, in bad cases, for a week. In the case of tropical toy fishes, which nibble continually at the plants and find food in the algae of the aquarium, regular feeding may be omitted for ten days.

The general belief is that too much feeding with prepared foods and too little with animal food, causes this trouble.

In case of any sickness in which indigestion is suspected as a contributory cause, it is well to discontinue feeding for several days or a week. Fishes will live longer with no food than with too much of it.

GENERALLY INCURABLE DISORDERS

Swim-Bladder Trouble: The fish loses the power to maintain its equilibrium for longer and longer periods, remains indefinitely at the top or bottom of the tank, or swims in a lop-sided fashion. The same remedies may be tried as for indigestion, with which this trouble is sometimes confounded. Placing the fish in warm shallow water (60 degrees to 75 degrees for goldfish, 85 to 90 degrees for tropicals) is thought to give relief.

Consumption is manifested by the thin sides and seemingly enlarged head of the specimen, sunken eyes, loss of appetite, listlessness, etc. General wrong conditions or internal parasites may cause it. A meat diet may be tried, but no cure is known unless it be to place the fish in an open pond and let Nature take care of it.

Dropsy reveals its presence in the bloated appearance and distended scales of the fish, little gas bubbles sometimes forming on the exterior. It is supposed to be caused by a disordered liver, and while the disease is generally fatal, there are certain remedies that one may have the satisfaction of trying. Salt baths appear to give relief, and tapping has been tried by inserting a needle just under the scales above the ventral fin on each side, in an upward direction. Mark Samuel suggests that as the disease does not kill till it reaches the brain, the fish may be made more comfortable by placing it in a solution of five to ten drops of digitalis to a gallon of water. This treatment is even reputed to have effected an occasional cure.



MAGELLAN UPLAND GEES

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GIRAFFE HOUSE

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FAR-DISTANT ZOOLOGICAL PARKS

The National Zoological Gardens of South Africa, at Pretoria

Illustrated with Official Photographs by the South African Railways

By A. K. HAAGNER, Director

THESE are the oldest Zoological Gardens in South Africa, having been founded in 1900, when the few living animals got together by the then Director of the Transvaal Museum in the yard of the old building on Market Square, were moved down to the present site. This was Government Ground, known as "Rus-in-Urbe," and it contained two dwelling houses which were once used as boarding establishments for the Government Boarding School (called the Gymnasium School, not far distant). These dwelling houses eventually became the residences of the Director and Assistant, respectively.

The commencement of the Zoo was very modest, the entrance gate being a single narrow one of wood with the word "Dierentuin" painted on a board above it. The first buildings consisted of a small wooden cage of two partitions for monkeys, another similar one for baboons, a series of wood and iron aviaries and a corrugated iron building of four compartments opening into four large wire netting paddocks, for antelope. Nothing remains today of these buildings, which were pulled down and the material utilized for various smaller buildings as the old ones were replaced by more imposing and substantial structures.

To the late Dr. J. W. B. Gunning, the first Director, belongs the honour of founding the institution, and his keenness and energy induced the Government to give it an annual grant, which was eventually increased to its present day amount of £6,000. The Institution is governed by a Committee or Board of Management appointed by the Government and consisting of public men, government officials and municipal representatives. The late Mr. Andrew John-

ston was Chairman for twenty years, and he was largely instrumental in producing the rapid growth of the Gardens, repeatedly collecting money for much needed buildings or improvements. He also personally contributed considerably to the funds. Mr. Harry Jorissen, Deputy Governor of the Central Bank, succeeded Mr. Johnston as Chairman, and takes an active interest in the Institution.

Besides the Government grant and gate entrance fees, the Institution receives a small municipal grant, and a small fund from annual subscribers, chiefly mercantile firms of the town.

A band or orchestra plays in the grounds every Sunday afternoon, and the tea gardens are spacious and pleasantly situated under the shade of a clump of eucalyptus trees.

The Gardens are noted for the lovely shaded avenues of stately trees, the beautiful flowerbeds, its sub-tropical aspect and general "lay-out." The area in use at present comprises some forty acres, and there is another portion of thirty acres on the north side of the Aapies River (which traverses the grounds from east to west), for further extension in the future.

The collection of animals usually numbers 1,600 specimens, composed of 600 mammals, 900 birds and 100 reptiles and fishes.

Among the more noteworthy groups are a fine collection of South African antelopes, and an equally fine array of South African birds of prey and South African game birds. The series of lions and leopards is very good, and most of the South African carnivores are represented.

The aviaries are spacious, and of ample size to contain well grown trees and shrubs.



NEW MONKEY HOUSE AND ROSE GARDEN

The paddocks for antelope and deer are fairly large, and the housing facilities quite adequate for the climate. Recently, a large Monkey House has been constructed containing fifteen roomy open air cages with small night houses attached. It should be mentioned here that, owing to the lovely, salubrious climate of Pretoria, expensively heated night houses are quite unnecessary, excepting for reptiles and a few tropical monkeys.

The following is a brief resumé of the collections: Near the entrance gate and to the right, will be found the Nocturnal House containing a collection of rodents and carnivora that sleep for the best part of the day. These include the porcupines of South Africa and America, the South African spring-hare

(*Pedetes cafer*), the coati-mundi of America, and several of the Mongoose family, including the black water mongoose and the white-tailed mongoose of South Africa.

Swinging on their perches under the shade of a fine avenue of silver oaks will be found a good collection of the larger parrots, including the South American macaws and Amazon parrots, Australian cockatoos and parrakeets, the black Vasa parrot of Madagascar and some Indian species.

Not far from the main entrance is the Octagon House containing the leopards, including a fine pair of black panthers from the Straits Settlements, the hyenas, spotted, striped and brown, and a puma received by exchange from Washington.



MAIN AVENUE AND CHEETAH CAGES



HOUSE FOR DEER

Opposite this installation are some open-air cases containing the lynx, cheetah, and several cats. On the left of the main avenue are situated the large duck pond, containing white and black swans and a variety of ducks, and also the sealion pond, which is concrete lined. On the right are the Indian blackbuck and South African springbuck camps with rustic houses. This is followed by the Pheasantries—ten large open air cages with night houses—for game birds and pigeons. Here are located a collection of Chinese pheasants and South African game birds, including crested and crowned guinea fowl, francolin of six species, bustard of four species, including the large giant or kori bustard that weighs up to thirty-five pounds.

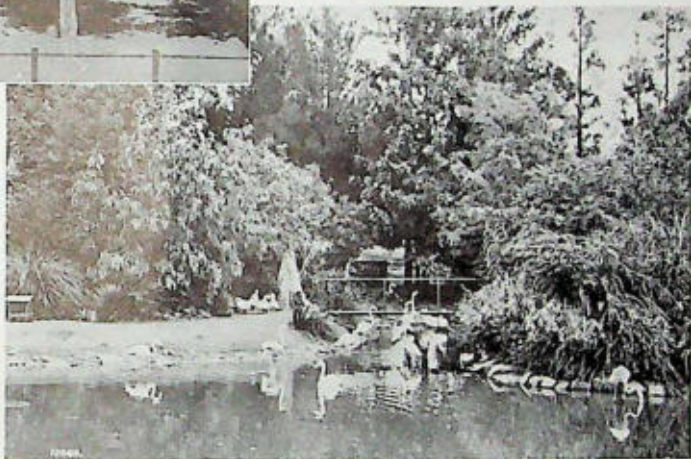
The large Flight Aviary nearby measures 135 feet by 38 feet, and contains mulberry and macrocarpa trees. Here are located four kinds of peafowl, including the albino, or white; the ibises, herons, storks, gulls, etc. Three blocks of paddocks contain several species of deer, including the red deer of Europe, the Indian hog deer, rusa and sambar deer and the fallow deer. A block of eight smaller paddocks contain a collection of Australian marsupials—wallabies and kangaroos. All species of deer and kangaroos breed well here.

The Bear House contains American black bears, gifts of the New York and Philadelphia Zoological Societies, polar bear, the brown bear of Europe, and the Alaskan bear.

The Lion and Tiger Houses contain seven lions and lionesses, and a fine pair of Bengal

tigers. Lions breed well here, although the cubs have had to be reared by tame dogs on two occasions.

Below these buildings is a Conservatory or Stove House well stocked with hot house plants—ferns, orchids, etc. To the right of this is a block of eight large paddocks for sheep and goats, including the Barbary sheep, the mouflon of Sardinia, the Himalayan tahr, and the llama and guanaco of South America.



PORTION OF LARGE DUCK POND

The new Monkey House which follows, and already has been mentioned, contains monkeys from India, America and South, East and West Africa. It includes a fine big example of the chimpanzee, a black spider monkey and a full grown Abyssinian colobus monkey; putty-nosed, Campbell's, and patas monkeys from West Africa and three species of mangabey from the same region, which with Maloney's guenon and the Angolan and South African vervets complete a fine collection of South African monkeys.

Below the Monkey House is the Giraffe House and Paddocks. Here are a fine pair of South African giraffes and a pair of dromedary camels. Paddocks for ostriches and emus, and another set for pigs, follow. Among the latter are the African warthogs and bushpigs, also the South American peccary and the Madagascar river hog.

The cages for small mammals lie between the Giraffe House and the Pachyderm House, and contain dingoes, jackals, wild dogs, wombats, mongoose of various kinds, the American woodchucks and prairie dogs, and the curious South African antbear or armadillo (*Orycteropus ater*),



PART OF FLYING AVIARY

seldom seen alive even by South Africans. It is a very difficult animal to keep alive, and the specimen now on exhibition is the third the institution has been able to rear. It has to be accustomed to an artificial diet of maize-meal gruel mixed with milk and raw eggs.

The Pachyderm House contains an Indian and an African elephant, a black rhinoceros and a fine bull hippopotamus, the largest we have



HOUSE FOR PACHYDERMS



RIDING ELEPHANT ON THE MAIN AVENUE

seen in captivity. A big bull rhinoceros was lost last year from nephritis.

We next pass a few magnificent examples of several species of palms, including an enormous date palm. The tea gardens are adjacent, below which will be found the Aviaries of the Birds of Prey—a series of eighteen large cages, each fifteen feet wide and ranging in height from twelve to eighteen feet. A fine series of eagles is located here, including the black or Versaux's, the tawny, the brown, the African hawk, the martial hawk and the crowned hawk-eagle of South Africa; also the

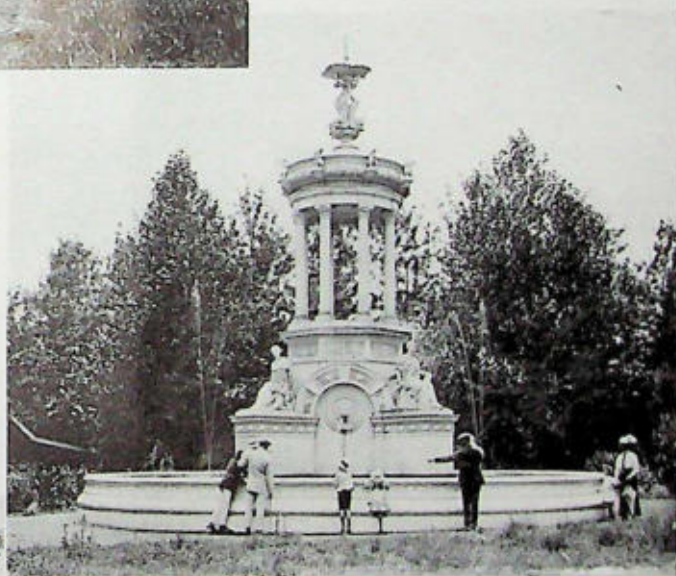
South African sea eagle (*Haliaeetus vocifer*), five species of South African vultures, including the enormous black or eared vulture (*Orogyps auricularis*), the white crowned (*Lophogyps occipitalis*), the white-backed (*Pseudogyps africanus*) and the Egyptian vulture. Of the exotic species, the condor of South America and the brightly colored king vulture are noteworthy. There also are five species of South African owls, including the giant eagle owl, and a fair collection of kites, kestrels and buzzards.

Below this are the Zebra and Buffalo Stables containing four species



AAPIES RIVER

of zebra, a zebroid (zebra-horse hybrid), the African, Indian and American buffalos (the latter better known to naturalists as the bison). Below this again is a reedbed which in summer is alive with brightly plumaged weaver and bishop birds breeding in comfort. A poplar grove and fine old willow trees growing on the river bank are much appreciated by picnic parties on public holidays.



[MARK'S FOUNTAIN



CENTRAL PORTION OF BEAR DEN

Adjacent to the buffaloes and zebras are the Canine Breeding Paddocks. The writer discovered some nine years ago that the more delicate and wilder species do much better in open-air, wire-netting enclosures with the earth for a floor and grottoes or rockeries for sleeping quarters. Here the Cape hunting dog (*Lycan pictus*), the Cape long-eared fox (*Otocyon megalotis*) and the silver fox (*Vulpes chama*) successfully breed, and the writer had the pleasure of landing all three species alive in America to adorn the collections of New York, Philadelphia and Washington.

Turning south, we proceed along a fine avenue of casuarina trees and pass large paddocks for the gnu or wilde-beast, and here are usually to be found several breeding pens for both South African species—the blue or brindled, and the black or white-tailed gnu.

The Large Bird House, with open-air runs, contains the cranes, storks and fancy breeds of domestic fowls, including a large array of bantams. Here can be seen all three species of South African cranes, the finest being the wattled crane, which is now, alas, becoming scarcer every year. In this



AARDVARK

building are situated a few small fresh water aquaria containing turtles and small fish.

Antelope paddocks follow next, and consist of three blocks containing sixteen enclosures. Here may be admired some of nature's loveliest creatures—the antelopes. The largest of the African species, the lordly eland, may be compared with the smallest—the tiny blue buck or blue duiker (*Cephalophus monticola*). The lovely kudu is represented by a family party—bull, cow and two calves—one eighteen months and one four months old. I believe this is the first record of kudu breeding in captivity. The period of gestation is the same as for the eland, nine months.



YOUNG AFRICAN BUFFALO

Here also may be seen the strange looking sitatunga (*Tragelaphus selousi*) with its splayed feet, which are admirably adapted to its semi-aquatic existence, and the lechwe (*Adenota leche*) or yellow waterbuck from Northern Rhodesia, which breeds regularly every year, and of whose progeny three were landed safely in America, and in adjacent paddocks are shown the beautiful sable antelope with its curved horns, and the stately gemsbuck with its long spear-like horns. Blesbuck, duiker, springbuck and impala—the last two the most graceful of antelopes, and noted for their leaping powers—complete the South African list, to which must be added the nylgai of India. All the species enumerated breed well in the Gardens.

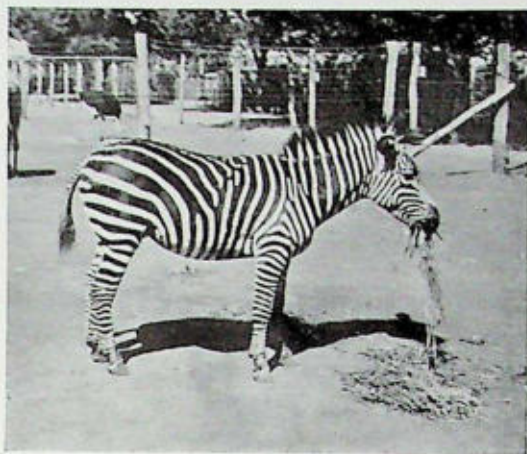


IMPALAS

An open air enclosure for rodents contains South American viscachas and golden agoutis, South African ground squirrels and various species of squirrels in a semi-wild state, breeding freely. Small cages (breeding pens) for porcupines, squirrels, etc., and a set of baboon poles fixed in concrete bring us to the end of this part of the gardens. Climbing a concrete stairway, we come to the Parrot Aviaries with the collections of various species of parrots, parrakeets and lovebirds, and also the weird-looking hornbills, including the large turkey-like ground hornbill (*Bucorvus cafer*). Close by is the duck pond already mentioned which contains flamingoes and waterfowl, and beyond this is an open space with lawns and indigenous shrubs, whereon is situated the "Marks" Fountain. Here will also be located the new open air enclosure for reptiles and the new Small Birds' Aviaries.

These much-needed additions are at present in abeyance owing to lack of funds, as the high prices of foodstuffs (produce mainly) during the last four years have made it impossible to continue the expansion of the institution. It is to be hoped that conditions will soon change, so that the National Zoological Gardens may continue their successful career.

As this article has been written mainly for American readers, the writer cannot let the opportunity pass without acknowledging his great indebtedness to the American naturalists for their wonderful hospitality and willing assistance to him during his recent visits to New York, Philadelphia and Washington. This tour always will remain fresh in his memory as one of his most pleasant recollections.



CRAWSHAY ZEBRA

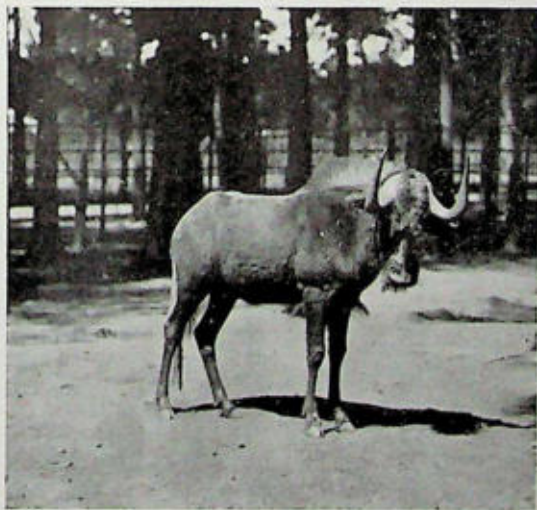


ALBINO AFRICAN PORCUPINE

HIMALAYAN POPPY FIELDS

ROOTS grow downwards, stems, flowers and fruit upward—a law which plants have worked out in conjunction with light, moisture and gravitation. So in a land which is all on edge, where mountain follows mountain, and valley upon valley like arrested waves of a troubled sea, something unusual must be done if one would have fields of wheat or poppies or rice. Such a land is the valley of the Jumna, below Lakhwar, in the foothills of the Western Himalayas, and there I turned in my saddle one day and photographed a hillside. My object was a band of monkeys which were slipping from terrace to terrace, and which proved invisible in the film. But the labor of generations of the hill folk was a worthy recompense. If a great giant should stride along the bed of the tumbling river and suddenly decide to mount to the summit of the range on either side, he

would find ready to his feet mighty steps, first of brilliant poppies, then of yellow-green wheat. Into the hard-turfed mountain sides, the patient natives have etched field after field, banked with broken rock, filled with fertile soil, from the lowest slopes to the crest. Later on I left my horse and the trail and clambered to the crest of the ridge at the meeting place of two valleys and there at the very top I found in a tiny niche the last and the highest field. It was formed by nine large stones, jammed closely together; it was six inches in diameter and four heads of wheat were sprouting from it, and I thought of the tremendous wheat fields in our western states, and I wondered what would happen to the world if these Asiatics ever developed their unending patience and resources of mind along lines which would make demands on the world beyond their borders. —W. B.



WHITE-TAILED GNU

A SCHOOL VIVARIUM.—Last year at the Washington Irving High School, the habitat of the model high school vivarium in which the Zoological Society maintains a friendly interest, Miss Florence W. Slater, head of the Department of Biology, lectured to 8,524 pupils and 208 teachers from the elementary schools of the region round about that institution. The Biological Department of the Washington Irving High School contained during the year 2,432 students.

The extent to which the living mammals, birds and reptiles, in the very practicable and well-conducted vivarium of the Washington Irving High School, have been utilized for educational purposes is indeed most gratifying. It is doubtful whether any similar effort in zoological education ever bore a greater amount of fruit than this.



ABYSSINIAN COLOBUS MONKEY

ELEPHANTS.—An elephant is intelligent, he has immense strength and a long life, and therefore has developed a very pronounced personality and a philosophy which never deserts him. Many people know a little about elephants, but some day *The Book of Hathi* will be written and it will be a eulogy and a classic. It will be a fascinating account of a wonderful end product of evolution, and unless written within the next half century it will be a memorial, there will be no wild elephants left upon the earth.

I have seen wild elephants swaying like giant tethered Zeppelins, with flapping ears and pendulous trunks, waiting for the heat of a Cinghalese midday to pass; and again in Rangoon when they piled teak, with or without the guidance of their mahout. And as they passed frolicsome calves, the eyes of the mothers wrinkled with some fleeting emotion, and they swung out their trunks in a caress like the sweep of a boom. And, once I squatted among baobab roots while an angry elephant winnowed the air above me

with her trunk seeking for some guiding scent. And the animal smell of her breath which seeped down through the foliage was terrible beyond all memories of dangers I have experienced.

When the last wild elephant is killed or captured, the world will be a little less wonderful, and when the last elephant dies, room will be made for things of less worth.—W. B.

THE BLUE BIRD OF PARADISE

By LEE S. CRANDALL

COURTSHIP displays among birds have always attracted the interest of observers.

Many remarkable habits have been made known, some almost passing belief in their fantastic extremes. These displays range from the noisy strutting of the house sparrow to the dignified and ever-wonderful spread of the peacock. Usually, though not always, they are confined to the male birds. While in a great many species the work of observation has been carried out thoroughly, and our knowledge of details is extensive, there still is much confusion concerning the actual causation. Whether it be held that these antics are for the purpose of charming the prospective bride, or merely as an escape for surplus energy, their close connection with mating and reproduction seems evident.

Specialization of plumage, taking the form of crests and similar variations, or brilliant patches of color, usually have to do with the courtship display. Remarkable effects often are produced by seemingly uninteresting species, the decorative plumage being hidden or obscured while the bird is at rest.

The development of display appendages often is very pronounced in certain groups, and appears to reach its highest point in the birds of paradise. Here every form of the bizarre and beautiful appears to have been produced, each species seeming to strive to surpass all others in aesthetic rivalry. Every degree of specialization is found, from the manucodes, with black, crow-like plumage, and only the slightly curled feathers of the neck for decoration, to those forms in which every force of evolution seems to have been exerted to produce a further marvel of beauty.

In groups wherein the means for display have been so amply provided, it follows that the birds themselves are not lacking in ability to use them. In antics and attitudes, most of the birds of paradise are unexcelled. Only in voice do they fail to meet every requirement. Here their

apparently close relation to the crows becomes evident, for the voices of all of the best known species are harsh and strident.

Unfortunately, all of the birds of paradise are very rare in captivity, due in part to the inaccessibility of their habitats, and also to their lack of stamina in captivity. Increased knowledge of their requirements has greatly improved their longevity, but the fact still remains that adult males of most species are not easily kept for any great period. Probably because of the unusually difficult and often dangerous character of New Guinea, where most of the birds of paradise are found, descriptions of the displays of wild birds are noticeably meager.

Most of our knowledge, therefore, comes from observations of captive birds, and in the case of *Paradisca*, the typical genus of the family, the facts have been reported in full detail. Three of the species of this group have been represented in our collection,—the lesser bird of paradise (*P. minor*), the greater (*P. apoda*) and Count Raggi's (*P. raggiana*). All of these birds are provided with the long, brilliantly colored side plumes unfortunately so well known in millinery commerce. In display, these plumes are raised above the wings, falling in a wondrous double arch toward the back. While thus displaying, the bird maintains a normal body position, but indulges in a variety of leaps, gestures and cries, according to the habit of its species.

Of this large and varied family, abounding in wonders, and with life histories but little known, it is not strange that occasionally a startling new fact is disclosed. Thus, when a new bird of paradise enters a collection, it is watched with more than usual interest.

Among the many fine birds brought to us in the autumn of 1920 by Ellis S. Joseph, were a pair of Prince Rudolph's Blue Birds of Paradise (*Paradisornis rudolfi*). The rarity, beauty and value of these birds placed them in the first rank among the many fine exhibits of the Zoological Park and they were cared for with great solicitude.

The male entered his molt almost simultaneously with his arrival, and as this is the critical period with newly imported male birds of paradise, his daily progress was observed with some trepidation. However, his constitution evidently was fundamentally sound, for the crisis was safely passed. As soon as the body feathers had been fully renewed, the pair were placed in a cage near the other birds of paradise. All went well for a few days, when suddenly the male attacked his mate and only her prompt



THE BLUE BIRD OF PARADISE IN THE ZOOLOGICAL PARK

Showing the bird in a normal pose, and two positions of display.
From Water Color Drawings by Herbert Kurth.

removal saved her life. This strange vagary of temperament is common among the birds of paradise, and was in accord with our expectations.

The comparatively short side plumes of the male had now reached their full length, and appeared as brilliant blue beneath, and delicate mauve above. The two ventral tail feathers or "wires" had grown to a length of a foot or more, each bearing on its tip a spatula of brilliant blue. While the bird was unquestionably handsome, his colors were not so startling as we had hoped they would be, and our disappointment in the bird's final appearance was marked.

Then, one morning a keeper who was working nearby noticed that the male bird was hanging upside-down from his perch, and otherwise conducting himself strangely. He promptly reported that the bird was in convulsions, and advocated its immediate removal to the hospital, for treatment. But more deliberate observation showed that while the bird's antics might properly be described as a convulsion, it evidently was not of the sort that calls for medical aid. He was in full display, such as perhaps had never before been seen by civilized men.

The Blue Bird of Paradise rarely has been figured. Even in museum collections, it is not a common species, though mounted specimens are occasionally found. Since all birds of this group are far more beautiful in display than when in tranquil mood, they usually are drawn or mounted in this position. Lacking knowledge of particulars, it is not strange that artists and preparateurs should be drawn into error by comparison with related species of known habits. Invariably, they have presented the bird with wings spread and plumes raised above the back, after the fashion of the *Paradisaea* group!

The display of this species, as revealed by our splendid specimen, is sharply contrasted with the conventional exhibit. Instead of remaining in an active, upright position, he grasps his perch firmly with his powerful feet and, with legs extended to the utmost, hangs head downward. During the entire display period of several minutes, the position of the feet is never changed, and the firm grip never is relaxed.

Viewed from the front, the plumes, inconspicuous and rather disappointing when at rest, form a brilliant, inverted triangle, with the raised feathers of the abdomen completing the center. In the middle appears a longitudinal, ovate patch of velvet black, bordered above by a narrow band of dull red, formed by the feathers that ordinarily clothe the abdomen.

The long, pendant "wires" rise to half their length, then droop gracefully downward on either side. The wings are held tightly closed and the head is turned upward.

During the display, the body is moved forward and back, with the hips as a fulcrum, and with a violent motion of the body the plumage is frequently spread to its widest expanse. The white lines of feathers which border the eye above and below, are conspicuously extended, leaving the bird only a narrow slit through which to peer at the observer. Throughout, the bird sings softly, in a low, grating voice, moving his head slightly by sharp jerks. This habit of singing, in which the Blue Bird of Paradise often indulges when not in full display, seems peculiar to this species.

Taken altogether, the display of this bird is a beautiful and marvellous sight. The rapid vibration of the body causes the brilliant blues of his plumage to run in waves of color over the entire filmy triangle. The dead black spot in the center is made more conspicuous by the contrasting color about it and when seen under certain lights, appears more like a deep cavity than a mere patch of plumage.

As far as we have been able to determine but three living Blue Birds of Paradise besides our own ever have reached Europe or America. The first of these, an immature male, brought to England by collectors in the employ of Sir William Ingram in 1907, was the subject of an article written by the owner for *The Avicultural Magazine*, from which the following is quoted: ". . . when he flew from his perch to the ground, the magnificence of his azure blue plumage was most conspicuous; the sheen of the feathers on his back was like spun glass, glistening like the ripples of the waters of the blue Mediterranean sea. . . . It must be a wonderful and entrancing sight to see the *rudolphi* displaying with his full plumage in the sunlight amidst the foliage of his dancing tree. . . . I very much doubt if we shall ever see his like again. . . . but, as long as I live I shall always think of what might have been had my bird lived to renew his plumage and to give an exhibition of his display."

The sight for which Sir William Ingram expresses so much feeling is now seen daily by many among our throngs of visitors and not all are lacking in appreciation of its wonder.

Boswell's original proof sheets for his "Life of Dr. Johnson," with corrections marked, have just sold for \$2,200. Nowadays the printers charge more than that for correcting anybody's proof.—*Sun-Herald*.

ZOOLOGICAL SOCIETY BULLETIN

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ELWIN R. SANBORN, *Editor*

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THAT GAME SLAUGHTER IN NATAL

Several months ago fragmentary bits of news came to America by way of England concerning a great slaughter of game that had taken place in the Transvaal, seemingly under government auspices. The early information received was brief and fragmentary, and gave no detailed reasons for the massacre of zebras and other species of game that has taken place.

In due course of time we received from the British Society for the Protection of the Fauna of the Empire, expressions which betokened its strong disapproval of the whole occurrence.

At last, however, we are in receipt of direct news from South Africa which uncovers the whole situation, and shows it in clear but hideous perspective. The ignorance, the sordidness and the blood-guiltiness of the whole affair is disgusting beyond words; and the savagery of it is quite unparalleled in the annals of British colonization. Even the casual reader can measure the depth of the iniquity of it by the fact that four of the twelve much prized and long protected remaining white rhinoceroses of South Africa, now found in South Africa in the Transvaal only, and most carefully preserved through a period of twenty years, were slaughtered in the drive, and left to decay on the veldt!

From a thoroughly trustworthy South African source we have the information that the organ-

The Natal massacre should be a warning to the whole world against the perpetration of any similar crimes against wild life.—W. T. H.

ized massacre of big game which occurred in Natal about nine months ago, involved the slaughter of about 2,000 zebras and at least 1,000 head of other large game. About five hundred white men, who were called up from the towns by advertisements, took part in the slaughter, and the pretext was "the tsetse fly." In addition to the slaughter, one result of the drive was to scatter the remaining big game still further afield, and presumably to carry the tsetse fly much farther than before. Inasmuch as a great many of the men engaged in the killing never before had handled firearms or hunted big game, it is reasonably certain that in addition to the game killed thousands of head were wounded, of which many must have died of their wounds.

In the first instance it was supposed that the game destroyed had been seriously encroaching upon the cultivated fields and gardens of civilization; but the facts seem to be otherwise. It seems that the theatre of the massacre did not consist of cultivated lands. It is said that the men who take up such lands as those occupied by the game do so for the purpose of exploiting the game and the timber, and when those are exhausted they return to the high and healthy parts of the country, leaving behind them a devastated and barren wilderness.

This, we repeat, is the statement of a competent South African authority who is thoroughly familiar with the whole situation.

We deeply regret the lapse backward into savagery of the perpetrators of the appalling slaughter described above. It is to be hoped, however, that the horror and aversion which it has caused in the minds of all fair-minded and humane Englishmen will go far toward preventing such exhibitions in the future.

We are quite familiar with the arguments usually brought forward in defense of the slaughter of big game that happens to be in touch with our so-called civilization. We do not believe in the perpetual maintenance of unbearable wild animal nuisances. It is quite conceivable that under certain conditions the checking of the increase of big game by well regulated killings can, and occasionally does, become necessary, although so far as the experience of the world has gone, such justifiable occasions are few and far between. But the wholesale slaughter perpetrated in Natal is an entirely different matter. It seems to have been conducted with blind ferocity and blood-thirstiness that did not stop even at the destruction of the most valuable wild animal asset of Natal—the white rhinoceros. In Rhodesia, where twenty

years ago a few white rhinoceroses still remained, the fine for killing one was £250; but how different nine months ago in the Transvaal!

MR. DITMARS' PURCHASES IN SAN FRANCISCO.

NEW and interesting specimens are steadily arriving. Two orang-utans, a slow loris, five Prevost's squirrels, a twenty-foot regal python and a twenty-two foot black-tailed python were recently brought from San Francisco by the writer. They arrived from Calcutta and Singapore, on the steamship *Granite State*. It is seldom that so large a collection of interesting animals arrives on the Pacific coast, and in this instance it was necessary to send a member of the Park staff to inspect, purchase and care for a consignment during the transcontinental journey. This seemed particularly urgent in the case of orang-utans, in memory of the recent loss by a dealer of a fine orang-utan that was shipped unattended from California to New York, with safe arrival guaranteed.

The writer was kept thoroughly busy during nine days in San Francisco, chiefly in protecting the oranges from changes in temperature. The days were warm and the nights decidedly cold. On two occasions the temperature dropped as low as 48 degrees. As there were no places to quarter them, the larger orang—of rather savage disposition—was placed in a south (and sunny) room of a warehouse, where he fared well during the day, but shivered at night. He was provided with an army blanket, and fortunately had enough intelligence to wrap up in it.

The smaller orang was kept in the writer's room at the Hotel Saint Francis upon reluctant permission from the management. Our considerable stay in San Francisco resulted from the arrival of a pair of anoas, or pygmy water buffalo, described in a previous paragraph. When the writer was able to leave for the East he transported all of his specimens as baggage, through special permission of the Southern Pacific Company, having been given sufficient room on the Overland Limited, a three day train to Chicago. This arrangement gave immediate access to the animals, and the facilities of kitchen and refrigerators of the dining car.

The animals fared well, and really seemed to rejoice in the heat across the desert and the Nebraska plains. At Chicago, some generous

courtesies were extended by the officials of the New York Central Lines. The animals were quickly transferred to a baggage compartment on the Lake Shore Limited, and reached New York twenty-four hours later. Thanks to the generous co-operation of our railway friends these animals were subjected to only four days of travel. En route the oranges and other mammals were fed moderately, three times a day and safely placed on exhibition in the Park. The orang additions were particularly gratifying, for these additions had long been desired.

—R. L. D.

ZOOLOGICAL PARK NOTES.

By RAYMOND L. DITMARS.

San Francisco Sea Lions—The Seal Rocks near Golden Gate Park, San Francisco, always a point of great interest to visitors on the Pacific coast, are not densely populated this summer. Evidently the sea lion herd has migrated to the Farallone Islands. The few sea lions on the rocks, however, are of large size, with a quite majestic bull of the Stellar sea lion species in spectacular prominence. Mr. John MacLaren, Superintendent of Parks, informed the writer that a huge bull steadily frequented the rocks for a period of about twenty years. One day it was found dead, and washed up on the beach, apparently a victim of old age. This fine specimen, which appears to have weighed at least twelve hundred pounds, is now mounted in the fine sea lion group in the museum building in Golden Gate Park.

Reptiles—Exchanges with the London Zoo.—The Zoological Gardens of London, through Dr. E. G. Boulenger, Curator of Reptiles, recently asked us for an exchange of reptiles, and we immediately shipped them the following specimens: 10 timber rattlesnakes, 4 water moccasins, 2 copperhead snakes, 4 hog-nosed snakes (northern), 2 hog-nosed snakes (southern), 6 water snakes, 2 coachwhip snakes, 1 gopher snake, 2 bull snakes, 2 king snakes, 3 spotted turtles, 4 wood turtles, 3 painted turtles, 4 box tortoises and 4 large bullfrogs. The shipment left on the Cunard steamship *Albania*. All the specimens arrived in good condition. In return Dr. Boulenger shipped us the following species: 4 black mambas or spitting cobras, 12 European vipers, 6 grass snakes, 6 dark-green snakes, 1 smooth snake, 2 sand boas, 12 pond turtles, 4 spike-tailed lizards, 1 Indian monitor, 1 cyclodes, 12 salamanders and 2 fire-bellied toads.

The spitting cobras were of particular interest. This very dangerous snake of southern Africa must be handled with great caution. Its tactics of defense are varied and formidable. It feigns death, then suddenly hurls itself at any one unsuspecting such habits, or rears in true cobra fashion and ejects fine jets of venom at the eyes of an intruder. Col. Roosevelt was much impressed with this reptile, and describes it in the narrative of his great African collecting expedition.

Our Beavers Build a New House.—For some reason unknown to us, our beavers have decided to "move." The old house has been occupied for a number of years and as the colony increased in numbers, additions were constructed to the south and east, until the structure appeared like a fair-sized island, with a foliage of high weeds. Of late years a small tree developed upon it. The house appeared to be a thoroughly established structure, satisfactory in every respect.

Early this spring the beavers were observed digging tunnels into the shore around the pond. They concentrated work upon one of these, emerging about ten feet inward from the shore line, where they dug out a circular gallery, full of water from the tunnel. Leaving enough of the ground above to form a generous living platform, above water, they then began extensive activities in gathering brush, sticks and mud. In a short time the familiar dome-like house rose over the skillfully planned foundation. The old house, now deserted is gradually sinking and disintegrating, showing that a beaver home needs constant attention from these animal engineers if it is to remain in habitable condition.

A Noisy Primate House.—The Primate House, never more crowded with specimens than now, has become the noisiest exhibition centre in the Park. The most vociferous chorus occurs in the morning. The first number is produced by three lusty gibbons—two hoolocks and a white-handed gibbon. Before the arrival of the former, with a shipment of animals purchased in London by Curator Crandall, our white-handed gibbon (many years on exhibition in the Park) gave occasional samples of his prolonged and piercing call. It is difficult to describe, but in effect it is a long wail, increasing in power and ascending in tone until it assumes ear-splitting intensity.

The hoolock gibbon is gifted with a call of shorter duration, but it is persistently repeated, and is even more piercing than that of the white-

handed species. With three of these animals in full cry and all of them much enjoying the operation of producing all the noise collectively possible, the effect upon the ears is almost stunning. The writer has clearly heard this chorus while on the Southern Boulevard, outside the Park and nearly half a mile away. The daily shouts and yells of Boma, the big chimpanzee, are another story.

Virgin Forest and Copperhead Snakes.—It occasionally happens that we discover a small area of country close to the city which appears quite undisturbed, and harbors a variety of wild life. The Inwood section of upper Manhattan Island, and an actual part of the city of New York, was long recognized as a spot of that kind, but now it is passing rapidly out of such standing, owing to the increasing number of picnic parties. Its grassy slopes now show numerous scars of bare earth, and the inevitable litter of newspapers and luncheon refuse that follows a fine Sunday.

Not far north of New York City, however, immediately north of White Plains, and within the township lines of the latter, there is an area about three miles in diameter, that is yet undisturbed. In this area, barely forty minutes' motor run from the northern boundary of the big city, are fine forests, rocky hills bearing mountain laurel, and brooks and lakes, although the latter now serve as reservoirs. In this area live wild foxes, skunks, raccoons, woodchucks, mink and weasels.

Even more interesting, however, and rather serious, too, is the fact that the poisonous copperhead snake is there quite at home, and in fair numbers. The reason for this appears to be that no highways traverse the ground over which these reptiles would naturally wander in search of food. If a road had pierced the centre of this territory they would have disappeared many years ago, but all of their wanderings are among swampy meadows, or among rocks and generally under cover. The discovery of these poisonous snakes marks the nearest record of venomous reptiles to the north of New York City. The writer has endeavored to locate the hibernating "dens" and thus gather the greater number of specimens. This beautiful spot ultimately will become a haven for picnics, and for future bits of real nature we must look northward toward the Bedford Hills.

The Heads and Horns Building.—The writer is preparing a "trick" motion picture to show the construction of the Museum Building on Baird Court which will house the Society's

National Collection of Heads and Horns. This picture is to be part of the program for the coming annual meeting, and it is designed to show in a few minutes the entire construction of an imposing building. Eight second intervals will represent a week's progress in building. The scenes begin with the clearing of the forest, and terminate with the arrangement and the completed installation of the specimens upon the walls.

Pictures for the Next Annual Meeting.—There will be much of interest on the program of the 1922 annual meeting. Curator Beebe is now arranging his motion picture films photographed at the Zoological Society's tropical laboratory in South America. All of this material was produced with the now famous Akeley camera. There will be views of the sloth in its native environment, the giant anteater, the leaf-cutting ant, tropical walking sticks and wonderful scenes of the impressive waterfalls at Kaiteur, that are five times the height of Niagara. The motion picture photography from the Tropical Station is the work of Mr. John Tee-Van.

A New Pair of Anoa's.—For the first time in the history of the Park we are exhibiting a pair of anoa's, or pygmy water buffalo of Celebes. In the past we have had two male specimens. The present pair arrived in San Francisco by way of Singapore, and encountered the usual rigid government inspection and quarantine. The writer was in San Francisco at the time these animals arrived, and suggested that he be permitted to take them East with him, thus transferring the quarantine to the port of New York.

There were two specifications for quarantine—a thirty-day period from the port of embarkation, and fifteen days at the port of arrival. The thirty-day period had expired during the voyage across the Pacific, but the latter period was a ground of sorrow. An immediate transfer to New York was declared impossible, and the writer came east without them, but bringing animals that could not be kept waiting in temporary quarters. Very fortunately Mr. Alex. Mitchell, of Oklahoma, and brother of our Mr. H. R. Mitchell, appeared in San Francisco most opportunely, at the time of the expiration of the final quarantine period. He successfully conveyed the animals to Kansas City, and at Chicago they were met by Mr. William Mitchell, who brought them directly through by Erie Railroad. They arrived in quite as fine condition as they were when they left Celebes, and

are safely quartered at the Small-Deer House, in charge of Keeper Riley.

An Albino Rattler.—The present star of the Reptile Collection is an albino rattlesnake, captured on Black Rock Mountain, in the Berkshires, Massachusetts. The writer observed this specimen, sunning itself at the base of a ledge, in August, 1920. He at first thought it was an alabaster or a marble paperweight left by some artist who had been sketching on the mountain. During a moment's hesitation the rattler glided into a crevice and escaped. Later in the season we hunted him, and again last spring, but without success. Early this summer Mr. R. M. Smith, of Sheffield, Mass., an ally of the writer, returned to the ledge and found the specimen coiled near a shelving rock. He shoved him out with a stick, and into a bag. This is our first record of an albino specimen of the timber or banded rattlesnake. The Park now has a number of interesting albinos. There are two albino woodchucks, an albino gray squirrel, a perfectly white Canadian porcupine, an albino crow and a fallow deer.

New Paintings of Animals.—Several important paintings have arrived to strengthen the already fine series of animal portraits at the Administration Building, in the Park. Among the recent additions is a life size oil painting by Carl Rungius of the North American puma, or mountain lion, at home among the crags of the Rockies. Another new and masterful oil painting, with the subjects life size, is by Louis Agassiz Fuertes. It shows nesting flamingoes on Andros Island, in the Bahamas. Mr. Fuertes made two trips to Andros Island to make studies of the vast nesting grounds, and to watch the birds in the care of their young. His painting is spectacular in the brilliant red coloration of the birds, the vivid green of tropical foliage and a striking cloud effect often seen in the Bahamas.

Attendance.—Despite surprises of the past year, when the Zoological Park records of attendance showed two and a quarter million visitors, the figures for the present year reveal even stronger proof of the steadily increasing popularity of the Park.

Restoring the Frogs.—Through changes in drainage, the droughts of former years and other causes, the Park ponds were slowly depopulated of frogs, and the cheery note of the green frog, as well as the impressive bass voice of the bullfrog had altogether ceased. During the past fall and the spring of the present year, this void was filled. The writer and his assistants in the

Reptile Department have very generously stocked all of the Park's lakes and ponds with frogs and tadpoles. There is now a frequent croaking of green frogs in the marsh garden, and a frequent and hearty bull-frog chorus at several points, particularly noticeable in the Heart-Shaped Pond immediately south of the Zebra House.

New Cage-Work.—A great amount of repair work has been accomplished the past spring and the present summer. One of the major jobs

was the dismantling, repairing, reconstructing and painting of the outside cages of the Lion House, with the construction of an entirely new system of permanent cage gutters of reinforced cement. The Burrowing Rodents' cages are now dismantled, and next year will be rebuilt along new lines, affording greater strength, more attractive appearance, and more room for the animals. The entire reconstruction of the outside cages of the Small Mammal House is well under way, and will be completed this year.

A GORILLA'S LIFE IN CIVILIZATION

By ALYSE CUNNINGHAM

IT was with the feelings of greatest misgiving that I settled down to the task of bringing up, or at least helping to bring up, a young gorilla, when my nephew, Major Rupert Penny of the Royal Air Force, in November, 1918, bought "Johnny Gorilla," which name we preferred to the "John Daniel" that was given him when he first came to England in July, 1918. Inasmuch as the British Government did not permit any wild animals to be brought into England at that time, John was brought in with a lot of monkeys which then were required by the government for experimental purposes.

We heard that a captain of a French ship brought John to Havre, where he was bought by an animal dealer and shipped to England with the monkeys. Soon afterward he was sold to a departmental store in London as a Christmas attraction, and it was there that we first saw him, about October or November, 1918.

Disliking anything in the shape of a monkey or ape, I did not take a fancy to the gorilla, but I thought him amusing when I saw him in his cage, clapping his hands or chest, and doing various little tricks off his own bat, much to the amusement of the crowds who saw him daily. On the other hand Major Penny had always been very much interested in primates, and he bought the gorilla with the idea of seeing how much mentality could be developed in the highest of the anthropoidal apes.

John Gorilla was captured when very young, on the seaboard of the French Gaboon country, and came to England when he was rather under three years old. He continued to amuse people in the zoo section of the store until near Christmas time, when he acquired influenza, or at least a severe cold—most probably caught from "the public." As he was in a very stuffy atmosphere

throughout the day, in close proximity to people, and he was being kept night and day in an amazing temperature of from 80 to 85 degrees, it was a case of a complete change or an early death.

John came to live with us at 15 Sloane Street, London, at the end of December, 1918. He was in a "rickety" condition and he weighed only thirty-two pounds. He stood erect with difficulty, as a photograph taken at that time plainly shows. When he left us in March, 1921, he weighed 112 pounds and his measurements were as follows: Height, standing naturally, 3 feet 4½ inches; Circumference of head, 19½ inches; Neck, 17¼ inches; Chest, 34 inches; Length of upper arm, to elbow, 12 inches; Forearm to wrist, 10½ inches; Around upper arm, 10 inches; Around wrist, 8½ inches; Top of head to seat, 28 inches; Hip to knee, 11 inches; Knee to heel, 11½ inches; Around ankle, 9 inches; Length of foot, 9 inches.

We converted a small room into a cage for him, separated from another room by bars, so that he could see and be near to people all day. The cage was heated by an electric radiator. One of the windows of the cage we had taken out, and the space was covered with several thicknesses of muslin, to allow fresh air to be filtered through. At once we dropped the high temperature he had been having down to 65 degrees. His cold got better at once.

We soon found it was impossible to leave him alone at night, because he shrieked every night, and nearly all night, from loneliness and fear! This we found he had done in the store before coming to us. He always began to cry directly he saw the assistants putting things away for the night. We found that this loneliness at night was trying on his health and appetite,



MAJOR PENNY AND JOHN
May, 1919.

besides which, we were afraid the people in the neighborhood would complain. As soon as possible my nephew had his bed made up every night in the room adjoining the cage, with the result that John was quite happy, and at once began to grow and put on weight.

By this time I was getting to like John, and to take a great interest in him. I fed him, washed his hands, face and feet twice a day, and brushed and combed his hair—which he would try and do himself whenever he got hold of the brush or comb. He soon got to like all this. My next idea was to teach him to be strictly clean in his habits. It was my ambition to be able to have him upstairs in our house at 15 Sloane Street, as an ordinary member of the household. I taught him first as a child is taught and handled. This took some time. At first I could not make him understand what was expected of him, even though I always petted him, and gave him grapes (of which he was especially fond, when he first came to us), but I think he imagined that this treatment was a punishment. At first, without other reasons, he would roll on the floor and shriek, but directly he understood what was expected of him he soon learned and began to behave excellently. This training occupied quite six weeks. About February, 1919, we took him out of his cage and allowed him the freedom of the house. Thereafter he would run upstairs to the bathroom of his own accord, turning the door knob of

whatever room he was in and also opening the door of the bathroom.

John's appetite seemed to tire of foods very quickly. The only thing he stuck to was milk, which he always liked best when warmed. We began by giving him a quart a day, raising to three and a half quarts a day. I found that he preferred to choose his own food, so I used to place for him several kinds, such as bananas, oranges, apples, grapes, raisins, currants, dates and any small fruit in season, such as raspberries or strawberries, all of which he especially liked to have warmed. These displays I placed on a high shelf in the kitchen, where he could get them with difficulty. I think that he thought himself very clever when he stole anything. He never would eat anything stale. He was extremely fond of jelly, especially fresh lemon jelly, which was often made for him, but he never would touch it after the second day.

Oranges or apples, or any fruit that had been cut he would never eat after a few hours. He loved roses, *to eat*, more than anything! The more beautiful they were the more he liked them, but he never would eat faded roses. As a consequence I hardly ever was able to have roses in the vases. He also liked nibbling twigs, and to eat the green buds of trees.

When he first came to us, I found that nuts gave him dreadful spells of indigestion, for after eating them he would lie down on the floor and groan. As he grew older he became very fond of peanuts baked in the oven, and they seemed to agree with him very well. He never cared very much for nuts of any other kind, except walnuts. With cocoanuts he was very funny. He knew that they had to be broken, and he would try and break them on the floor. When he found he couldn't manage that, he would bring the big nut to one of us and try to make us understand what he wished. If we gave him a hammer he would try to use it on the nut and on not being able to manage that, he always gave back to us both the hammer and the cocoanut. He knew what hammers and chisels were for, but for obvious reasons we never encouraged him in anything to do in the line of carpentry.

John loved to have people come to see him in his home. At first we used to admit every one who asked, but after a while I found this was impossible. Very soon we were compelled to limit visitors to those introduced by personal friends, or people who wished to see him from a scientific standpoint. Whenever people came to see him, he would show off like a child. It was his custom to take them by the hand and lead



JOHN AT THE LONDON ZOO, SEPTEMBER 1929

He went there three days each week, going and returning in a taxicab with Miss Cunningham.

them round and round the room. If he saw that a person was at all nervous about him, he loved running past them, and give them a smack on the leg—and you could see him grin as he did so. A game he was very fond of was to pretend that he was blind, shutting his eyes very tightly and running about the room knocking against tables and chairs. He loved to take everything out of a waste paper basket and strew the contents all over the room, after which he would always pick up everything and put it all back when told to, but looking very bored all the while. If the basket was very full he would push it all down very carefully to make room for more. He would always put things back when told to do so, such as books from a bookshelf, or things from a table.

His table manners were really very good. He always sat at the table, and whenever a meal was ready, would pull his own chair up to his place. He did not care to eat a great quantity, but he especially liked to drink water out of a tumbler. I always gave him some butter with his breakfast, but he seldom liked bread. Sometimes he would take a whole crust or round of toast when you least expected him to do and eat it all. He always took afternoon tea—of which he was very fond—and a thin piece of bread with plenty of jam; and he always liked coffee after dinner. He was the least greedy of all the animals I ever have seen. He never would snatch anything and always ate very slowly. He always drank a lot of water, which he would get himself whenever he wanted it, by turning on a tap. Strange to say he always turned off the water when he had finished drinking. He seemed to thrive on water, and this never prevented his taking his milk as well.

John seemed to think that everyone was delighted to see him, and he used to throw up the window whenever he was permitted. If he found the sash locked he would unfasten it and when a big crowd collected outside he would clap his chest and his hands. He was especially fond of children, and would always put out his hand in an appealing fashion and grunt with pleasure. When told to do so, he would always come in, shut the window and lock it.

He was especially fond of my little niece, three years old, who used to come with her mother to stay. John and she used to play together for hours and he seemed to understand what she wanted him to do. If she ever cried, and her mother would go and pick her up, John would always try and nip the mother or give her a smack with the full weight of his hands, evidently thinking that she was the cause of the child's tears.

One day we were going out, for which I was sitting ready dressed, when John wished to sit on my lap. My sister, Mrs. Penny, said:

"Don't let him, he will spoil your dress."

As my dress happened to be a light one I pushed him away and said, "No." He at once lay on the floor and cried just like a child for about a minute. Then he rose, looked round the room, found a newspaper, went and picked it up, spread it on my lap and climbed up. This was quite the cleverest thing I ever saw him do. Even those who saw it said they would not have believed it had they not seen it themselves. Both my nephews (Major Penny and Mr. E. C. Penny), his wife and my sister (Mrs. Penny) were in the room and can testify to the correctness of the above record.

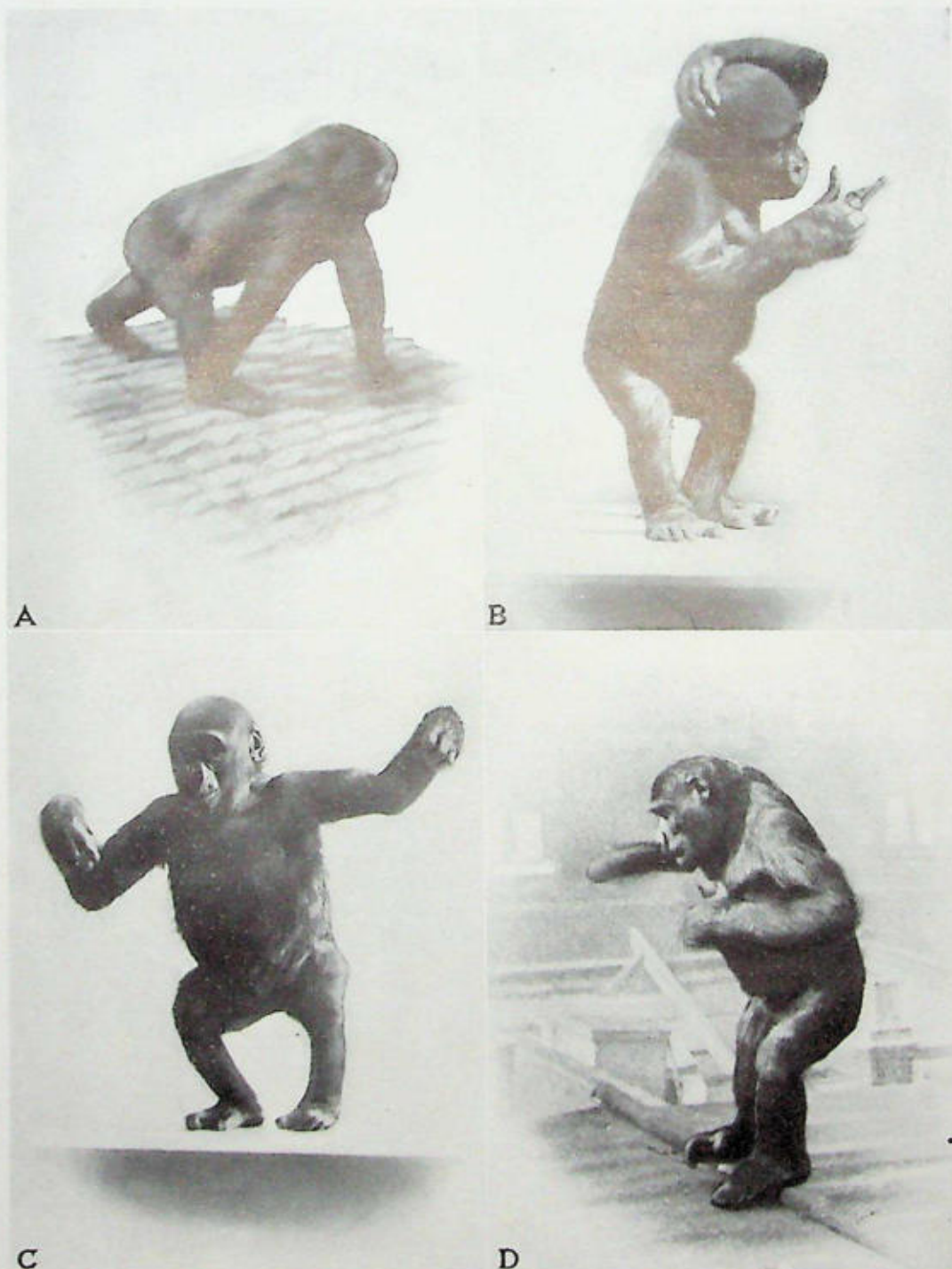
Another clever thing John did, although I suspect this was due more to instinct than downright cleverness. A piece of filet beef steak had just come from the butcher. Inasmuch as occasionally I gave him a small mouthful of raw beef, a small piece of the coarser part of the steak was cut off, and I gave it to him. He tasted it, then gravely handed it back to me. Then he took my hand and put it on the finer part of the meat. From that I cut off a tiny piece, gave it to him, and he ate it. When my nephew came home he wouldn't believe it, so I tried it again, with the same result, except that then he did not even attempt to eat the coarser meat.

John seemed to realize danger for other people in high places, for if any one looked out of a high window, he always pushed them away, if he were at the window himself, but if he was away from it he would run and pull them back.

Our gorilla could stand a lot of cold, and we often let him go on the roof in freezing weather. This he did not seem to mind as long as he could come into a warm room when he wanted to. He would then go straight to the fire, rub his chest and sit down with his feet right on the fender. The one thing, however, he could not stand was dampness during the winter, or any draught.*

We found that exercise was the thing he required to keep him in health, and my nephew used to give him a great deal of that by playing hide and seek with him in the morning before breakfast, and in the evening before dinner—up and down stairs, in and out of all rooms. He simply loved that game, and he would giggle and laugh while being chased. But he was very

*In the New York Zoological Park the terror of the animals and the animal man is the cold dampness of wet weather in winter.—Ed.



CHARACTERISTIC ATTITUDES OF JOHN, THE GORILLA.

A- The all-fours attitude common in apes. B- Erect, but physically weak (December 1918). C- John, troubled with rickets (December 1918). D- John, physically very fit, and clapping his chest (February 1921).



JOHN GORILLA AND CHILD THREE YEARS OLD
December, 1920.

cautious. He never would run into a dark room without first turning on the light! He enjoyed getting into a warm bath and sponging himself, but we could allow this only during warm summer weather.

He always went to bed at eight o'clock. He had his own little room, adjoining that of my nephew, with a spring bed and blankets. He would get out in the night by himself, go back to bed and pull the blankets over himself quite neatly. A thing he greatly enjoyed was to stand on the top rail of his bed and jump on the springs, head over heels, just like a child.

We never taught him any tricks; he simply acquired knowledge himself. We took him by train to our cottage in the country, as an ordinary passenger, without even a chain round his neck. We found he did not like fields or open country, but he was very happy in a garden or in woods. He was very much afraid of full grown sheep, cows and horses, but he loved cows, calves or lambs, proving to us that he recognized youth. At the cottage he found he had to *jump* to get water, which he taught himself in three days.

We made one very great mistake with John. His cage was used as a punishment, with the result we never could leave him there alone, for he would shriek all the time. We never were able to get a satisfactory person to look after

him, and so he became a very great tie. We tried a great many persons, but they all imagined that you could not bring up the animal without a stick. Now a stick was the one thing that our gorilla would not stand from anyone save Major Penny and myself. Presently we found out that the only way to deal with him was to tell him he was very naughty, and push him away from us; when he would roll on the floor and cry and be very repentant, holding one's ankles and putting his head on our feet.

At last our gorilla became such a tie that we knew we must presently part with him. Understanding he was to be placed in a private park in Florida and believing that these would be ideal conditions for him, we signed the contract to sell him, only to find out too late what the real conditions were to be. Unfortunately also the man sent to take him across to America had not the slightest notion how to treat him, because, although we stipulated he would stay with John for six weeks, he was with John only a very few hours. Thus was poor John Gorilla taken away from us by a complete stranger to him, with the result that from totally changed conditions and homesickness he soon became ill, and my presence was called for by cable entirely too late for me to find him alive. He died in Madison Square Garden Tower in the last week of April, 1921.



MISS CUNNINGHAM AND HER GORILLA PET
Taken in March, 1921.



JOHN GORILLA CLAPPING HIS CHEST.

From a motion picture film, taken to show the characteristic breast-beating act of gorillas.



MALAY SAMBAR DEER

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FALLOW DEER IN THE NEW YORK ZOOLOGICAL PARK

Three striking color phases, represented by the albinistic form, the typical European form and the black phase from Russia.
Photograph by Elwin R. Sanborn.

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ALBINOS IN THE ZOOLOGICAL PARK AND ELSEWHERE

By RAYMOND L. DITMARS

Illustrations from photographs by Elwin R. Sanborn

IN a period of over twenty years in a zoological park, there are many opportunities to examine specimens that vary from the typical forms they represent. We think that the Park offers for such observations a wider field than the average natural history museum. All of our animals are transient, and must be replaced, and the realization of this causes us to be constantly in touch with collectors, whose observations and captured material add largely to our records. The purpose of this article is to cite our records as to the occurrence of albinism in our collections.

Albinism is due to the lack of color pigment in the skin, affecting the external covering of hair, feathers or scales, according to the nature of the subject. An albino mammal or bird is pure white, owing to the lack of coloring matter in pelage or plumage. Albinos with a bare integument or with scales like the reptiles and fishes are usually of pinkish coloration. The indicated pinkish hue results from the blood and muscular tissue showing through the partially translucent skin. The eyes usually appear pink, the pupil but faintly indicated, owing to the lack of color in the minute muscles of the iris. Owing to the lack of this shielding color, permitting light to filter throughout the area of the iris, and consequently rendering ineffective the contraction of the pupil in rays of strong radiance, in a strong light the pure albino suffers from "halation" of vision. In a light so subdued that the pupil would normally dilate to cover the greater part of the iris, the animal sees perfectly well. The extent of albinism may be immediately noted by an examination of the eyes, and the gleaming pink iris, denoting the reflection of blood within the eye-ball, points to a purely albinistic example.

Studies of albino snakes are particularly interesting, as the more vivid color patterns still are indicated to greater or less extent, seldom being altogether absent. The writer has noted specimens with perfectly pink eyes, that were faintly ringed or blotched with yellow or salmon markings, correctly representing the location of pitchy black patterns on normal specimens.

Excluding all domestic types, the Zoological Park has exhibited albinos of the following species:

Ring-tailed monkey, raccoon, gray squirrel, Canadian porcupine, woodchuck, fallow deer, common opossum, jackdaw, crow, peacock, pheasant, quail, sparrow, rhea, alligator, rattlesnake, milk snake, garter snake, palm viper, South American tortoise and pond frog.

The list presents a fair demonstration of albinism among the classes and orders of mammals, birds, reptiles and amphibians. We realize albinism is due to the caprices of nature, and that so far as scientific investigation is concerned there are grave barriers to a definite solution, but we are, nevertheless, led to form several conclusions.

It is our belief that albinism is more prevalent among the rodents than in any of the other orders of mammals. In reaching this conclusion, the writer has given full consideration to the fact that the rodents form an extremely large order, with very abundant representatives of many of the genera. Nevertheless, in comparing this order with other orders among the mammals, we fail to note, from records gathered during twenty years, any mention of the albinos among the carnivores, except in extremely rare instances, and not always from



ALBINO AMERICAN CROW

produce albinistic progeny. In his extensive studies of the original wild bison of the plains, Dr. Hornaday found no records of real albinos from among those now extinct millions, nor does he remember from his personal investigations of living and mounted specimens having observed an indication of even partial albinism except one pale yellowish-gray specimen, distinctly off color from the normal example.

Among the birds, albinism appears to be fairly frequent among numerous orders containing species both large and small.

Albinism is fairly frequent among the reptiles, although the writer has never observed an albino lizard, nor a perfectly albinistic crocodilian. We have exhibited two albino alligators, one of which was largely pure white, but a few black



ALBINO INDIAN PEAFOWL

authentic sources. We hear of occasional albino monkeys, also of deer, but of the rodents we have constant records among some of the larger and more important species that are not particularly abundant. Even among the rodents, albinism appears to be extremely rare in certain families and genera. It is fairly frequent among the bushy-tailed tree squirrels (*Sciurus*), but appears infrequent among the chipmunks, (*Tamias*), and the spermophiles (*Spermophilus*). It is by no means rare with the American porcupine—a not particularly abundant type,—yet rare with the prairie-dog, which is very abundant over large areas and is readily observed. With the closely related woodchuck, albinism is very frequent. We have exhibited at least a dozen in the Zoological Park. There appears to be no doubt that certain species of mammals seldom or never



ALBINO RACCOON



ALBINO POND FROG

race. The typical form is olive-green, with red markings. Pale yellow specimens—about the hue of a lemon skin—and without markings, are quite common. In fact, they are seen as frequently as the typical form. In snake albinos the forked tongue is perfectly white. Albino turtles never appear to be perfectly white, but a rather dingy yellow. This is probably caused by the thickness of the shell and its horny composition.

We have noted several albino frogs, one pure white with pink eyes. The condition may be fairly frequent among the amphibians, but in the normally precarious life of such a creature



ALBINO CANADA PORCUPINES

markings adorned the back (in very bold contrast), and the eyes were silvery in place of the green-bronze iris of the normal alligator. The writer has noted a number of albino snakes, and an interesting series has been exhibited in the Park. Here, as among the animals, the condition appears to be more frequent among some genera than with others.

After many years of repeatedly observing great numbers of rattlesnakes and copperhead snakes at the "dens" or spots where they congregate for hibernation, the writer observed his first albino rattlesnake during the past year. With the blacksnake, seen in much smaller numbers, as well as the milk snake, we have noted several pure albinos of each. There is a palm viper in Central America, (*Lachesis schlegelii*), which appears to have established an albinistic



WEASEL IN WINTER PELAGE



WHITE RHEA

the handicap of attraction is too severe to permit maturity in but few instances.

It is probable that among certain groups the tendency towards albinism is more frequent than ordinarily is surmised. This would particularly be the case with the smaller types, subject to the attacks of various enemies. Many of the smaller, defenseless animals rely for protection upon a strong similarity to the ground, or to leaves. Imagine the plight of an albino quail, or a white woodcock! A normal specimen needs but to snuggle among dry leaves, remain motionless and an enemy might pass a yard away and not detect it. Eliminate the dull color of many of the smaller mammals, birds, reptiles or amphibians and they form objects that instantly attract attention, from friends and enemies alike. This condition probably spells the doom of the greater number of albinos before they attain maturity. As an instance of this condition the writer cites the record of an albino bat, observed during the past summer. This animal was noted flying in company with a number of others of normal coloration, in a clearing close to a farm house, where a bat colony appeared to make permanent abode.

It was first noted when young, soon after leaving the mother. For several weeks this pure white and striking object flitted in circles about a stable enclosure, and then suddenly disappeared. Its vivid form, both in flight, or hanging head downward by day, formed an irresistible target for hawks, owls and weasels.

In the scientific breeding of albinos there have been marked disputes, and in some instances results quite contrary to theory. Perfect albino strains of the fallow and the red deer have been produced in Europe. Albino peacocks are constantly bred. Both deer and peacocks steadily breed true to the white color of their parents. Various records show us, however, that among the first progenies of pairs of albinos from normal parents, "throw-backs" in the third generation occasionally result of practically normal coloration, and hence in possession of color pigment. Of course, partially albinistic progeny occur. Usually, however, albinos breed true, and invariably so after several generations.

Among the larger wild animals the occurrence of albinos is so rare that the meeting of albino pairs is an event of almost infinite



COMMON WOODCHUCK
Typical Color.

killed by a pot-hunter. It was found to be about seven years old. Feeling confident from the age of the buck that there might be white descendants, isolated on the island where the deer had been introduced a number of years before, he made observations throughout several years, and in 1915 captured alive a fine albino buck. That animal was placed in a large corral with several does of normal color, the idea being to establish a herd of white deer. Apparently some mysterious factor on the island inclined towards the production of albinos, for a white fawn was captured shortly after. The following year, one of the does gave birth to an albino female fawn. Another yearling albino doe was brought in from the State Game Farm. Another white fawn was born the following year, and in that same year a white doe



ALBINO RATTLESNAKE

rarity. Owing to this condition an article by George Shiras, 3rd, in the *National Geographic Magazine* of August, 1921, is of great interest, in describing a situation relating to our native white-tailed deer on the southerly shore of Lake Superior. Mr. Shiras' observations of these deer cover a period extending from 1912 to the present date, and relate to a wild herd on Grand Island, an area heavily forested, and with a shore line of about forty miles,—a miniature paradise of lakes, ponds and streams and a favorite resort for wild game. This island is now a game preserve.

Mr. Shiras explains that ten years ago an albino buck of the white-tailed deer species was seen on Grand Island, and a year later was



ALBINO WOODCHUCK

and two albino fawns were noted running free in a remote part of the island. Breeding experiments have continued, and apparently Grand Island is to be the birthplace of the only herd of albino white-tailed deer that ever existed in the United States. We expected to receive from Mr. Shiras, a photograph from his intensely interesting series, showing this very notable condition, but, unfortunately,

a miscarriage of mail prevented its publication in this issue of the bulletin.

In closing this *resumé* the writer would mention two other records personally noted the past summer and denoting albinism among the lower forms. One was an albino example of the leaf-winged locust or lesser katy-did, a grasshopper-like type found in a meadow close to the writer's



ALBINO GRAY SQUIRREL

home in Westchester County. It was a pale pink, in coloration like a faintly-tinted rose. The normal coloration of this species is leaf-green. The other example was a perfectly albinistic young chestnut tree, and the same is now growing within a hundred yards of the State Fish Hatchery, at Hartsville, Massachusetts. This chestnut is about four feet high, with perfectly white leaves. It

is growing from a crevice on a ledge, and a small shoot is extending upward from its base, the former with independent roots. It is the writer's intention to transfer the offshoot to the Zoological Park, the coming spring, and note whether a richer soil will produce the necessary chlorophyll to normally color the leaves.



ALBINO COYOTE

ZOOLOGICAL SOCIETY BULLETIN

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ELWIN R. SANBORN, Editor

VOL. XXIV, No. 6

NOVEMBER, 1921

A NEW FRENCH MEDAL FOR WILD LIFE PROTECTION

In designing, executing and awarding crosses and medals of honor for approved services, the French are the masters of the world. In that field the Americans are only in the amateur class.

Acting in conjunction with the French Société Nationale d'Acclimatation,—its parent,—the Ligue Française pour la Protection des Oiseaux has established a very beautiful and impressive medal, to be awarded by the Ligue for distinguished services to wild life. As an earnest of its high intentions the first copy was with due ceremony bestowed upon an ex-Minister of Agriculture, Deputy Raynaud, in recognition of important services in the protection of the insectivorous birds and game of France.

The new medal is of remarkable symbolism. With deliberate intention it conveys a distinct expression of remembrance of the encouragement to take up wild life protection anew that went from America to France immediately following the close of the war.

The central figure of the design is the armorial protective shield of the United States, surmounted by an eagle exulting with outspread wings, all borne on the back of a sea-gull that is flying over a stormy sea. In the distance a mass of storm clouds is being pierced by the rays of a glorious sun-burst, and above all are thirteen significant stars. This beautiful design is the work of M. Maurice Loyer, general secretary.

The art work is perfect, the execution is exquisite, and underneath all this is the highly complimentary inscription:

PRIX DU PERMANENT WILD LIFE PROTECTION FUND



As the years go by, it will be, to the creators of that Fund, a source of satisfaction to remember that in France a handsome prize is being bestowed in their name for active services in the defense of Wild Life. The reverse of the Medal bears an inscription which reads:

SOCIÉTÉ NATIONALE D'ACCLIMATATION DE FRANCE
AU
PERMANENT WILD LIFE PROTECTION FUND
EN RECONNAISSANCE 1921

This copy of the medal has been sent to the Trustees of the Fund as a token of remembrance.

Along with the medal described above, the League for the Protection of Birds bestowed its original medal, also "in remembrance," upon the New York Zoological Society, in appreciation of its sympathy and support at a critical period.



MEDAL PRESENTED "EN REMERCIEMENT" TO THE NEW YORK ZOOLOGICAL SOCIETY BY THE FRENCH LEAGUE FOR THE PROTECTION OF BIRDS.

1921



A PAIR OF NYALAS

VANISHING SOUTH AFRICAN GAME AND ITS NEED FOR PROTECTION

By A. K. HAAGNER, F. Z. S., ETC.

Director, National Zoological Gardens of South Africa, Pretoria; President, Transvaal Game Protection Association.

WHEN in New York, in 1920, I was requested to write a short sketch of the more interesting and scarcer forms of game animals found in South Africa, with particular reference to their status at the present time. I do this with all the more pleasure seeing that the request has come from a man who has courageously and consistently fought for the preservation of game animals on sane and common-sense lines.

In South Africa our difficulties appear to be worse than those obtaining in the United States. They have at times appeared to me to be so insurmountable that I have often thought seriously of "throwing up the sponge"

and acknowledging myself beaten, but my American friends have been so emphatic in their encouragement that I have been led to continue my efforts. There is, however, one big and fundamental difference between the two countries. America seems to get money together for any serious project in hand, whereas we in South Africa have to go down on bended knees to raise a few pounds for any scientific or non-utilitarian matter.

The Transvaal Game Protection Association is only a small society boasting but few members, and its funds are very meagre, but the Central Executive Committee contains, nevertheless, some very enthusiastic gentlemen who



MOUNTAIN ZEBRA COLT

devote much of their spare time to the work of the Association. Amongst these may be mentioned the hard-working Secretary, Major J. C. V. Roos; Dr. A. A. Schoch (the Assistant Attorney General of the Transvaal), Messrs. C. A. O. Bain, D. F. Gilfillan, Paul Selby and F. J. Finch-Smith of Johannesburg, T. N. de Villiers, O. Pirow, and A. S. Porter of Pretoria. Without the co-operation and assistance of these men I do not know how our Association could continue its work, but we want more help from members, and we want more members as well. The Transvaal Provincial Administration recognizes the Association to a large extent, as its recommendations are followed in the great majority of cases. It also makes a small grant to the funds, for which we are profoundly thankful.

The difficulties in South Africa are:

- (a) Our country dwellers have for generations been accustomed to shooting where and when they like, and game restrictions and laws are irksome to them. Poaching on either Government and private grounds, and contravention of the laws are not, apparently, looked upon as crimes.

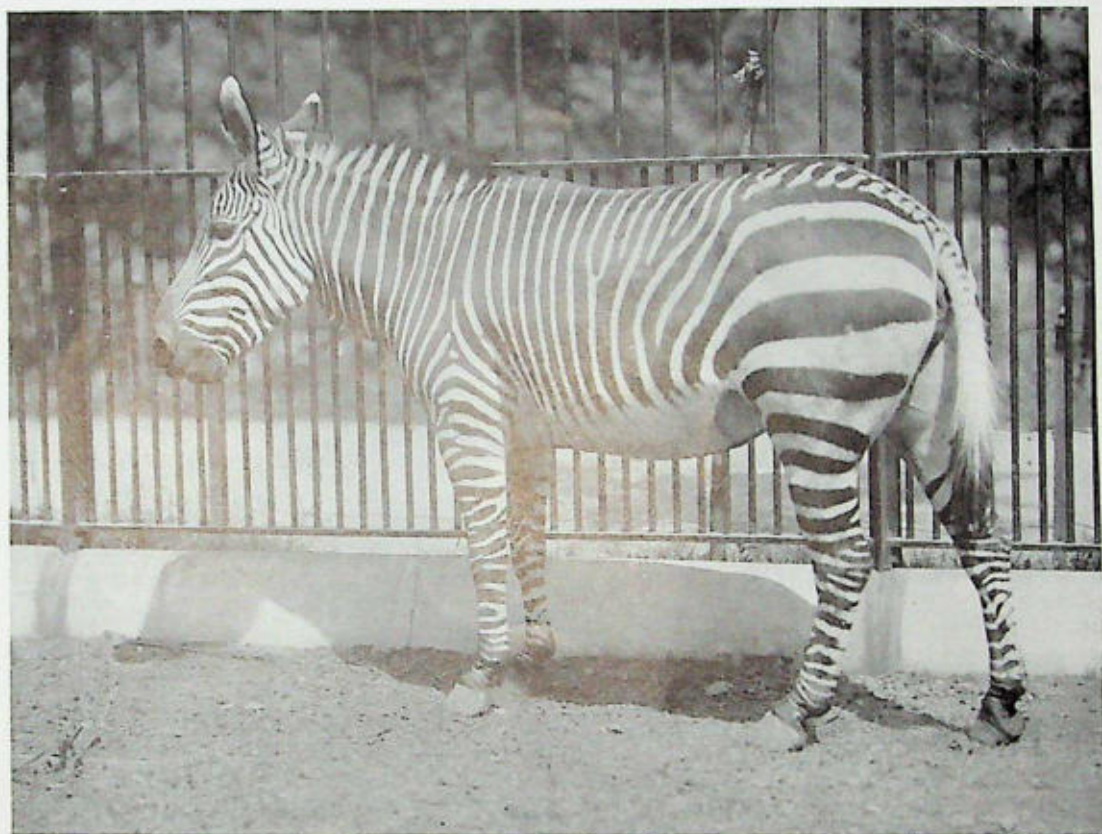
- (b) The enormous extent of territory still unsettled, or but thinly populated, renders detection difficult, and policing insufficient for the needs of the wild life.
- (c) The natives, who are born poachers and who by means of snares, traps and crowds of mongrel dogs, destroy annually an enormous number of head of game, chiefly young animals. The Native Affairs Department has been appealed to time and again to try and limit the number of these dogs, or at least to force the natives to conform to the regulations, but thus far without any appreciable result.

It will thus be seen that our difficulties are more than ordinary. Add to the foregoing the onward march of civilization and the continual inroads made upon the game territories, and the reader will begin to realize our discouragement.

I will now endeavor to give a short account of the present status of some of our most



HORNS OF NYALA, INYALA, OR ANGAS ANTELOPE
World's first record, length, 32 $\frac{3}{4}$ inches



MOUNTAIN ZEBRA IN THE ZOOLOGICAL PARK

Photograph by Elwin R. Sanborn.

valuable big game animals, and their needs for the future.

THE WHITE RHINOCEROS (*Diceros simus*).

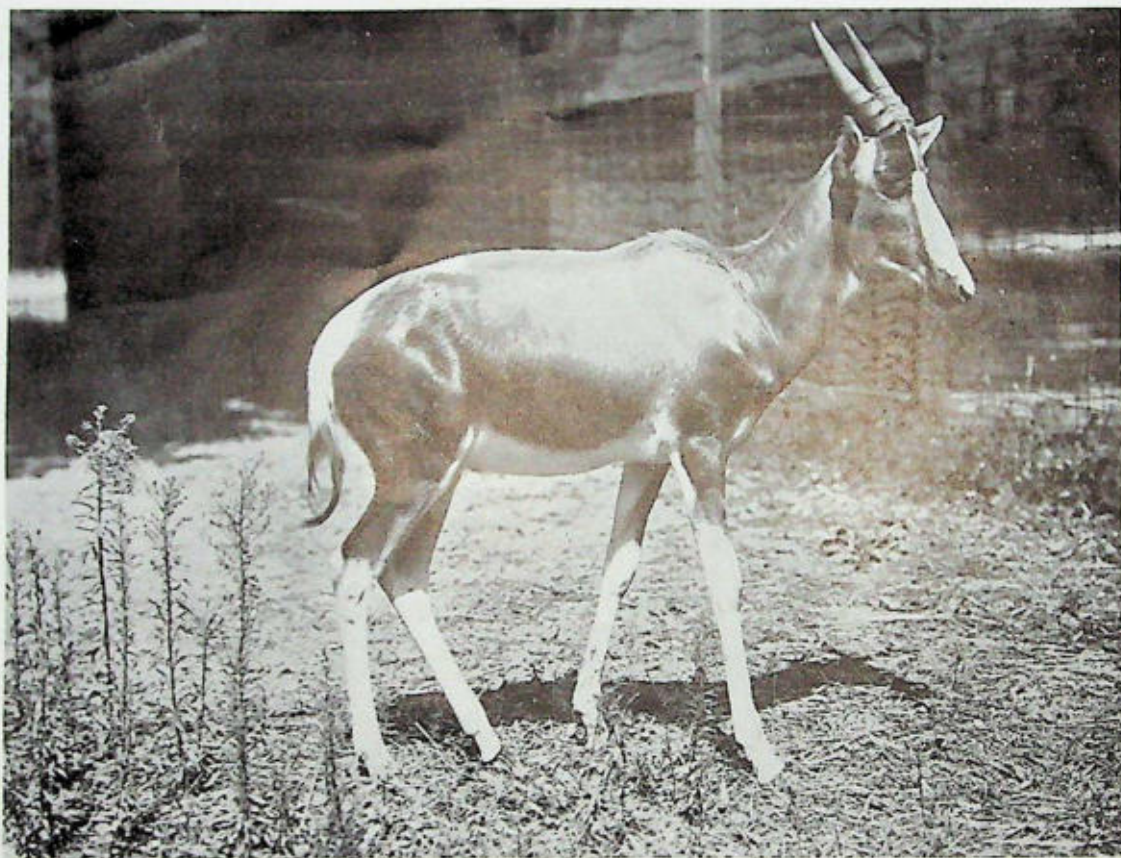
The White or Square-mouthed Rhinoceros is today only found within the boundaries of South Africa proper in Zululand.

Some years ago a special reserve was founded in this country for their benefit. This is known as the "Mfolozi Reserve," and is situated in the triangle formed by the junction of the White and Black 'Mfolozi Rivers, and extending westward for about twelve miles—an area of about 75,000 acres. One or two are occasionally found in the vicinity of the Gqokolweni Bush, as they wander southward across the White 'Mfolozi River. There are about thirty of these huge pachyderms left alive in the territory above mentioned, where they exist today by the grace of the Natal Provincial Administration. Whether any will remain after the present generation is doubtful. The white settlers of Zululand (and especially those of the Empangeni settlements) are determined that all the noble

creatures in the one-time game paradise—Zululand—shall be exterminated.

The fight grows fiercer every year, and unless the reserves in South Africa are *nationalized*, as they are in North America, we can say good-bye to many beautiful forms. The Provincial Councils leave too much of these matters pertaining to game to their small executive committees, and these may, or may not, contain men interested in the protection of game.

Recently an enormous drive was engineered by the Natal Provincial Administration, and many men from all over the Union took part in the butchery, which extended over a fairly large area in Zululand. It is said that quite a number of these so-called "sportsmen" never had a rifle in their hands before, and the mystery is that more accidents and irregularities did not take place. As it was, four of the rare White Rhinoceros were killed, and the game was scattered all over the country, thereby largely defeating the aims and objects of the drive, which was to rid the area of game and so to try and do away with the "nagana" disease of cattle (i. e., *typanosomiasis*).



BONTEBOK IN THE ZOOLOGICAL PARK

This interesting antelope, once very numerous, now is so nearly extinct that only about 300 individuals remain alive, of which 25 may be killed each year for sport. Photograph by Elwin R. Sanborn.

One must feel for Major Vaughan-Kirby, F. Z. S., the Game Conservator of Zululand, who has done his uttermost, but who is up against a tough proposition. He is, however, not the man to take opposition lying down, and it is hoped that his energetic protests will bear fruit.

NYALA (*Nyala angasi*).

This beautiful antelope is one of the most localized species we have, so far as distribution is concerned. It is found only in a few well wooded portions of a narrow strip of country along the east coast, from Zululand to Gazaland in Portuguese East Africa. In the latter country they are, however, becoming more scarce every year, owing to the poaching which the Portuguese authorities seem powerless to prevent.

In Zululand possibly about a thousand at the outside remain alive today. The principle stronghold is the Mkuzi Game Reserve. The only place south of the Mkuzi River where they are found is the 'Sipicayi Bush at the northern

extremity of False Bay. These animals, however, as a rule carry poor heads, and Major Kirby thinks that native trapping and Boer shooting will soon exterminate the species. In the Mkuzi Reserve they are numerous, and numbers are also still found in all suitable localities (i. e., bush country outside the actual sandveld) north of the Mkuzi, throughout the Ubombo and Ingwavuma divisions of Zululand.

This antelope is of a shy, retiring nature and inhabits almost impenetrable thickets, so that given a fair chance it should not be in any danger of becoming exterminated. The attitude of the authorities of the Native Affairs Department in Natal is, however, apparently one utterly lacking in sympathy for these beautiful creatures. North of Zululand, Nyala were common at Matope, south of Delgoa Bay, but are getting scarcer every year. A few still linger in the bush near Lourenco Marquez, and some are found also in isolated patches north of this place.

There is also a small territory on the Inyamapuzi River in Gorongosa, north of Beira, inhabited by these antelope, and another north of the Zambesi in British Nyasaland. This is the northern limit of their range.

THE BONTBOK (*Damaliscus pygargus*).

This pretty antelope is the southern relative of the Blesbok (*D. albifrons*) and only about 200 are left alive today. These are strictly preserved by the Cape Government and by their owners, as they exist in a semi-domesticated condition.

Herds are to be found on four farms in the Bredasdorp district and a few on three farms in the Swellendam district; and had it not been for the praiseworthy efforts of the original owners—the Van der Byls and Albertyns—this animal would no doubt belong to the past, in company with the extinct Bluebuck and Quagga.

The Bontebok is Royal Game and may only be shot during the open season. The number is limited to 12½ per cent and is controlled by the issue of permits as recommended by the local magistrates. The license to shoot Royal Game costs three pounds for one season for persons other than landowners, domiciled in the Province, and twenty-five pounds for those not living in the Province.

THE MOUNTAIN ZEBRA (*Hippotigris zebra*).

This animal was the first species of zebra to be made known to science, and in common with Grevy's Zebra of East Africa is characterized by its assinine appearance, in opposition to the equine build of the Burchelline Zebras.

It inhabits the mountainous country of the Central plateau of Cape Colony, and localized in four districts of the Province, viz., George (4 farms), 330; Oudtshoorn (3 farms), 50; Sutherland (1 farm), 20, and a few in the Cradock district, making a total of not much more than 400 individuals left alive in the Cape Colony today.

Mountain zebras are allowed to be captured only under exceptional circumstances, and as their capture is attended by a certain amount of risk to both horse and rider the price has risen from sixty pounds to eighty pounds, according to the will of the seller. They have to be galloped down and owing to the rough nature of the country they inhabit, few men will undertake the job. A different subspecies (*H. hartmannae*) inhabits the South West Protectorate.

There are several other species of antelope which are becoming scarce, such as the Southern

Eland, the Red Hartebeest, the Vaal Rhebok, the Grijsbok, and the Southern Oribi.

SAVING WYOMING ANTELOPE

IN August the State Game Commission of Wyoming had under serious consideration the question of granting permits to kill 100 buck antelope and 100 bull moose. Under the present state law they have discretionary powers in the matter.

On August 25 William C. Gregg, at that time visiting in Wyoming, wired T. Gilbert Pearson, President of the National Association of Audubon Societies, of the impending slaughter of the antelope. Mr. Pearson at once filed a protest with Governor Robert D. Carey, who is the executive head of the State Game Commission, and also sent word to other organizations interested in wild life conservation, which for years have had the habit of cooperating when campaigns for the well-being of wild life became necessary. A telegram notifying Mr. Madison Grant of the situation reached him at Victoria, B. C., Canada. Mr. Grant at once sent the following message to Governor Carey:

"New York Zoological Society protests most earnestly against the threatened butchery of antelope in Wyoming as disgrace to civilization. Antelope is only representation of genus and family exclusively American and is our most valuable animal zoologically. It is doomed to speedy extermination unless carefully protected, as only a few hundred survive in North America."

It remains only to be added that as result of the protests filed by Mr. Grant, the Audubon Society and other interested organizations the Game Commission decided not to issue permits to kill antelope, and thus once more has been averted a catastrophe to this now rare western animal.

GAME REPORTS FROM BRITISH COLUMBIA

THE last Annual Report (for 1920) of the Game Conservation Board of British Columbia contains a great amount of interesting news from a great game country.

The Mountain Goat is abundant, and more than holding its own.

Alarm is now felt about the over-killing of deer, and a "buck law" is seriously discussed.

The bag limit on Mountain Sheep has been reduced in northern British Columbia to two rams of any one species, or three in all, and



A GENUINE TREAT ON A HOT AUGUST DAY

These great tortoises bask in the sun until their shells seem to fairly radiate heat. At such a time the cooling shower from the hose affords them most evident delight. Photograph by Elwin R. Sanborn.

in the south only one ram may be killed. The Board refuses all applications to kill ewes and lambs for museum groups. In the Kootenay District the open season has been shortened.

The Wapiti is being very successfully restored to southern British Columbia by the stoppage of killing. The Elk River Game Reserve is now well stocked with them.

The Grizzly Bear now is accorded a measure of protection. None may be trapped south of the main line of the Canadian Pacific Railway, and only three may be killed under one license in a season. (A bag limit of three is one too many!)

The total amount of big game killed in 1920 was really small. The great drop in the price of fur in the early winter of 1920 rendered trapping so weakly remunerative that the fur-bearers enjoyed a much-needed rest. The total catch of animals, trapped for their fur, was as follows, as obtained by 1,812 trappers:

Beaver*	.....	
Fox	.....	105
Fisher	.....	586
Lynx	.....	1,242
Marten	.....	11,446
Mink	.....	5,387

*No figures received.

Otter	.....	245
Muskrat	.....	46,103
Raccoon	.....	1,389
Skunk	.....	185
Weasel	.....	43,489
Wild-cat	.....	149
Wolverine	.....	247

Noxious Animals Killed Under Bounty Law

Wolves	.....	84
Cougars	.....	211
Coyotes	.....	176
Crows	.....	1,955
Owls	.....	55

A CHRISTMAS BIRD CENSUS OF
KARTABO*

By WILLIAM BEEBE and INNESS HARTLEY

IT always has been an exciting feat to see how many birds one can see within a given time or limited area. Birds of a city backyard, or a month's visitors to a bramble patch, offer a gamble which is fascinating to the human mind. I once took the greatest joy in recording seventy-six species of birds within a week, in a single tree in Brazil. This widespread human interest has been used for years with most

*Contribution No. 96, Tropical Research Station, New York Zoological Society.



HAUNT OF TINAMOU, CURASSOWS AND ANT-BIRDS

In the heart of the tropical jungle, showing twisted lianas and the base of Mora trees.

important results by Dr. Chapman in "Bird Lore," whose Christmas census lists I always peruse with as much detail and interest as if I had personally been a member of every party.

Mr. Inness Hartley and I decided to have a Christmas census of the birds about our jungle laboratory at Kartabo, British Guiana, but this date occurs toward the end of the short rainy season. And Christmas was a very unusual day—as it rained from 5 A. M. to 5:30 P. M. The following day was almost as bad, so we had to compromise on the 27th of December, 1920.

From dawn to dark we covered considerable ground. One trip in the launch was made a short distance down the Mazaruni River, a walk was taken along the beach, two trips through the clearing about the tents and bungalow, and four trips in the jungle, all within a quarter-mile circumference. All the observations were made by Inness Hartley or myself, and we were out for about half the day—at various times from 5:30 A. M. to dark at 6 P. M.

On this 27th of December, 1920, the temperature was 72° at 6 A. M., 81° at noon, and 76° at 6 P. M. The morning was quiet, while the trade wind blew gently from 1 to 6 P. M. The morning was cloudy up to 11:30 A. M., while four heavy showers fell between noon and 4 P. M., with bright sun between them.

We observed 116 species of birds, distributed among 418 individuals. Of these a swift and a vulture may be classed as aerial; nine as water or shore birds; eighteen as inhabitants of the clearing, and the remaining eighty-seven tenants of the jungle itself. We had been studying the birds herabouts for seven months, and yet it is so difficult to identify birds in the high trees with any certainty that we had to shoot about twenty species to be sure of them. Besides those which we identified, we each saw at least twenty or thirty more whose identity escaped both glass and gun.

Several, such as the Goldbird and the Giant Goatsucker or Poor-me-one, were identified from the call alone—this being absolutely unmistakable.

It is interesting to note that thirty-seven species or 31% of the whole, were named by Linnaeus, emphasizing the interest of this region as the origin of most of the collections which he named over one hundred and fifty years ago.

No.

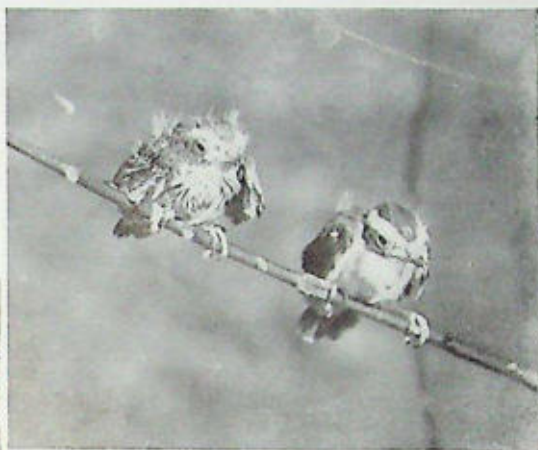
Seen	Common Name	Scientific Name.
2	Guiana Great Tinamou	<i>Tinamus major major</i> (Gmel.)
2	Variegated Tinamou	<i>Crypturus variegatus variegatus</i> (Gmel.)

1	Crested Curassow	<i>Crax nigra</i> Linné
1	Lesser Olive Guan	<i>Penelope marail</i> (P. L. S. Mull.)
3	Little Chachalaca	<i>Ortalis motmot</i> (Linné)
1	Guiana Partridge	<i>Odontophorus guianensis guianensis</i> (Gmel.)
2	Purple-tinted Pigeon	<i>Oenacnas purpureocolincta</i> (Ridg.)
6	Talpacoti Ground Dove	<i>Chaemepelia talpacoti</i> (Temm. & Knip.)
3	Great-billed Tern	<i>Phaetusa chloropoda</i> (Vieill.)
2	Common Tern	<i>Sterna hirundo</i> (Linné)
2	Collared Plover	<i>Charadrius collaris</i> (Vieill.)
2	Spotted Sandpiper	<i>Actitis macularia</i> (Linné)
1	Little Blue Heron	<i>Florida caerulea caerulea</i> (Linné)
3	Yellow-headed Vulture	<i>Cathartes aura urubitinga</i> (Pelz.)
3	Red-throated Caracara	<i>Ibycter americanus</i> (Bodd.)
1	Black-faced Hawk	<i>Leucopternis melanops</i> (Lath.)
1	Swallow-tailed Kite	<i>Elanoides forficatus yetapa</i> Bonn. & Vieill.
4	Red-and-Yellow Macaw	<i>Ara macao</i> (Linné)
5	Mealy Amazon	<i>Amazona farinosa farinosa</i> (Bodd.)
1	Dusky Parrot	<i>Pionus fuscus</i> (P. L. S. Mull.)
8	Purple Guiana Parrot	<i>Touit purpurata</i> (Gmel.)
2	Black-headed Caique	<i>Pionites melanocephala melanocephala</i> (Linné)
2	Great Gray Kingfisher	<i>Megaceryle torquata cyanea</i> (Vieill.)
2	Little Green Kingfisher	<i>Chloroceryle americana americana</i> (Gmel.)
2	Guiana Motmot	<i>Momotus momota momota</i> (Linné)
2	Giant Goatsucker	<i>Nyctibius griseus griseus</i> (Gmel.)
1	White-necked Night-hawk	<i>Nyctidromus albicollis albicollis</i> (Gmel.)
20	Swift	<i>Chaetura</i> sp.
1	Cayenne Hermit	<i>Phoebastria superciliosus superciliosus</i> (Linné)
3	Red-vented Hermit	<i>Phoebastria ruber ruber</i> (Linné)
1	Broad-shafted Sabrewing	<i>Campylopterus largipennis</i> (Bodd.)
2	Black-eared Fairy	<i>Heliothra aurita aurita</i> (Gmel.)
6	Black-throated Trogon	<i>Trogon curucui curucui</i> (Linné)
3	Green Trogon	<i>Trogon strigilatus strigilatus</i> (Linné)
3	Southern Trogon	<i>Chrysotrogon violaceus violaceus</i> (Gmel.)
2	Black-tailed Trogon	<i>Curucujus melanurus melanurus</i> (Swainson)
6	Common Ani	<i>Crotophaga ani</i> Linné
2	Black-spotted Barbet	<i>Capito niger</i> (P. L. S. Mull.)

- | | |
|---|---|
| 5 Sulphur - and - White-breasted Toucan | <i>Ramphastos vitellinus</i> Licht. |
| 1 Green Aracari | <i>Pteroglossus viridis</i> (Linné) |
| 2 Golden Jacamar | <i>Jacamerops aurea</i> (P. L. S. Mull.) |
| 1 Collared Puffbird | <i>Bucco capensis</i> Linné |
| 3 Swallow Puffbird | <i>Chelidoptera tenebrosa tenebrosa</i> (Pall.) |
| 1 Spix's Amazonian Woodpecker | <i>Celcus undata</i> (Linné) |



RUFUS-FRONTED ANT-CATCHER'S NEST AND EGGS
Cymbilaimus lineatus lineatus (Leach); a photograph new to science.



LESSER KISKADEE FLYCATCHER NESTLINGS
Taken from nest near the Station.



YOUNG DUSKY NIGHTHAWK
Hatched on the ground at the edge of the jungle.

- | | |
|--------------------------|---|
| 1 Red-necked Woodpecker | <i>Scapanus rubricollis</i> (Bodd.) |
| 2 Lineated Woodpecker | <i>Ceophloeus lineatus lineatus</i> (Linné) |
| 3 Undulated Piculet | <i>Picumnus buffoni undulatus</i> Hargitt |
| 1 Ashy-backed Bushbird | <i>Dysithamnus mentalis spodiopnotus</i> Salv. & God. |
| 5 Mouse-colored Bushbird | <i>Hypolophus murinus</i> (Sel. & Salv.) |
| 8 Cinereous Bushbird | <i>Thamnomanes glaucus</i> Cab. |
| 3 Pygmy Antbird | <i>Myrmotherula pygmaea</i> (Gmel.) |
| 5 Rufus-bellied Antbird | <i>Rhopias guttata</i> (Vieill.) |

- 12 White-flanked Ant-wren *Myrmopagis axillaris axillaris* (Vieill.)
- 1 Gray-breasted Ant-bird *Myrmopagis cinereiventris cinereiventris* (Sel. & Salv.)
- 2 Spotted-tailed Ant-bird *Herpsilochmus sticturus sticturus* Salvin
- 3 White-bellied Ant-wren *Rhamphocelus albiventris albiventris* Selater
- 6 White-fronted Ant-catcher *Pithys albifrons* (Linné)
- 1 Rufous-fronted Ant-catcher *Anoplops rufigula rufigula* (Bodd.)
- 5 Schomburgk's Ant-creeper *Myrmoborus leucophrys angustirostris* (Cab.)
- 1 Woodcock Antbird *Rhopoterpe torquata torquata* (Bodd.)
- 1 Black-faced Ant-thrush *Formicarius colma* subsp.
- 2 Guiana Spinetail *Synallaxis guianensis guianensis* (Gmel.)
- 5 Dusky-vented Philydor *Philydor erythrocerus erythrocerus* (Pelz.)
- 2 Brown-tailed Xenops *Xenops genibarbis genibarbis* Ill.
- 3 Little Wedge-billed Woodhewer *Glyphorhynchus cuneatus* subsp.
- 2 Guiana Spotted Woodhewer *Xiphorhynchus guttatus sororius* (Berl. & Hart.)
- 1 Chestnut-rumped Woodhewer *Xiphorhynchus pardalotus* (Vieill.)
- 1 Rufous-throated Woodhewer *Dendrochelidon rufigula* (Less.)
- 1 Guiana Curve-billed Woodhewer *Campylorhamphus trochiloides trochiloides* (Laf.)
- 1 British Guiana Flatbill *Craspedoprion olivaceus guianensis* McConnell
- 2 Pelzelin's Flatbill *Rhynchocyclus sulphureus* subsp.
- 2 Spotted Tody Flycatcher *Todirostrum maculatum maculatum* Desmarest
- 1 Helmeted Pygmy Tyrant *Colaptes galeatus* (Bodd.)
- 4 Oily Flycatcher *Pipramorpha olivacea olivacea* (Licht.)
- 3 Yellow-vented Flycatcher *Elania martinica flavogaster* (Thun.)
- 3 Small-billed Kiskadee *Myiarchus cinerascens cinerascens* (Linné)
- 9 Guiana Kiskadee *Pitangus sulphuratus sulphuratus* (Linné)
- 4 Lesser Kiskadee *Pitangus lictor lictor* (Licht.)
- 2 Pitangua Flycatcher *Megascops pitangua* (Linné)
- 3 Whiskered Flycatcher *Myiobius barbatus barbatus* (Gmel.)
- 1 Royal Great Crest *Oncorhynchus coronatus coronatus* (P. L. S. Mull.)
- 7 White-throated Kingbird *Tyrannus melancholicus satrapa* (Cab. & Hein.)
- 2 Golden-headed Manakin *Pipra erythrocephala erythrocephala* (Linné)
- 2 White-crowned Black Manakin *Pipra leucocilla leucocilla* (Linné)
- 3 Crackling Manakin *Manacus manacus manacus* (Linné)
- 4 Black-tailed Tityra *Tityra cayana* (Linné)
- 2 Goldbird *Lathria cinerea cinerea* (Vieill.)
- 5 Spix's Attila *Attila thamnophiloides* Spix
- 3 Cayenne Chatterer *Cotinga cayana* (Linné)
- 2 Pompadour Chatterer *Xipholena punicea* (Pallas)
- 3 Variegated Swallow *Iridoprocne albiventris* (Bodd.)
- 4 Gray-breasted Martin *Progne chalybea chalybea* (Gmel.)
- 4 White-banded Swallow *Atticora fasciata* (Gmel.)
- 3 Guiana House Wren *Troglodytes musculus* subsp.
- 1 Quadrille Bird *Leucocolepis musica musica* (Bodd.)
- 2 Sabian Thrush *Planesticus fumigatus* subsp.
- 3 Guiana Woodbird *Pachysylvia muscipina muscipina* (Sel. & Salv.)
- 1 Yellow Warbler *Dendroica aestiva aestiva* (Gmel.)
- 5 Chestnut-bellied Seed-eater *Sporophila castaneiventris* Cab.
- 7 Olive Kernel-eater *Pitylus canadensis canadensis* (Linné)
- 3 Guiana Bananaquit *Coereba chloropyga guianensis* (Cab.)
- 4 Turquoise Honey Creeper *Dacnis cayana cayana* (Linné)
- 11 Green Honey Creeper *Chlorophanes spiza spiza* (Linné)
- 1 Violaceous Euphonia *Tanager violacea violacea* (Linné)
- 2 Chestnut-headed Tanager *Tangara gyrola* (Linné)
- 6 Yellow-bellied Tanager *Tangara mexicana mexicana* (Linné)
- 8 Blue Tanager *Thraupis episcopus episcopus* (Linné)
- 2 Eastern Palm Tanager *Thraupis palmarum melanoptera* (Selater.)
- 18 Silver-beaked Tanager *Ramphocelus carbo* (Pall.)
- 2 Fulvous-crested Tanager *Tachyphonus surinamus surinamus* (Linné)
- 2 Golden-crested Tanager *Tachyphonus intercedens* Berl.
- 50 Great Black Cacique *Ostinops decumanus decumanus* (Pall.)
- 1 Yellow-backed Cacique *Cacicus cela* (Linné)
- 2 Rice-grackle *Cassidix ornatrix ornatrix* (Gmel.)
- 3 Red-breasted Blackbird *Leistes militaris militaris* (Linné)
- 1 Moriche Oriole *Icterus chrysoccephalus* (Linné)



THE HOME OF GUIANA PARTRIDGES, HERONS, KINGFISHERS AND HUMMINGBIRDS
The open jungle near the river shore.

AQUARIUM NUMBER

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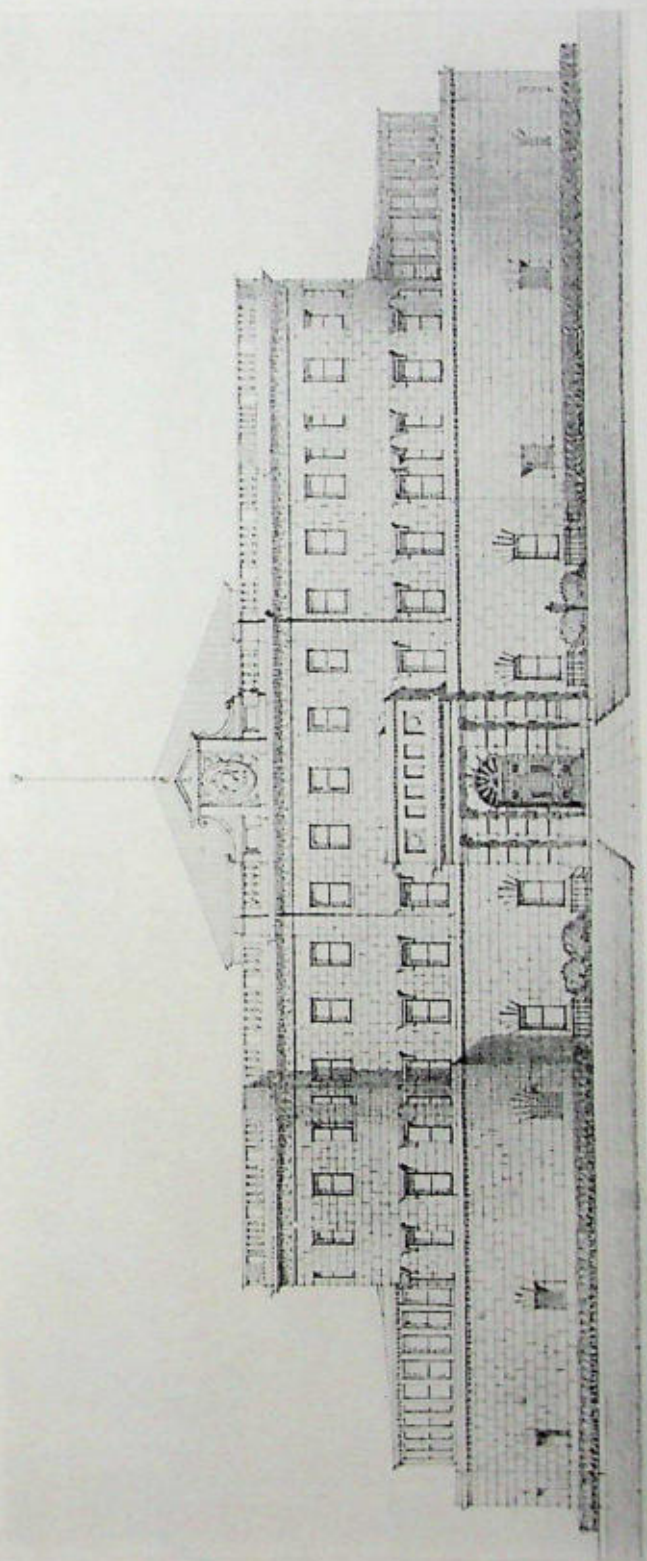
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Yearly, \$1.50



CASTLE GARDEN AS PICTURED ON THE LAFAYETTE PUNCH BOWL, 1824
Courtesy of the New York Historical Society



THE NEW YORK AQUARIUM

Front elevation, showing the third story, for the construction of which the City made provision in December, 1921. The existing second story will be extended and included in the rounded ends shown above, which conform to the shape of the original heavy wall on which the second and third stories rest. The present patched and discolored brown finish will be removed and both stories, as well as the entire original wall, be given a uniform rusticated surface as shown above. This addition will make a vast improvement in the appearance of the building, as well as provide increased space for administrative purposes. The urgent need of the Aquarium for office, storage, feed-room, lavatory, repair room, library and laboratory space, will then be met in a satisfactory manner.

Reproduced from the Architect's Drawing.

ZOOLOGICAL SOCIETY BULLETIN

Published by the New York Zoological Society

VOLUME XXV

JANUARY, 1922

NUMBER 1

A GREAT IMPROVEMENT AT THE AQUARIUM

By C. H. TOWNSEND

THE New York Zoological Society has come to the relief of the New York Aquarium with \$75,000 of its private funds.

Of this sum \$65,000 has been expended in the re-construction and modernizing of the mechanical department. The basement on the landward side of the building has been deepened, water-proofed, lined with white tiles and provided with windows admitting both light and air. Small, easily coaled, low-pressure boilers have replaced the huge high-pressure boilers, while small, electrically driven, rotary pumps have taken the place of the old, cumbersome steam pumps.

When the new machinery is set in motion, the old plant on the main floor, with its boilers, pumps, filters, air compressors, water-heaters and refrigerator, will be removed entirely, and the space thus vacated made available for new exhibits.

The Aquarium has waited many years for relief from conditions verging on the intolerable, but which the City has not been disposed to undertake. It is nineteen years since Mayor Low's administration offered the management of the Aquarium to the Zoological Society. During all these years our firemen have worked in a low ceilinged, dark, illy-ventilated furnace room, periodically flooded by the tides, often shoveling wet coal into the furnaces from half-submerged wheelbarrows. At such times the tide water invaded the ash-pits underneath the furnaces, sometimes rising to within a few inches of the fires. During these monthly periods of high water, the return pumps were overflowed and stopped, with the result that steam heat was cut off from the building, sometimes in very cold weather, to the discomfort of employes and visitors alike. The nuisance has at last been abated.

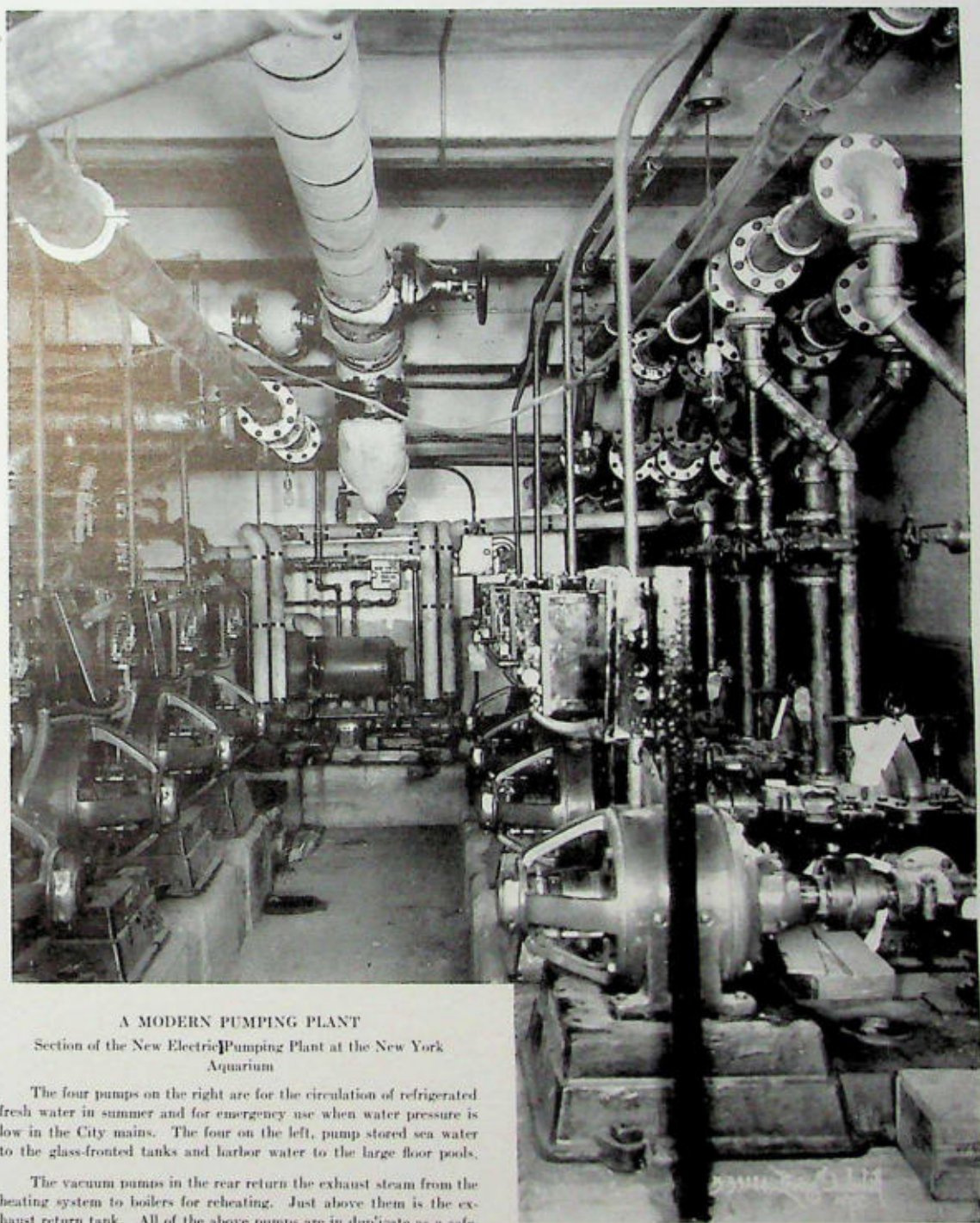
The New York Aquarium, being of necessity a big pumping plant, it seems incredible that the heavy work necessitated by its four water systems has been carried on successfully day and night for twenty-five years, under conditions so adverse that they would not be tolerated for a single year by any department of the City's service making claim to efficiency.

The Aquarium claims to have done its work as the largest and best patronized aquarium in the world, in spite of all drawbacks. It has made progress in its work and improved its exhibits, without increase in space for new collections or additional working equipment.

The public museums, aquariums, and zoological gardens of the world are hereby challenged to produce a record like that of the New York Aquarium, which, at an average annual cost of \$45,000, has maintained in one hundred tanks more than two hundred kinds of fishes and other aquatic forms, represented by from six to eight thousand specimens and having had over forty-seven millions of visitors in twenty-five years.

As a result of the Zoological Society's improvement of the equipment, the Aquarium will be able not only to maintain its extensive living collections more easily and safely, but will be able to increase its exhibits by fully one-fifth.

When the new pumping plant is started, the work of removing the old one and erecting in its place tanks for new exhibits will begin. On the ground floor the new glass-fronted tanks will be larger and deeper than any now in the building. The balcony space above will be specially arranged for the keeping of fresh-water toy fishes of the tropics, which the Aquarium has not hitherto exhibited for lack of proper equipment.



A MODERN PUMPING PLANT

Section of the New Electric Pumping Plant at the New York Aquarium

The four pumps on the right are for the circulation of refrigerated fresh water in summer and for emergency use when water pressure is low in the City mains. The four on the left, pump stored sea water to the glass-fronted tanks and harbor water to the large floor pools.

The vacuum pumps in the rear return the exhaust steam from the heating system to boilers for reheating. Just above them is the exhaust return tank. All of the above pumps are in duplicate as a safeguard against breakdown. Beyond these pumps are located the new low-pressure boilers.

Single pumps that are not shown here in the photograph are as follows: Air compressor to aerate sea water tanks and aid in the cleaning of filters. Vacuum pump to prime all pumps for easy starting.

Thermostatic control pump to regulate the heat of the radiators in the building during the winter. Ammonia compressor for the refrigeration of fresh water in summer. Motor driven fan for the circulation of fresh air on main floor. Sump pump, a safeguard against flooding of pump room.



THE BATTERY

From an early undated color print in the collection of the Whitehall Club.

In the last week of the year, the City made provision for a third story on the front of the building, to create more space for administrative purposes, rendered necessary by increases both in exhibits and attendance. The fund appropriated, \$86,000, will permit not only of additional office, storage and laboratory room, but also will permit of a great improvement in the outside appearance of a building that has been rendered increasingly unsightly by each generation that has used it for other purposes than the fortress it was built for a century ago.

The new front elevation facing the Custom House is in the hands of architects, McKim, Mead and White, who will deal intelligently and appreciatively with this nondescript old structure and improve its aspect from one direction at least.

The stained and defaced old walls will be given a new finish, probably in gray tones, that will relieve the prison-like look it has worn for the past twenty-five years, and be more in keeping with its present use as the world's most popular public museum.



CASTLE GARDEN IN 1869, AS AN IMMIGRANT DEPOT.

From a print presented by Mr. Daniel H. Hanckel.



PROGRESS OF THE BATTERY ENLARGEMENT—ITS PRESENT CONDITION.

CASTLE GARDEN IN THE EARLY SIXTIES

This print is of interest here, as showing a portion of "Kapske Rocks," on some of which the building rests. The reef pictured here lies under the sea-wall.

From a print in the collection of the Whitehall Club.

As West Battery, as Castle Garden, as the Immigrant Depot, it has historic claims, and finally as The Aquarium, with two millions of visitors a year, it is hard to explain the neglect it has suffered. Hereafter, there will be less complaint about its unsightliness, but it cannot be improved into entire keeping with the fine buildings of Battery Park for the moderate sum now to be spent on it.

Some day the ancient structure, with its extensive collections from sea and lake and river, will be improved into the new temple of Neptune that it really ought to be.

ground made by filling. Another is a rare, colored print giving an interior view in 1855, when "Castle Garden" became an immigrant depot. Two others are of the period when the space between the building and the shore was being filled in for the enlargement of Battery Park.

The fifth shows the building in 1824 at the time of Lafayette's second visit to the United States.

The "Castle Garden Number" of the BULLETIN (March, 1920), which was soon exhausted, will be reissued at an early date, as it still is greatly in demand. C. H. T.

OLD PRINTS OF THE AQUARIUM BUILDING

SINCE the reproduction in the Zoological Society BULLETIN for March, 1920, of numerous old prints of this historic building, the Aquarium has acquired or borrowed several others which are reproduced in the present issue on account of their historic value.

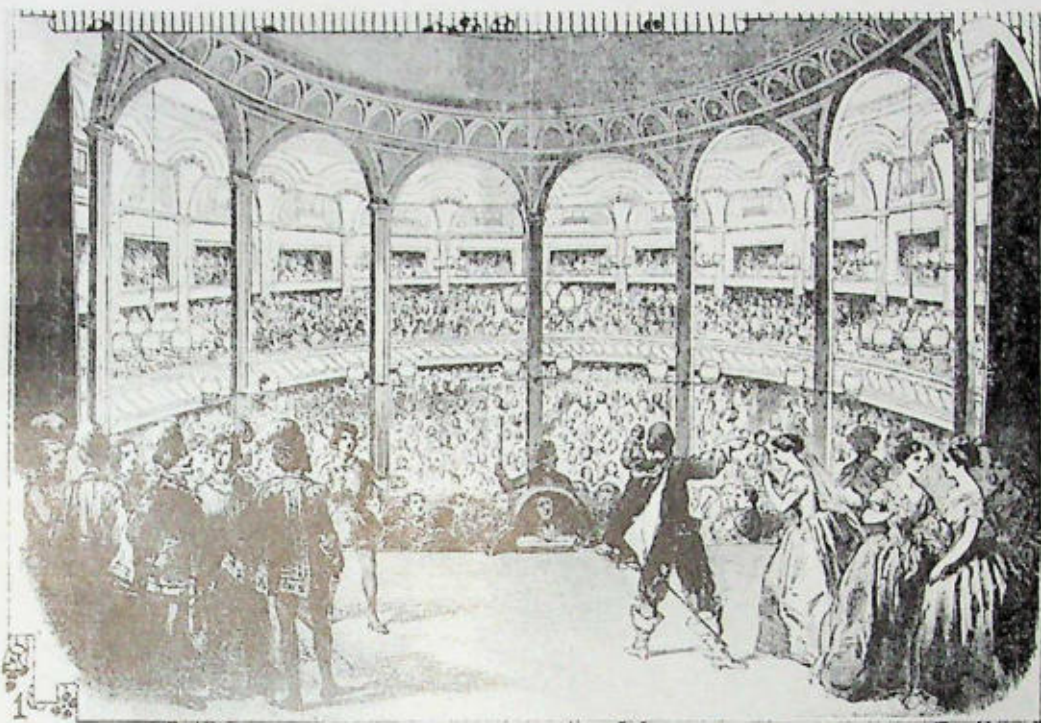
One of these belongs to the early period when "Southwest Battery" or "Fort Clinton" stood off shore. It shows a mass of shipping in the background, where high buildings now stand on

SOUTHERN FISHES TAKEN NEAR NEW YORK

By C. H. TOWNSEND

AMONG the fishes brought in during the summer by the Aquarium well-boat SEAHORSE, was a fine specimen of the thread-fish (*Alectis ciliaris*) captured in Sandy Hook Bay on July 29.

It is a southern species which appears on our coast in summer as a straggler and is found as far north as Massachusetts. Its appearance is striking, some of the rays of the dorsal and



CASTLE GARDEN AS THE HOME OF GRAND OPERA

Print not dated. Courtesy of Musical America.



CASTLE GARDEN IN 1855

From a colored print presented by Mr. Daniel H. Hanckel.

THREAD FISH (*ALECTIS CILIARIS*)

Photograph by Elwin R. Sanborn.

anal fins being long and filamentous. In the young they are sometimes five times the length of the body of the fish, but become shorter with age.

Our specimen is about six inches long, with filaments or "threads" projecting at present but little beyond the tail, although when captured they were nearly twice the length of the fish. It is a silvery fish, with five broad slightly curving black cross bands much like those in the young moonfish. The six upper rays of the dorsal and the five lower rays of the anal are the ones that are prolonged into streamers. The first ray in each of these fins is broader than the other and lighter in color, being almost white. The other long rays are partly black with white tips.

The eye is large and bulging. No other thread-fish has lived as long in the Aquarium as the one now to be seen there.

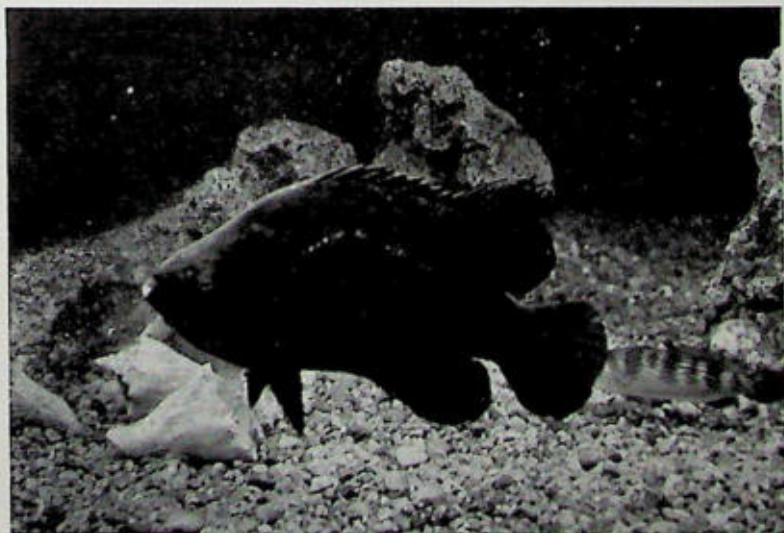
The thread-fish reaches a length of two feet in tropical waters and is said to be a good food fish.

The triple-tail (*Lobotes surinamensis*) is another late summer straggler from tropical America. It has been found as far north as Massachusetts. It reaches,

in the south, a length of three feet and a weight of twenty-five pounds, and is also a food fish. The Aquarium boat secured a specimen at Sandy Hook on July 13, which is still living. It is several years since we have had this species on exhibition, the last one having been taken in Gravesend Bay. Our present specimen is larger and darker than any of those exhibited previously, the others being more or less tinged with yellow, while this one is almost black. All of the triple-tails captured in local waters have appeared between July 13 and the latter part of September. The

name is suggested by the elongated dorsal and anal fins, which extend backward and are rounded in outline much like the tail. The fish now in the Aquarium is about twenty inches in length.

During the summer of 1920, the Aquarium boat brought in a hundred or more young pompano (*Trachinotus carolinus*) from five to seven inches in length, which were taken in seines at various times between September 23 and October 21, along the beach just inside Sandy Hook. They have proved to be very hardy in captivity

TRIPLE-TAIL (*LOBOTES SURINAMENSIS*)

Photograph by Elwin R. Sanborn.



YOUNG POMPANO (*TRACHINOTUS CAROLINUS*)
Photograph by Elwin R. Sanborn.

STRIPED MULLET (*MUGIL CEPHALUS*)

Photograph by Elwin R. Sanborn.

and are still living. While they feed freely, they have not grown as fast as was expected. This may be attributable to an insufficiency of live food, which cannot be had during the winter months and is not always obtainable in summer. Seining operations in the same locality during the past summer, 1921, yielded larger numbers of young pompano and about two hundred more were added to our collection. We saw no adult pompano, and the Sandy Hook pound-net fishermen say they are rarely taken in their nets.

The pompano is a common species along sandy shores in the South Atlantic and Gulf states. The young have been taken as far north as Cape Cod in late summer. Young pompano brought to the Aquarium many years ago and kept in unheated tanks, died in November when the temperature fell below 60 degrees. We suspect that most of the tropical species which wander up to the latitude of Long Island in summer, perhaps assisted by the Gulf Stream, never get back to the warm latitudes where they belong, but perish on the approach of winter.

The young pompano in our collection are all bright silvery fishes, with none of the yellowish tinge of the adults. The pompano is one of the very finest food fishes to be found in American waters. Its greatest length is twenty inches, with a weight of six or seven pounds, but the average size is much smaller.

Visitors are advised to look up the young pompano. There are no livelier fishes in the Aquarium.

Hitherto the presence of the striped mullet (*Mugil cephalus*) in the Aquarium has been irregular. Careful collecting in local waters may show that it is available oftener than we have supposed. The young are more numerous than the adults and appear earlier. Our seines took hundreds of rather small mullet at Sandy Hook, mostly in September. Their growth in captivity has been surprising. It would not be exaggerating to say that they have increased in size fully one-third in three months. The largest appear to be nearly a foot in length and all are remarkably lively.

ZOOLOGICAL SOCIETY BULLETIN

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and the proof reading of his contribution.

ELWIN R. SANBORN, *Editor*

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copies and \$1.50 yearly for subscriptions.

VOL. XXV JANUARY, 1922 No. 1

THE BRAND OF A LAMPREY

By C. M. BREDER, JR.

SOME time ago a correspondent of the Division of Fish Culture, United States Bureau of Fisheries, submitted two tails of the King salmon, presumably *Oncorhynchus Tshawytscha* (Walb), with peculiar disciform marks on them, writing that he had seen over fifty fish marked in a similar manner. Apparently he was fully convinced that these marks were made by employees of the Bureau by means of a brand or stamp of some nature. The correspondent admitted his inability to decipher the characters constituting the marks but stated that he thought the return of the tails would be an aid of some value to the experimenters who had been engaged in marking these fish, which were taken in the Yukon River, Alaska, during the summer of 1919.

The marks were however readily identified by members of the scientific staff as being made by a Lamprey, possibly *Entosphenus tridentatus* (Girard). The probable reason for these marks being found only on the caudal fin is that in other cases where the lamprey had attached itself to the body, it was able to secure a better hold on its victim and either kill the fish or make the deep characteristic wound universally recognized by fishermen as the work of this creature, whereas in the case of the present examples owing to their attachment to the extreme posterior and the leverage that the fish could exert enabled them to more readily throw off the parasite, thereby allowing it only to leave the imprint of its mouth and suctional disc. Alter-



SUCTION SCAR MADE BY THE MOUTH OF A LAMPREY
ON THE TAIL OF A PACIFIC SALMON

natively it might be supposed that the fact that the Lamprey having found itself attached to such an unsucculent part of a fish as the tail, caused it to relinquish its hold voluntarily in favor of searching for other more profitable hosts.

There is on record mention of similar cases where the party finding such marks even went so far as to hazard a guess as to the legend and date printed thereon. In this connection it might be mentioned that the United States Bureau of Fisheries has never attempted to mark fish by means of brands that could possibly make such a mark, having always confined their efforts to attaching various metal tags and buttons or to the clipping of fins in diverse manners. It is likewise understood that any brands or stamps that may have been tried by other institutions were no doubt especially designed to be of a different shape than that of the nearly circular Lamprey wound in order to avoid just this confusion.

—C. M. B. JR.

A BUSINESS VENTURE IN LIVE EELS

By C. H. TOWNSEND

THE annual catch of eels along the Atlantic Coast from Maine to Florida exceeds three million pounds and is worth a quarter of a million dollars. New York's share of the eel supply is a large one, sometimes exceeding half a million pounds a year, but perhaps New York can use more.



A CARGO OF EELS

Barges with live eels from Canada.
Photograph by C. H. Townsend

On November 17, three barges, each over one hundred feet long and twelve feet wide, arrived from Quebec with 165,000 pounds of live eels. They were towed by way of the St. Lawrence River, Lake Champlain and Hudson River, and were thirteen days in transit. The barges are virtually well-boats or live cars, the sides and bottoms consisting of heavy slats, with quarter inch spaces between to provide abundant circulation of water. Each barge is divided cross-ways into tight, five-foot compartments, for proper control of the live cargo and to prevent fore and aft surge of water while in motion. All compartments are full of water to their hatches and the decks are almost awash. The barges have a draught of four feet. A crew of five men accompanied the tow, which was a consignment from The Live Fish Company of Quebec. The eels were sold alive in New York by commission, some of them to be marketed in Chicago and other cities.

The eels are captured in the Quebec region of the St. Lawrence River in wire traps constructed somewhat after the pattern of the great pound nets in lower New York Bay, and with similar leaders to divert the moving fishes toward the traps or pounds. The leaders are usually one hundred feet long, but in one case nearly a mile long. The traps are so located as to be left dry at low tide, when the eels are removed. The catch is made when eels are

working toward salt water, and is heaviest during the dark of the moon. The season is from July to October inclusive. Large as is the catch of eels in America, it is vastly more so in Europe.

Here we avail ourselves of the opportunity to answer publicly the eternal question presented to the Aquarium about the mysterious ways of the eel. Science knows more about the eel than it did some years ago, and the missing chapters in the eel's life history have been supplied through modern deep-sea investigations, rather than in the study of fresh or coastal waters where eels are more in evidence. Unlike salmon, shad and other fishes which enter fresh waters to spawn, the eel descends streams

at maturity to spawn far at sea. The young eels, three inches or so in length, called elvers, that enter fresh waters in large numbers and are continually working up-stream, have always been known, but the stages of growth between the egg and the elver were not. In fact the newly liberated egg is still unknown. The next stage, in which the baby eel does not exceed three inches in length, is of comparatively recent discovery. We here find it a thin, flattened creature, so transparent that ordinary print may be clearly read through its body. When first described in this stage it was called *Leptocephalus* and was not known to be the common eel.

Females with ripe eggs are unknown, the millions of undeveloped eggs carried by each female not developing while the eels linger in fresh or coastal waters. The eels found far inland are always females and remain in fresh water for several years. When tending toward maturity, they seek the sea. Male eels remain in tidal waters, are smaller and less in evidence. Like females they do not reach breeding maturity until they have entirely passed to sea. The great bulk of the eel catch everywhere consists of females. Mr. Friedrichs of the Quebec eel fishery, says that all the eels captured there are roe eels moving down stream, and that males are not found.

COMMON EEL (*ANGUILLA CHRYSYPA*)

Photograph by Elwin R. Sanborn.

The eel catch in the St. Lawrence River is derived from eels belonging to that river and its tributaries including Lake Ontario. The Lake Ontario catch of eels in 1899 exceeded 123,000 pounds. The annual yield of all the other great lakes combined seldom exceeds 2,000 pounds, the Falls of Niagara constituting an impassable barrier to all kinds of fishes. Enormous numbers of young eels gather below Niagara in spring and summer, but there is no evidence that they ever pass farther by that route.

The eels of the upper lakes may pass up by way of the Erie and Welland canals. It may be that limited numbers of eels in the Mississippi River find means of passing into the upper lakes. Whether eels inhabited the upper Great Lakes before the construction of canals, the writer is not informed. The fishery statistics at hand contain no records of eels in Lake Superior.

Eels enter all our streams from the St. Lawrence River to the Gulf of Mexico. It is only the young eels that move up stream. Adults

move down stream and do not return. Both males and females die at sea after the first and only breeding season in their lives. The eel is very prolific, each female producing from five to ten millions of eggs.

COLLECTING LOCAL MARINE FISHES

By C. M. BREDER, Jr.

THE work of collecting local marine fishes with the Well-boat *Seahorse* was continued this year* employing the methods found to be so successful during the warmer months of 1920. These methods consisted chiefly of visiting the various pound and fyke nets in Raritan and Sandy Hook Bays at times when the owners were removing their catches. Such specimens as were thought desirable being purchased and placed at once in the well. In addition to this a considerable amount of collecting was done

* See "The Work of the Aquarium Well-boat" by C. H. Townsend, Zoo. Soc. Bull., Vol. XXIII, No. 6, Nov., 1920; pp. 115-17.



THE SEAHORSE ANCHORED BESIDE A POUND NET

with seines varying from twelve feet to three hundred in length. These latter operations yielded many shore seeking forms as well as smaller fishes which could not be taken in the large trap nets owing to the comparatively coarse meshes of the latter.

A total of fifteen trips was taken between the months of May and November varying in length from two to five days, and the performance of the craft was entirely satisfactory.

Local anglers and commercial fishermen testify to the fact that fishing was particularly poor this season especially in these bays, except during the last month of the boat's activity. The paucity of fishes was especially noted in regard to the summer visitants that reach these waters from points southward by riding the warm waters of the Gulf Stream for frequently long distances from their normal habitat. However the lack was more in numbers than in varieties. A total of seventy-seven species were encountered while fifty-three were brought to the aquarium for exhibition.

It is interesting to note the habits of the various species as correlative to their ability to survive confinement. In general those forms which are of a free ranging and fast moving habit only visiting these bays from the vastness of oceanic expanses chafe at the confines of even the largest aquarium, while on the other hand forms which dwell in the smaller bays and estuaries, and usually found close to shore, adapt themselves to confinement much more readily as the shock of the change in environment is

not nearly so considerable. Among the former we find such species as, the brown and hammerhead sharks, menhaden, butterfish, mackerel, bonito, and headfish; and among the latter are, the sturgeon, nummichog, striped mullet, swellfish, spiny boxfish, toadfish and American sole. There are however numerous exceptions, although most of these can be accounted for by some structural or functional peculiarity of the species concerned. It is partly for this reason that the shore inhabiting forms are always better represented in the aquarium than those of the open sea.

In addition to the fishes, many specimens of other groups were also taken, including coelenterates, mollusks, crustaceans, and tunicates. Besides these specimens for exhibition purposes it was possible to gather much natural food which has done its bit to add to the health of certain of the specimens. The large sea turtles were supplied copiously with various sea weeds, while many of the fishes were offered crustaceans and molluscs, both of which are so necessary for keeping a considerable number of the species in proper condition.

Twice during the season the Director of the Detroit Aquarium visited this institution, and fortunately it was possible to give very material aid to him in gathering a good collection of local marine fishes, which of course are particularly interesting to our inland countrymen.

Numerous incidents and pleasing sights smacking of the "great outdoors" will be remembered by those fortunate enough to be participants on these trips, even if it be recalled that they were within the very shadow of the great commercial center of the nation, and that the water for most part was littered with all manner of sewage and lost by-products of its activity. The constant presence of this obnoxious debris was forgotten as soon as the fall of night hid its obtrusive character in dim half-lights, while by way of compensation myriads of tiny phosphorescent medusae twinkled just beneath the water's surface, which could almost be mistaken for exaggerated reflections of brilliant stars.



BABY SEA LION, ONE WEEK OLD
Photograph by N. Y. World.

To be under way after dark was to leave a wake of livid glow as the revolving propeller stimulated these "jellies" to greater luminosity, while to be rowing in the skiff was to leave illuminated patches on either side at each dip of the oars, which while submerged were completely visible as glowing blades. Those individuals that were so small in size and large in number caused the latter phenomenon, stimulated by the contact of the oars, while the larger and fewer individuals glowed as single oval spots of light—truly a beautiful sight.

Even considering the handicap under which the work was carried on, namely, the lack of desirable specimens in quantities, it can be considered as entirely satisfactory. Another season, when conditions are more propitious, most excellent results may with confidence be anticipated.

SEA LION BORN AT THE AQUARIUM

By C. M. BREDER, JR.

ONE of the two female sea lions *Zalophus californianus* always to be seen in one of the smaller floor pools gave birth to a pup on June 13, 1921, at 5:00 A. M. As it is a well known fact that sea lions rarely show external evidence of gravidity, it is not surprising that the birth was entirely unexpected, and that no signs of pregnancy had been observed by the attendants. While no definite record was kept it is known that the mother had been separated from her mate for nearly a year. He was the large and well known individual that has been in the aquarium for 13 years and is now on exhibition in the large central pool.

The little pup was a female and started life under a handicap as she was born in the water or at least fell into it shortly after birth. The animals in a state of nature seek high and dry place among the rocks to give birth to their young, and many days pass before they are inclined to approach the water. The attendants told of the mother's great efforts to rescue her offspring from drowning and of her final success in dragging it out by the nape of its neck onto the resting platform. Provision was made at once for the two in a dry tank, and other than being a little weak, the youngster appeared to be in a rather satisfactory condition.

Nursing was observed for the first time at 11:00 A. M., June 15, and it was quite obvious that the many visitors drawn by the interesting spectacle annoyed the mother to a considerable extent. Again during the night she gave milk to the pup and continued this twice a day, until June 20, when for some unknown reason she refused to allow it to nurse. At this time the pup measured 2 feet 2 inches from the tip of its nose to the tip of its tail, while its girth just posterior of the fore flippers was 1 foot 5 inches and its weight was 12½ pounds. Daily it was given an airing and sunning on the aquarium roof, which it seemed to enjoy thoroughly, often rolling over on its back and slowly clapping its diminutive flippers together. The little animal was quite spirited and often made vicious snaps at offending hands. When disturbed or hungry it would give vent to a bleating cry very similar to that of a lamb. The mother persisted in her refusal to feed it, gently nipping it in the loose hide on the back whenever it approached her for that purpose.

Attempts were made to feed it cow's milk



BABY SEA LION, ONE WEEK OLD
Photograph by Chas. H. Townsend.

from a nursing bottle, but it steadfastly refused and insufficient food could be poured down its gullet by force to keep it alive. On the 27th it had fallen to a weight of 11 pounds and on the 28th it weighed only $10\frac{3}{8}$ pounds. On the 29th at 5:00 P. M. it breathed its last having

lived $16\frac{1}{2}$ days. Its death was no doubt due directly to an insufficiency of food.

The mother appeared to be in no way concerned over the loss of her whelp and is now with her companion and as active and entertaining to the visitors as ever.



DOMESTICATED REINDEER
Part of the Lomen herd of 35,000 animals.

THE DOMESTICATED REINDEER IN ALASKA*

By C. H. TOWNSEND

THE introduction of the Siberian domesticated reindeer among the Eskimo of Northwestern Alaska was begun twenty-nine years ago as a missionary and educational enterprise, with a view to making the people self-supporting in a region where the native wild caribou were rapidly disappearing.

To-day there are more than two hundred thousand of the animals in our great northern territory, about seventy per cent. of which are owned by native Eskimo.

White stockmen have during recent years engaged in raising reindeer; have built cold storage stations; have already made important

* The writer is indebted to Mr. Carl J. Lomen of Nome, Alaska, engaged in raising and shipping reindeer, for the use of the photographs here reproduced. Dr. William Hamilton, of the Alaska Division of the Bureau of Education, and Mr. Lomen have both supplied recent information on the reindeer industry. An earlier account of the introduction of the reindeer by the present writer was published in this BULLETIN in November, 1913.

shipments of refrigerated reindeer meat to Seattle and other cities, and the business is developing in a promising manner.

The industry is based on a northern animal capable of foraging for itself in Arctic winter weather, and is located in a region where suitable grazing range is practically unlimited. As the reindeer herds, when properly controlled, double in size every three years, it is believed that within another decade there will be in Alaska fully a million reindeer, a number almost double the combined herds in Northern Norway, Sweden and Finland.

Alaska has an unforested grazing area suitable for reindeer, of many millions of acres, sufficient for the support of four or five millions of reindeer. There are now over one hundred different herds in the hands of natives, distributed over western Alaska from the Arctic shore southward to the Alaska Peninsula.

It is desirable that the reindeer be introduced into other sections, and it has been sug-



A SLED DEER WITH ALASKA ESKIMO DRIVER

gested that reindeer herding be taught to the Indians living to the eastward of the Eskimo country, at least in such regions as have suitable grazing ground. The cultivation of the reindeer may extend in time to the Arctic prairies of Canada, which may, with Alaska, become the source of a food supply equal to that formerly derived from the great stock ranges of our western states.

In western Alaska, with the distribution among the Eskimo already accomplished, attention will be given to breeding and to developing an American market for meat.

Much meat is used in Alaska, but there is an increasing surplus to be exported to the United States. The first shipments, made in 1914, consisted of refrigerated meat which sold at twenty to thirty-five cents a pound. Larger shipments have since been made at better prices, those of 1920 aggregating one hundred and fifty tons. In 1921 a larger supply was available, part of which was not marketed owing to transportation difficulties.

Where the reindeer have been distributed, the economic independence of the natives is already established. The value of this domesticated animal to the natives cannot be overestimated. The reindeer is a present source of food and clothing, harness and leather, horns for knife handles

and other implements, hair for mattresses. As for transportation, that should be a chapter by itself.

The effect of reindeer possession upon the minds of the people is most valuable. They regard it as a safeguard against starvation. Many of them have experienced famine. Teachers in Government schools in northwestern Alaska may be quoted as saying "The reindeer feature is our greatest success;" "We have nothing else that can compare with it;" "We fall back

upon the reindeer industry as a reliable means of support for the Eskimo;" "We are now laying stress upon the technique of the industry;" "The three r's are four r's in Eskimo schools, to include Reindeer."

The reindeer work has been in the hands of the teachers in both Government and mission schools and has evidently been well handled from the start. The original importations across Bering Strait, beginning in 1892, did not exceed 1,280 reindeer. From these small beginnings the herds have increased to more than two hundred thousand animals, not including one hundred thousand males killed in the meantime for food and clothing.

A recent development among the natives is the annual reindeer fair, which has created a spirit of union, a thing much needed by the



DOMESTICATED REINDEER, NOME, ALASKA



REINDEER CORRALS, LOMEX HERD

Eskimo race. The people gather from far and near to display their deer, sledges and harness, and to compete in the races for the prizes offered for driving. The reindeer fair is the great social event of the year and is held in different sections of the country. Its very fun and frolic stimulate the interest and serve well the serious purpose behind it.

The original importations were made with governmental, church and private funds. As Government appropriations for special reindeer work have not during recent years exceeded five thousand dollars, the churches should help again so that the enterprise may be extended. It would be a tribute to the memory of Dr. Jackson, whose foresight and persistence made possible the first importations. Additional trainers are needed. Selected bucks should be brought over from Siberia to improve the stock, which is in danger of inbreeding among the smaller herds. The Eskimo come for aid and instruction at every opportunity offered. It is gratifying to note that Congress appropriated \$25,000 for reindeer work in 1921. The introduced occupation of reindeer herding has, within a single generation, raised the Eskimo to the pastoral stage. It is now entering another stage in which the natives, already supported by their own herds, will produce a surplus, and to some extent

share with white stockmen in the profit of an organized industry.

It is thirty-six years since the writer spent a summer among the Eskimo of Kotzebue Sound, and witnessed their trading with Siberian natives who brought great numbers of reindeer skins across Bering Strait for barter. To-day they have profitable herds of their own, and are no longer dependent upon either Siberian skins or native caribou for their clothing.

*Estimate of Number of Reindeer in Alaska,
July 1, 1921.*

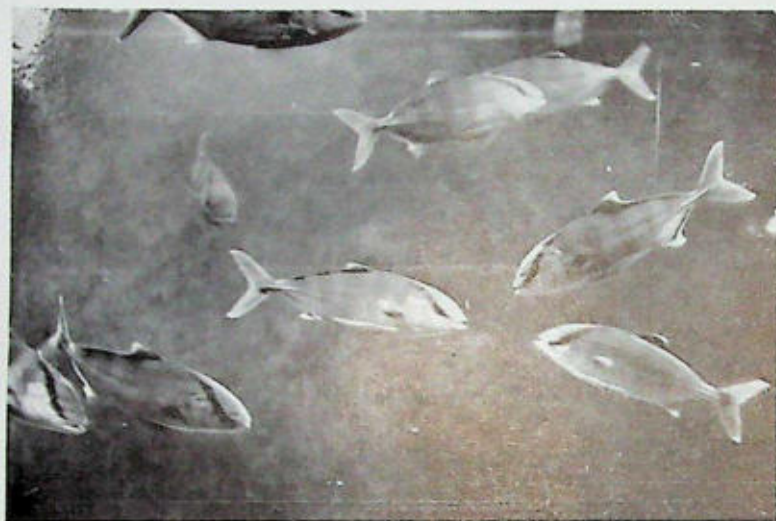
<i>Ownership</i>	<i>Number</i>
Natives	152,500
Whites	50,000
Laplanders	5,000
Missions	4,500
Government	4,000
Total	216,000
Proceeds of Sales of Surplus Male Reindeer to June 30, 1921.....	\$762.62

Attendance in 1921—Visitors at the Aquarium during the past year numbered 2,376,840 or 6,511 a day. This is equal to the annual attendance before the war.

The grand total of visitors for the twenty-five years ending December, 1921, exceeds forty-seven millions.



REINDEER AS DRESSED FOR SHIPMENT WITH HIDES ON

PILOT FISH (*NAUCRATES DUCTOR*)

A constant associate of the shark.
 Photograph by Elwin R. Sandoen.

SHARK, SHARK-SUCKER AND PILOT-FISH

By C. H. TOWNSEND

SINCE the Aquarium came into possession of the well-boat *Seahorse* two years ago, certain marine fishes of migratory habit which had previously been considered rare, became common in our collections. The fish exhibits increased not only in numbers of specimens, but in variety of species. Comparative rarities, such as shark-sucker, pilot-fish, file-fish, trigger-fish, pompano and mullet are now to be seen there regularly.

One of the best exhibitions of fish life in the Aquarium today is a five foot sand shark accompanied by its inevitable parasite, the shark-sucker, and followed at a safe distance by a small group of pilot-fishes.

It is the destiny of the shark perpetually to tow through the seas the loafer, foreordained to be a hanger-on since the beginning of fish time.

The shark-sucker does not insist that the shark alone furnish him free transportation, but is a stow-away on the porpoise, the whale and the sea turtle. Anglers report that it clings to the big tarpons caught in Florida waters and may be seen when the tarpon makes its great leaps. This may be done for the purpose of dislodging the sucker, as it has been seen to let go at such times and drop back into the water. It is not averse to clinging to the bottoms of boats. It was this habit which

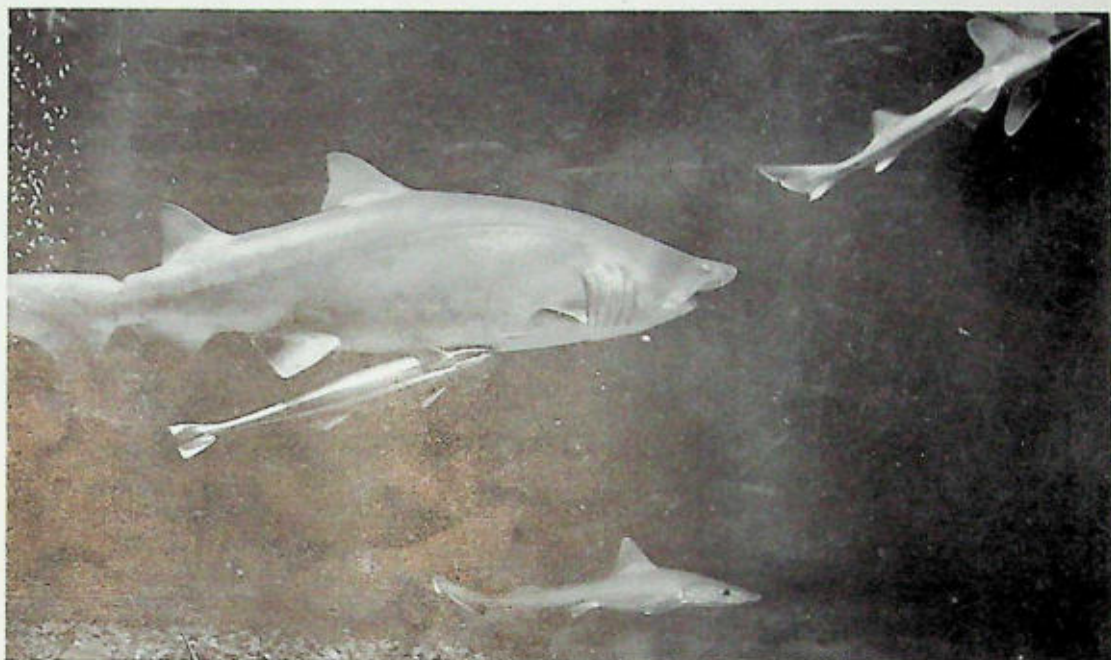
gained the fish the name of "ship-holder," the ancients believing it to hold back vessels; and its name *Echeneis* has this meaning.

Our large sand shark has been accompanied for six months by the *Echeneis*, which has shown no inclination at any time to attach itself to the other sand shark in the same tank.

We have watched porpoises playing under the bow of a schooner with shark suckers firmly attached. The sucking disc on the top of the head, by which it clings, is longer than the head of the fish and has a surprising holding power, as has been proved in the Aquarium.

A large shark-sucker lowered partially into a pail of water, took hold of the side of the pail with its disc so firmly that when raised by the tail it lifted both bucket and water, a weight of twenty-four pounds. During the past two summers the Aquarium boat brought in sand sharks and shark suckers at various dates between July 7 and October 11, all taken in Sandy Hook Bay. Many of the sharks and sea turtles entering the bay, must be accompanied by shark-suckers and pilot-fishes that cannot escape capture when the former wander into the big pound nets. We do not get them elsewhere.

We are not quite justified in referring to the shark-sucker as a parasite, when it is really a commensal—implying a living together. It does the shark no harm and may even be of service to it in destroying parasitic crustaceans which attach themselves to many kinds of fishes. We are not warranted in assuming that the shark has any concern about the welfare of the shark-sucker, since the latter is careful never to place himself in advance of the shark, but clings to back or belly, well out of harm's way. When we placed pilot-fishes, which also accompany sharks, in the shark tank, they were evidently at a disadvantage in caring for themselves and the larger shark managed to kill three of them. It is probable that the shark-sucker would fare no better if it swam about as freely as the pilots. We have noticed that it is careful to shift its position on the larger shark when the smaller shark swims too near for comfort. What a life "twixt the deil and



SAND SHARK WITH SHARK-SUCKER ATTACHED

Photograph by Elwin R. Sanborn.

the deep sea" and how quickly it makes the shift.

When first placed in the shark tank the sucker attached itself almost instantly to a young nurse shark about three feet long, with most unexpected results. This sluggish, bottom dwelling shark, a species not utilized by shark suckers so far as known, became wildly excited and made such furious charges about the tank that the shark-sucker let go and attached itself to the sand shark, which paid no attention to it and with which it remained permanently. For some weeks it attached itself to the head and back of the shark, riding there belly up, but later changed its position, remaining underneath the shark frequently swimming there without holding on.

The alert and active pilot-fishes being unable to take care of themselves in a tank containing two sand sharks, they, with the larger shark and its sucker, were transferred to a much roomier tank where they appear to be safe. They immediately grouped themselves in the rear or to one side of their ancient but dangerous associate and do not seem at all disposed to move in advance of his ugly jaws.

The shark-sucker having nothing to fear from the pilots, and with no other shark to dodge, doubtless leads as care-free a life as his

tribe can be expected to lead, considering the kind of leadership he elects to follow.

Put a shark-sucker in any tank containing a shark, and his first move is to get as close to the nearest shark as possible in the quickest possible time. His mother brought him up in shark society and there he is pleased to return even after months of absolute safety in a tank by himself, with nothing exciting at hand and nothing to do but apply his suction disc to the unresponsive wall of the tank. It was a dull life. Allah designed him for the red field of danger.

The pilots evidently feel much as the shark-sucker does about the change. Life is more interesting even if not so safe. They follow their leader with the persistence of the dog—it can hardly be called fidelity—and remain with him in adversity. I have several times seen a group of pilots clustered beneath a shark caught at sea and hauled against the side of the U. S. Fisheries Steamer *Albatross*, and captured with a net drawn around them by one of the ship's boats, all remaining close to the struggling monster while the wide ocean invited escape. It would be interesting to know where shark-suckers deposit their eggs, and at what age newly hatched suckers develop their clinging discs, but the books are silent.



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ELEPHANT HOUSE AND YARD IN SYDNEY, AUSTRALIA
This enclosure is moated. In the distance is the installation for monkeys.

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NUMBER 2

FAR-DISTANT ZOOLOGICAL PARKS

III. The Taronga Zoological Park, Sydney, Australia

By A. S. LESOUEF, Director

THE first attempt to exhibit wild animals in Sydney, the capital of the State of New South Wales, arose from the introduction of foreign animals and birds for acclimatisation purposes. These were temporarily accommodated in Moore Park, a small open space near the city, and the collection, together with specimens of the native fauna which were to be sent in exchange for those imported, proved of such interest to the public that it was decided to form a permanent zoological garden. Though these grounds did very well for many years under the guidance of the Zoological Society of New South Wales, they were unable to expand and keep pace with the growth of the city. In 1907 it was decided to build a new zoo altogether, on a site more suited for the purpose. This was found on the Military Reserve, practically a virgin forest adjoining the suburb of Mosman, fifty acres of which were dedicated for zoological purposes and placed under a Government Trust of seven members, who elected the executive officers and appointed the employees.

The work of construction was started in 1912 and the Park was opened to the public, though still incomplete, in 1916.

The requirements of wild animals in captivity are extremely various, and it is impossible to get a site that will conform to the environment of species from hill and dale, forest and desert; but if choice is possible then the latitude, prevailing winds, soil, water, drainage are all governed by accessibility and convenience of working.

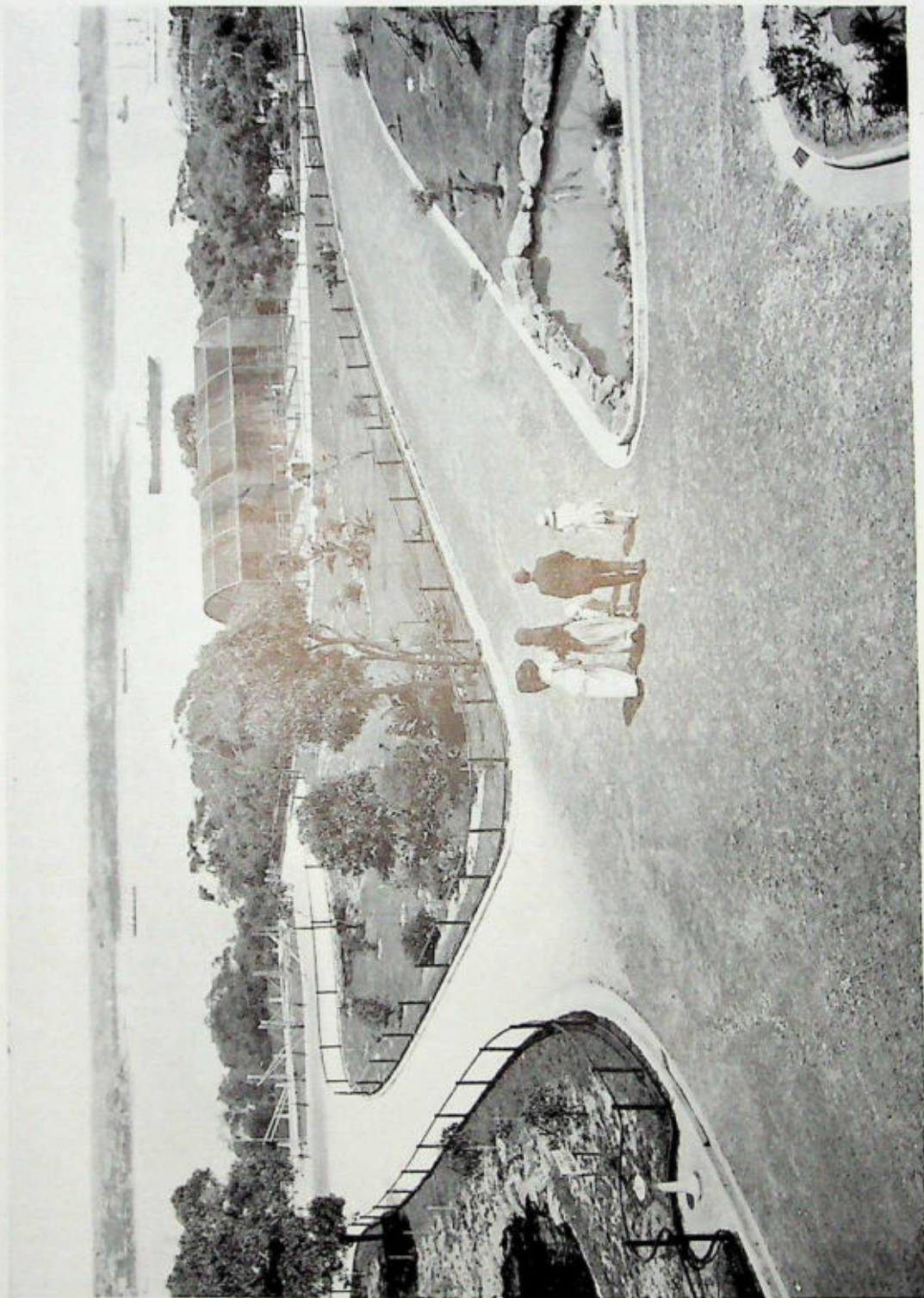
Taronga Park seems to fill the bill for most of these items, with the additional asset of being situated in one of the most picturesque spots on the shores of Sydney's far famed har-

bor. The area is a hill terraced from the harbor front to a height of 340 feet in a series of gentle slopes; a thin layer of soil covers porous sandstone which frequently outcrops in rugged masses. A fairly heavy growth of indigenous trees covers a conspicuous plateau. The damming of a tiny rivulet enabled ponds to be made, while others were formed out of quarries which provided material for roads and buildings. Flat spaces were at a premium, but sufficient were available for the animals that imperatively require them, such as the camels, elephants, etc.

Sydney being semi-tropical and south of the equator, practically all the animal enclosures are open. No large houses are required and very little shelter is necessary. However, as too much light is more trying to animals than too much darkness, the southerly aspect of the park is an important factor. Exposure to the northern glare would greatly inconvenience if it would not kill the large carnivora, the bears being temperate-climate forest animals while the large felines are nocturnal.

The laying out of the grounds, disposition of the cages and enclosures demanded careful thought. This work was based on several "desiderata" laid down beforehand, the main points of which were the following:

- (a) All paths should be curved.
- (b) Each enclosure should be viewed from two or more sides.
- (c) Bars and fences were as far as possible to be eliminated, but where necessary were to be as inconspicuous as possible.
- (d) Each order of animals to be on the same section of the grounds.
- (e) Ample lawns and resting places were to be provided for the public.



VIEW OF THE HARBOR OF SYDNEY FROM TARONGA ZOOLOGICAL PARK

It was further decided that the flora of the park should be confined to Australian trees, ferns and palms with the exception of herbaceous bedding plants necessary for special color effects.

The grounds, naturally picturesque and well covered with eucalyptus, angophora, acacia and other beautiful trees, shrubs and ferns were made more beautiful by the landscape gardener's art. The animal enclosures, for the most part made to resemble the natural sandstone of the country, were masked and softened with pretty foliage trees so that the net result has been to show the animals in a rather spectacular fashion, in beautiful surroundings, and removed as far as the space available permitted from the ordinary attributes of confinement.

The primates have a series of walled enclosures containing rocky shelters and fairly high trees. The height of the containing wall varies with the species exhibited from eight feet vertical and twelve feet for the spider monkeys, crab-eating macaques, etc., to fourteen and sixteen feet respectively, for the more active members of the family such as the rhesus, all the green monkeys and small baboons, up to an extreme of twenty by twenty feet for such wonderful leapers as the langurs and the large baboons. It must be admitted, however, that the details had to be altered several times before these active and lean members of the animal kingdom would consent to "stay put," for several specimens surmounted seemingly impossible obstacles to gain their liberty.

The star attraction in this section is not yet finished. This is an enclosure about 150 by 75 feet surrounding a hill sixty-six feet high, in which it is hoped to exhibit several hundred monkeys. Practically every boulder in the hill will be a shelter with a screen in front, to admit only animals of a certain size so that the smaller species will always have a handy refuge if pursued.

The large apes, which are more or less dangerous when excited, must at all times be kept under control, and therefore are kept in a strongly-made house.

The large carnivora are divided into two sections, the bears and the felines. The lions and tigers are housed in twin enclosures containing an exhibition yard about fifty feet square surrounded by walls from sixteen to twenty feet in height and fronted by a moat twenty-six feet in width by sixteen deep. There are three large sleeping and catching dens attached. All openings are controlled by sliding doors bal-

anced by counter weights and in addition secured by a pin and locked chain, so that three separate actions are necessary to open, thus eliminating possibility of accident due to carelessness.

The measurements of the moat were based on data gathered by Colonel Sanderson when hunting tigers in India. He found that under good conditions a tiger could leap a ravine eighteen feet wide, and therefore another eight feet was allowed as margin, but at the same time giving the animal a bad take-off, which puts the animal at a disadvantage of several feet. In actual practice this width has proved too wide, and it is probable that a distance of eighteen feet under similar conditions would prove more than sufficient. The whole structure is built to look like the natural sandstone, and resembles the general landscape.

The bears occupy a large terrace on the southern side of the gardens. There are six exhibition yards, fronting a natural rocky wall, each surrounded by a moat fifteen feet in width by ten deep for the large species such as polar, grizzly and brown, and from six to four and one-half feet wide by six to five feet deep for the American black, Himalayan and Malayan bears. Each yard has two large catching or shelter dens attached. The animals can be seen from both sides of the enclosures, and are generally only ten feet away from the visitor. Here the bears are quite contented and owing to no visible barriers are seen under good conditions. The polar bears especially, with their large swimming bath are quite at home, and if they take any interest at all in things beyond their home the blue waters of the harbor are in keeping with this maritime species. They are in fact part of the "window dressing" of the park, for visitors on incoming ships are shown those white forms in the distance and take an early opportunity of a closer inspection.

The elephants are the only animals in the gardens for which an ornamental house has been built. They have a building designed like an Indian temple with access to an exercise yard which is bounded by a moat ten feet wide by eight deep, a space that they can just reach over with their trunks but which forms an impassable barrier. At one end of the yard is a large bath, and here in hot weather they love to disport, plunging right under the water and showing by their actions that a bath is just as enjoyable to them as it is to a human.

The female elephant "Taronga" is the oldest inhabitant of the park, having been received in



ENCLOSURE FOR MONKEYS

Over the trees in the middle ground is a glimpse of Sydney Harbor.

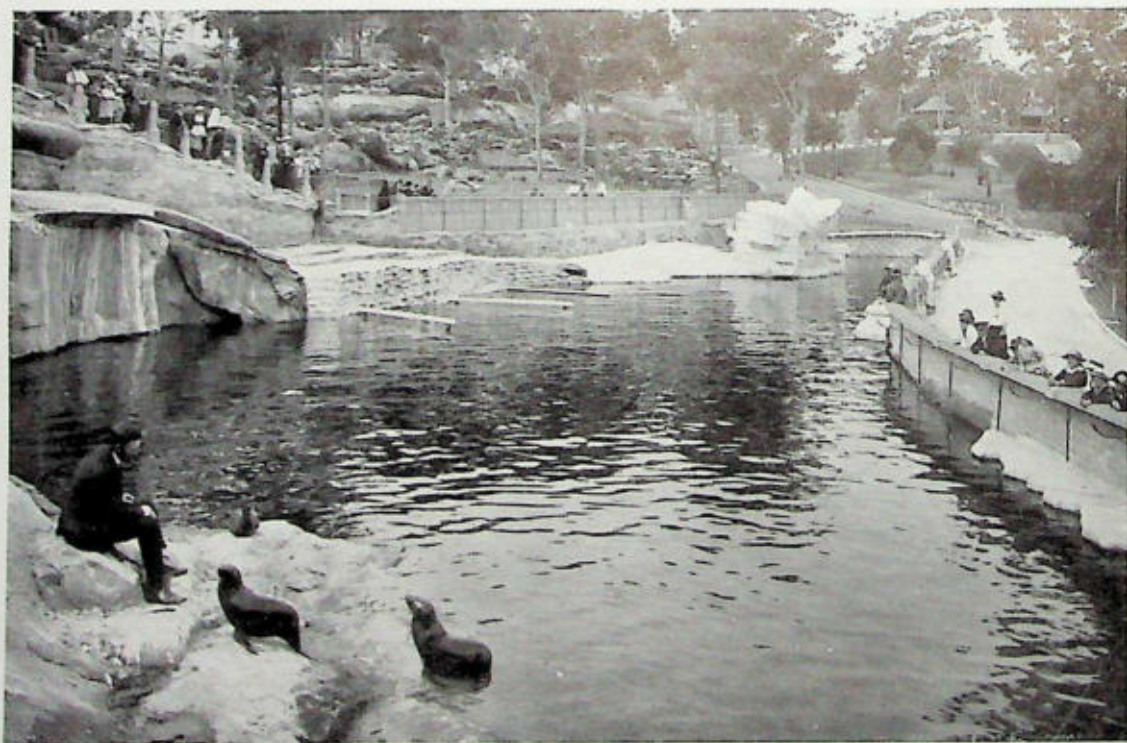


POLAR BEARS ON LOWER SECTION OF THEIR INSTALLATION

The lower left corner of the picture shows the abrupt descent into the trench.



INSTALLATION FOR THE TIGER



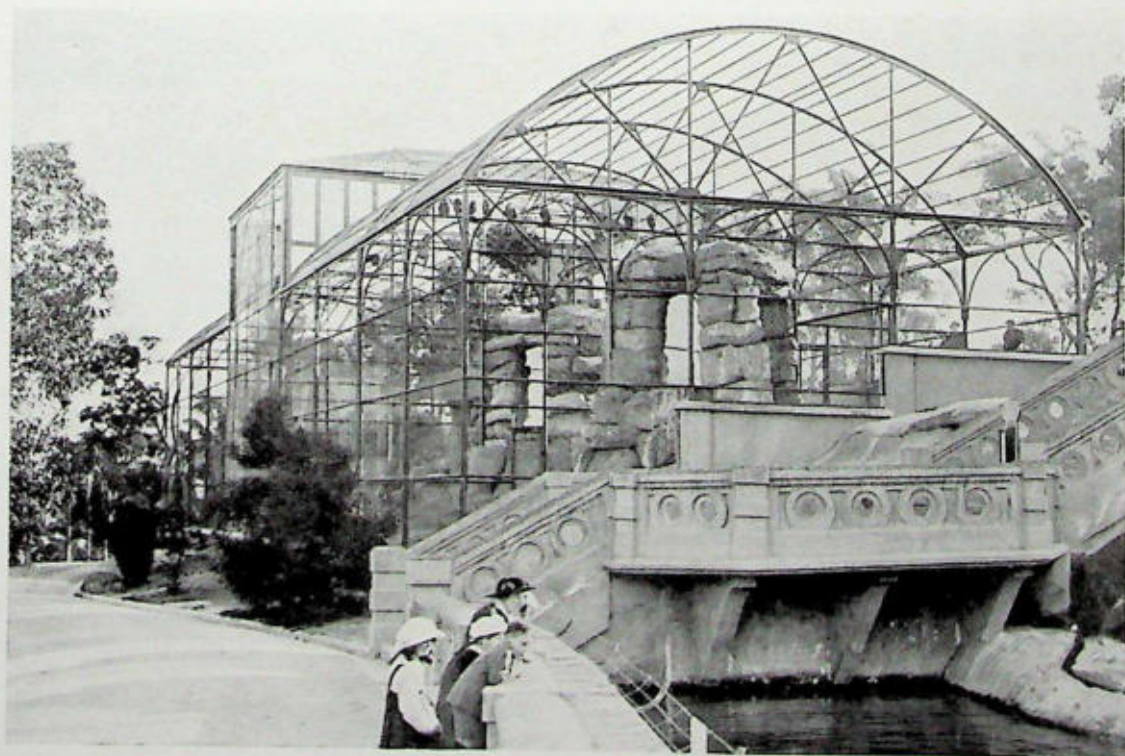
SEAL POND

A large installation capable of accommodating a great many specimens.



THE HIPPOPOTAMUS POOL.

No exhibition of animals is complete without a hippopotamus.



AVIARY FOR THE BIRDS OF PREY

This structure has great architectural grace and has been planned for beauty as well as utility.



NORTHERN ENTRANCE AND EXECUTIVE OFFICES, TARONGA ZOOLOGICAL PARK

Evidently the people are enthusiastic over their Park as this opening-day crowd demonstrates. It is worthy of note that the institution is a "Zoological Park" and not a "Zoo."

1883 when about twelve years old. She is now over fifty years, and well over the average age for elephants in captivity. For nearly forty years she has given long and faithful service, having carried hundreds of thousands of children without an accident.

Seals are perhaps more interesting to watch than most carnivora. They are best seen from an elevation, and the visitor at Taronga is about ten feet above their large pond. To see them bounding over 150 feet of water after a fish is to be lost in wonder as to where the great speed comes from. The Australian fur seal which is the species shown, is kept in bounds by a three-foot ornamental concrete wall. Two of the first inmates of the pond, received before the structure was complete, escaped. A large bull swam out to sea and was seen no more, but a handsome young male was found practising diving evolutions in a ladies' swimming bath about three miles away.

As befits an Australian zoo, the Order Marsupialia is well represented, but as the grounds are as yet unfinished, and about half the allotted space is occupied by antelope, nevertheless a fairly representative collection is on exhibition. The weather is mild enough to enable the kan-

garoos to be kept out of doors in large paddocks all the year round, and here one can often see the red or the grey species indulging in their natural sport of boxing under rules which allow the use of both arms and hind limbs as occasion offers. Each round lasts about three minutes, and the contest ends when one is exhausted.

The ungulate sections are not yet built, and so only a few are shown in temporary quarters. These include a pair of Prjevalsky horses, bred in New York, impala, blackbuck, springbuck, camels, guanaco, llamas, zebu cattle, bison and a fine male hippo.

The birds at Taronga Park are all shown in outdoor flight aviaries, no heating being required. The cages are designed to give adequate shelter without resorting to the conventional house with flight cages attached. This was accomplished by constructing a concrete cover on the centre of a wire enclosure, an arrangement which while giving protection from the weather, keeps them always in view and does not detract from the outline of the structure. In the case of the more delicate finches the aviary may be entirely closed in on the weather side. Very few birds are shown in-



POLAR BEAR, "SILVER KING"

Silver King has been photographed many times, and numerous periodicals have published his portrait, but this one Dr. Hornaday declares to be the finest picture ever made of this famous bear.
Photograph by Elwin R. Sanborn.

ZOOLOGICAL SOCIETY BULLETIN

Departments:

Mammals	Aquarium
W. T. HORNADAY.	C. H. TOWNSEND.
Birds	Reptiles
LEE S. CRANDALL.	RAYMOND L. DITMARS
WILLIAM BEERE, Honorary Curator, Birds	

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ELWIN R. SANDSON, Editor

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dividually, but large aviaries contain many species, though occasionally a great many of one variety may be on view together. A recent exhibition of several hundred Gouldian finches made a striking picture.

A special feature in the aviary collection is a number of birds of paradise, from four to six species usually being represented. These lovely birds are found to thrive well out of doors, provided they do not get too much light. They love to bask in the sun—especially when moulting—for an hour or two, but it is necessary for them to be able to retire to deep shade for the greater part of the day. Their love of display is remarkable, and every genus so far observed has a radically different way of showing off its especial charms. The most grotesque perhaps is that of *Diphallodis magnifica*.

An effort is being made to form a "rookery" of wild ibis and herons in the park. Many young birds are being turned out unpinioned. A good series of cranes, storks, swans, ducks, geese, game birds, and running birds are on view in open paddocks and ponds. None of these receive any shelter except that provided by trees and bushes.

Taronga Park has cost to date about £130,000. A small charge (sixpence) is made for admission. The revenue from gates together with the net profit from the refreshment rooms gives a return of about £17,000 or \$85,000, which is sufficient for all expenses of upkeep. The attendance is about 500,000 annually.

MR. A. S. LE SOUËF

Late in January the Zoological Park received with pleasure a visit from Mr. A. S. LeSouëf, designer and Director of the Taronga Park Zoo,

at Sydney, Australia. Elsewhere in this issue of the BULLETIN appears an article by him describing the remarkable out-of-doors institution that he did so much to create.

Mr. LeSouëf is the brother of the justly famous W. H. Dudley LeSouëf, Director of the Melbourne Zoological Gardens; and the third brother of the zoological trio, E. A. LeSouëf, is Director of the Zoological Gardens at Perth, West Australia. Late in 1921 the Sydney director arrived in London with a large collection of Australian and New Guinea birds and mammals, including half a dozen birds of paradise, and two lung-fishes.

The most interesting piece of zoological news brought to us by Mr. LeSouëf concerned the important work on the Mammals of Australia that he is preparing for publication in the not far-distant future, and also the work on the Birds of Australia that will appear perhaps about 1923.

Mr. LeSouëf's investigation of the mammalian life of the great central aboreal desert of Australia will, when published, be of keen interest to all mammalogists.

A VICTORY OVER THE LONDON
FEATHER TRADE.

For about two months a contest has been going on in London in the Parliamentary Committee on the Importation-of-Plumage Act. Through its two representatives in the Committee, the London Feather Trade has been contending for the admission of egret plumage, on the ground that the supply comes from Venezuela, where no egrets are killed, and all egret plumes are obtained in the swamps and jungles from birds that drop them in the annual moulting process. The bird-defending members of the Committee, headed by Mrs. Reginald McKenna, have strenuously resisted this demand, and disputed its soundness.

In a hurried note from Mrs. McKenna, dated February 10, we are informed, without details, that in the egret contest in the Committee the feather trade was finally defeated by a vote of six to two. The discussion lasted two days. "Having won over the egret," says Mrs. McKenna, "we feel that most of the others, if not all, are safe; and it is a great relief. So far we have lost only *Rhea rothschildii*."

Inasmuch as the bird defenders are rejoiced over the result of the contest, we, also, may cheerfully assume the right to be glad, even without full details.



BLACK BEAR FROM ANTICOSTI ISLAND

Presented to the Zoological Park by Senator Gaston Menier of Paris.

Photograph by Elwin R. Sanborn.

A REMARKABLE BLACK BEAR

LAST July, Mr. Georges Martin-Zédé, General Manager of Anticosti Island,—which now is wholly owned by Senator Gaston Menier, of Paris,—caught in a box trap a very large and fine male black bear. It is marked by a muzzle that is particularly white and noticeable. Senator Menier presented the animal to the Zoological Society, and it reached the Park in September.

This is the finest American black bear that ever came to us. Its net weight on arrival was 635 pounds; but at that time it was noticeably under its normal weight. It rapidly took on flesh, and now must be about fifty pounds heavier.

This fine animal is an interesting psychological exhibit of philosophy in a bear. From the day of his capture he never has been angry at man! On the second day after he was trapped he ate from Mr. Martin-Zédé's hand, and in all his shipping and handling he has been uniformly

and persistently patient and good-natured. He acts as if he had been in captivity all his life; and in a newly captured adult bear this state of mind is really astounding.

The only departure from this serenity of temper occurred when he became peeved at one of the Alaskan brown bears in the cage adjoining his. Then he snorted his displeasure. Quite as we expected, he went into hibernation in January, but he remained incommunicado for only three weeks.

W. T. H.

GERMAN ZOOS RUINED

A RECENT visitor from Germany, deeply interested in zoological institutions, advanced some very interesting information concerning the Zoological Gardens of that country. No other nation in the world was so well supplied with "zoos" as pre-war Germany. Every municipality that made any pretensions whatever, had its vivarium, which often was the center of the social life of the town.

As a result of the great economic and political disturbance in Germany, our informant reports the dawn of evil days for her zoological gardens. The great drop in the buying power of the mark made necessary the increase of gate charges from a few pfennig to four or five marks. Instead of the hoped-for gain in receipts, the opposite resulted, since the combination of waning interest and higher prices greatly reduced the number of visitors. It thus appears that most of the Gardens, with the exception of that at Berlin, could no longer be supported by the Societies which had controlled them, and were taken over by the municipal governments.

With the great need of money for the many other public activities, we are told that the zoological gardens have received but scant attention. Many have been compelled to close, others are about to do so and the few that still are in the hands of struggling Societies, are reported as deeply in debt.

If these statements represent the true state of affairs in zoological Germany, as we have no reason to doubt, they disclose a condition that will be deplored the world over. Chaos among the Gardens of Germany means unstable conditions elsewhere and our own sources of supply will not become normal until some adjustment is made there.

L. S. C.

REARING A RED HOWLER MONKEY

By GLADYS M. DITMARS

Illustrated from photographs by R. L. Ditmars

FROM zoological records in both Europe and America it appears that the South American howling monkeys—two species, the red howler and the black howler—are “impossible” as captives. They partake sparingly of food and pine away after two or three months of exhibition. In the series of records of the Zoological Society of London covering a lengthy term of years, the average duration of life of captive howling monkeys is three and a half months. Among all the specimens exhibited there, the longest record was thirteen months. But four or five specimens ever arrived at the New York Zoological Park. These specimens lived from two to three months. So far as heard from, the story has been the same from all zoological institutions, and as it has been my proud privilege to have broken zoological records in rearing a howling monkey, and in keeping this interesting creature in good health for a period of fourteen months,—with the howler continuing to thrive,—the following summary may be of some interest.

The howling monkeys are particularly interesting from several points of view. They attain a considerable size,—weighing over twenty-five pounds,—and attaining a length, including body and tail, of nearly five feet. Their make-up is weird and grotesque. They are described as “savage,” deliberate in motion, and unlike most monkeys, give voice to deep, throaty sounds that render them unique among all the monkeys of South America. This is rendered possible by the expansion of the hyoid bone into a large “sound box” in the throat, which swells to great proportions as the animal *roars*,—for that

is the correct word. How the name “howling” monkey ever originated is rather a puzzle. These animals growl, and in a tone well worthy of a big cat animal, and they might well have been called growling monkeys.

On the 9th of December, 1920, Professor and Mrs. Alfred E. Emerson arrived in New York from the New York Zoological Society's Tropical Research Station at Kartabo, British Guiana. Mr. Beebe, Director of the Station, had entrusted to Mrs. Emerson's care several specimens shipped north for the Zoological Park's collections. Among these was an infant red howler monkey. Its mother had been shot for scientific investigation, and as she fell a few plaintive sounds were heard. Then this baby was discovered clinging to her body. The waif was immediately adopted by Mrs. Emerson, and it was estimated to be a month old,—or born about the 15th of September, 1920. The baby took grudgingly to a diet of powdered barley and evaporated milk. It required frequent feeding, but Mrs. Emerson delivered her little charge at the Zoological Park, in good health, and with it gave specific directions for its care.

During its first day in the Park, my father kept the little fellow in his office and fed it four times. He noted that the baby looked very miserable as it sat with drooping shoulders, and with big round eyes gazed mournfully from its cage. To send this tender little waif to the Monkey House, where the keepers were all day very busy with a series of about a hundred specimens, many of them dangerous, seemed out of the question. Here was a rare and interesting baby, of a notoriously delicate kind, and

something out of the ordinary course had to be done. Director Hornaday was consulted, and at once his decision was to turn the care of the new arrival over to me.

The fiery hue of the little stranger at once suggested a name, so we called him "Red." As we drove up home to Scarsdale with Red buttoned in my fur coat, his big shiny eyes set in a jet black face frequently glanced up at me in interrogation. That was his last day in a cage. He has been free ever since, and is absolutely different in habits from any other monkey we have ever had at home—and we have reared a number of interesting kinds.

To start properly, I gave the newcomer a warm bath and noted the following facts: Red's estimated age was three months. His total length, including body and tail, was 15 inches. The general color of skin was very dark brown, except the face, hands and feet, which were black. His back was covered with thick, silky hair, ranging from brown to rusty red. His tail and stomach region were devoid of hair. The eyes were very large and intelligent, and at first were of a bluish hue. A month later they turned to very dark brown. The teeth were extremely small, regular and white, with no indication of canine enlargement. Two fingers in the right hand had been broken and stiffened in knitting. There were indications of a break of the vertebrae in the terminal half of the tail. All these injuries probably occurred in the fall from the tree.

As Red had appeared to do well on the diet selected by Mrs. Emerson, we followed about the same schedule. Sufficient of the prepared barley to make three meals was thoroughly boiled each morning. With each morning and evening meal we gave him about a wineglassful of milk, slightly warmed; and this he greatly relished.

After about a month he tired of the barley, and also refused strained oatmeal, rice, and in fact all the standard cereals. It seemed altogether wrong to give this interesting baby heavier foods than milk or cereal. In order to get him to eat at all it was necessary to cut bits of banana, apple or cooked raisins and mix them with the barley. Infant though he was, he screamed and reached for the banana and apple, and neither appeared to harm him. As he grew tired of the cereal, the milk was increased to three small glasses per day. He grew voraciously fond of it, and after a meal his outline would be distinctly changed, his little round stomach being shiny with distension.



RED WHEN THREE MONTHS OLD
His eyes first were of a bluish tinge, then gradually changed to dark brown.

In March, 1921, there were signs of trouble. Red was now approximately six months old, and had grown two inches, but was not developing satisfactorily. There were indications of rickets, or what among monkeys is called "cage paralysis." This comes from a softening of the bones and is due to a lack of lime and bone nourishment. In some species of monkeys it seldom develops, yet other kinds, maintained upon the same diet quickly show this condition, owing to the absence of the bone-building material so essential to infants of all kinds. I have reared several Java macaques from the baby stage, a Burmese pigtail and a sooty mangabey. They were given strained cereals, a little fruit, stale bread and plenty of milk. None ever showed signs of rickets, but clearly, the diet of such monkeys would never do for the howler.

My father and I discussed the matter and decided to substitute meat broths for the cereal; and here we made a discovery. Red was ravenously interested, and in feeding him some of the broth a bit of meat was caught in the spoon. His manifestation of joy over this fragment of meat surpassed all former interests in other foods. He reached frantically into the bowl for more, and then I decided to make a bold experiment. I had a piece of beef broiled for him and he devoured every shred of it, mumbling and grunting in a fashion that he exhibited only when especially pleased.



THE HOWLER ROARING

Red in his baby days roared tremendously. The sounds were utterly out of all proportion to his size.

Truly, the development of the howler is rapid! Here was an infant half a year old, but seventeen inches long (his mother measured fifty inches) and demanding meat. I have always noted the fondness of most monkeys for meat, and believe they actually need it in their diet, but never before have realized its necessity to an animal so young.

The symptoms of rickets had advanced to the stage that Red was unable to do more than grovel along the floor. Neither arms nor legs had strength sufficient to raise his body. The meat experiment convinced me that Red must no longer be treated as an infant, and at once his diet was altogether changed. Incongruous as it may seem, he was now given everything wholesome that he would eat, and he refused practically nothing except the monotonous cereals of his short "baby" days. Day by day the list of tested and assimilated foods grew longer. Red was given boiled and baked potatoes, beans, peas, carrots, cauliflower,—in fact all kinds of vegetables. He would eat heartily of all kinds of meat, with absolutely no preference whether broiled, fried, roasted or boiled. His favorite item was spaghetti and this he delighted to hold in two writhing handfuls, devouring it strand by strand. He was fed three times a day, being provided with a small high chair and tray beside our table. With each meal he had plenty of milk,—and he consumed about a wineglassful.

Upon this formidable diet (which has continued up to the present time without elimination) Red passed through a transformation covering a period of about three months. His weak legs soon showed an inclination to support his body in wobbling fashion, and within six weeks more he was up and walking. His eyes grew darker and more expressive, and his tail became thickly coated with reddish hair. The hair of the body grew long and wavy, and acquired a golden sheen. All indications confirmed our discovery of a successful diet for the howler,—plenty of meat and a variety of vegetables.

To my mind there is yet another important factor in the treatment of these delicate little people of the jungle, which receives too little thought, and that is their mental condition. I believe that many monkeys may be mentally ill and in that case, the offered diet is of little avail. Red has been practically a member of our family. He has been taught cleanly habits, and has the run of the house. He has his favorite nooks and spots where he sprawls for a morning sun bath. A wicker basket with some bits of blanket serve as his bed, and when he is tired he hops in and takes a nap. He is satisfactorily nourished and also mentally well, and we are convinced that under these conditions the howler is not a "delicate" species. This was pretty well demonstrated by an experience of the past summer. We motor daily from our home to the Sound for an afternoon bath, and Red accompanies us on all our trips, sitting on the sand of the beach, but making friends with no one unless they are altogether to his liking.

Once after having left the howler in charge of two little girls who are very fond of him, we returned to discover that a boy had strolled in from the amusement park, and was contributing to Red's entertainment by feeding him generously from that homely combination consisting of a frankfurter, roll and sauerkraut. Red had partaken of the triple combination, but most heartily of the first and last ingredients. Later on he was favored by the parking attendant, who gave him a copious drink of sarsaparilla. We were worried about the afternoon's dissipation, but that evening our cook contributed to our anxiety by discovering all too late that Red had wrecked the frosted decoration of a lemon-meringue pie, and also had entered deeply into the foundation of the pie itself, including the crust. While we have since taken all precautions to prevent repetitions of such happenings, our howler was in no way affected by such dietary carousing, which again leads



RED'S HAIR IS LONG AND SILKY

The thick pelage extends to the tip of his tail, covering it completely except the under, prehensile part.

me to think that the trouble with captive monkeys of that type has been largely mental. Miss Cunningham's valuable article in the *BULLETIN* on the gorilla, John Daniel, points to a similar condition.

As is naturally the case with all young monkeys, Red was occasionally ill, but his only troubles that we were able to note were colds and dysentery. During the two winters he has been with us he developed a severe "cold in the head" about twice each winter season, and appeared quite miserable sneezing and wheezing. In each instance we have quickly cured him by thoroughly rubbing his nose with camphorated vaseline and swabbing his nostrils with the same, using a tuft of cotton on a blunted toothpick. Besides doing this we rubbed his breast with warmed camphorated oil, then kept him quiet, in a warm place. Dysentery is a more serious matter and with all monkeys should receive immediate and careful attention. We at once stopped giving him any heavy food and alternately gave him subnitrate of bismuth and bicarbonate of soda. The dose of each was about as much as could be scooped up on the rounded end of a large penknife blade and dissolved in about half a wineglassful of water.

We also gave him tea to drink instead of plain water. Tea is much used among the Chinese animal dealers in caring for orang-utans and preventing dysentery.

As is probably the case with all howlers, our specimen is absolutely unable to endure cold. I believe that if Red were exposed to a temperature as low as forty degrees he would soon perish. He detests the winter, and if the temperature of our living rooms goes even a few degrees below seventy, he crawls under cushions to hide or squeezes close to the radiators, his arms upraised in order to expose his breast to the heat. If he is cold he will not eat, and during the present winter we have knitted him a woolen jacket, which he greatly enjoys and in which he bravely goes exploring the house in the early morning, before the heating boiler has been looked after, and the radiators, which have been chilled by bedroom windows being open, have attained the heat of the daytime.

As this article is intended to present points of information that may be new in the study of monkeys, it is important to cite a few observations of our howler's habits. One thing we have discovered which may be valuable as a scientific record, and that is, the surprising



RED TAKING A SUN BATH

Every morning he climbs to the top of a small table near a window and stretches out in the warm rays of the sun.

tendency of our specimen to give off through the pores of the skin and the hair the reddish color-pigment which gives this species its name. When this little animal is given a bath, the water becomes deeply stained within a few minutes with the same peculiar, reddish color as his hair, and he emerges from the bath as if distinctly bleached, the long hair of the back being almost yellow. Within a week he "colors" up again. This dye action of the hair is more strikingly illustrated by the small blanket in which he is wrapped at night. At times this becomes as deeply tinted as if stained with iron rust. We have saved portions of the blanket for analysis. The strange dye-giving tendency of the hair may explain the great difference in color observed among wild howling monkeys, some of which are dark red, some pale rusty red, and others actually yellow. It may be that the exposure of some individuals to heavy rains in the jungle, while others have been sheltered, has resulted in these color variations. We have had the woolly monkey of South America and the saki at our home, but with these we have never noted this condition. Nor have we observed a hint of it among the Old World monkeys, such as the macaques and mangabeys that my father has

studied and photographed in his laboratory—all of which are carefully bathed before filming, in order that their coats may be in the best possible condition.

Our howler has a fair vocabulary of distinct sounds. He seldom utters his deep-toned and weird roars unless he is hunting someone and is in doubt as to just where they are. When he unexpectedly discovers a member of the family, in one of the rooms, quietly reading, he enters the room uttering low short grunts or barks, sounds difficult to describe. Climbing up on the chair and settling in one's lap, he croons in soft fashion and makes gurgling sounds, produced by gently expelling air against the roof of the mouth. He has a habit of pleading, with prolonged whining sounds, to have his back scratched, or to be noticed; and when frightened he utters an altogether unique, sharp bark, repeated several times. The exhaust whistles on automobiles passing the house will often cause him to glance towards the windows and utter these barking sounds.

Red is horribly afraid of a human sneeze; just why, we do not know, because his vocabulary contains no such sound. If anyone sneezes, Red gives a quick glance at the nearest window



RED WHEN A YEAR OLD

As he advanced in age, the expression of his face changed very materially.

—then rushes for shelter. He usually hides under a heavy chair, then slowly emerges, glancing cautiously towards all windows in the room. He shows no fear of the one who sneezes, but appears to consider the sneeze as an emphatic warning to take cover. All of his fears and doubts appear to come from imaginary things outside the windows. There is nothing in the house that he is afraid of. He lords it over the cat and dog, the former a particularly large, lazy animal; and if we make a move to "shoo" the cat out of the way and Red notes the action, he rushes at the cat with growls and barks to help in the process. He has been severely cuffed by the cat for pulling her tail and deliberately pawing over her dinner while she was eating, but he has no fear of her.

He dislikes strangers and is liable to misconstrue a visitor's actions when shaking hands. Red seems to think this a hostile motion on the

visitor's part, and has several times rushed up and glared at a caller, his fur bristling straight from his body, making him appear twice his normal size.

Red is absolutely regular in habits. He is tucked in his blanket by the last member of the family retiring for the night, and makes no move to venture out again. He seldom wakes until he hears someone stirring in the morning, when his plaintive cry is heard at the door of the room where he sleeps, as he demands freedom for the day, and breakfast. Early morning is his noisiest time, for the howler appears to usher in the morning with many yawns, each accompanied by a noisy intake of breath, followed by a roar that ends in a squeal. His morning toilet includes much scratching of head and sides, and usually the latter half of his marvellously prehensile tail, and then follows an astonishing exhibition by the tail itself. This



THE WONDERFUL PREHENSILE TAIL

As an infant, he would coil his tail around an object, throw the end over like a half-hitch and make an absolutely secure loop.

dexterous appendage can be curved over any portion of his back, and the tip works precisely like the human forefinger in scratching any portion of his body.

While Red has been with us for over fourteen months, he has never broken anything in the house. He solemnly inspects many objects, but makes no attempt to pick up anything unless it is very small, and even then he never carries it away. He has never knocked over a vase or a glass. This is remarkable in comparison with most species of monkeys, which if liberated will literally wreck the contents of a room in a very short time. Yet Red is not morose and loves to play. He delights in being rolled on his back, and wrestles with one's hands amid an accompaniment of explosive grunts and growls, his ample mouth wide spread in an unmistakable grin.

After fourteen months of our care, Red is now twenty-six inches long (more than half grown), and is developing strong canine teeth. Later on he may become a problem, but at present we are determined to maintain him as a member of the household. Since we received him, he has never been entirely separated from the family. He has traveled thousands of miles by motor and Pullman cars, and he has slumbered in many hotels where rules have not yet been formulated to bar red howlers from the premises.

PRESENT STATUS OF THE EUROPEAN BISON OR WISENT

By THEODORE G. AHRENS

In the *Journal of Mammalogy*, May, 1921.

ORIGINALLY there existed two types or species of wild oxen in Europe: The ur (*urus*), aurochs, Slavonic tur—*Bos primigenius*; and the wisent, Polish zubr, Roumanian zimbr—*Bos bonasus* L. or *Bison europaeus*.

The ur had no mane, resembled our domestic cattle, but had larger horns. The wisent has a mane, long hair on neck and shoulders, a hump, short horns and is a counterpart of our American bison. The ur became extinct in Europe, with the exception of Russia and Poland, in the fourteenth and fifteenth centuries.

The province of East Prussia, which belonged since 1511 to the Hohenzollerns, harbored a very considerable number of wisents. Many wisent hunts are mentioned in literature, and the animals enjoyed considerable protection. In 1726, 117 wisents were still counted, but in 1755 the last animal in East Prussia was killed by a poacher. In Brandenburg the wisent existed till the eighteenth century. It was care-

fully protected and in 1743 eleven were still accounted for. In 1768 the last Brandenburg wisent perished.

Wisents lived in Austria and Hungary throughout the middle ages, but became extinct there in the sixteenth century.

Finally the forest of Bieloviesh (Russian), Bealowies (German) or Bialowieza (Polish), in Lithuania near Grodno, and a district in the Caucasus Mountains are or were the only remaining regions in which any considerable numbers of indigenous wisents lived. To be sure, upon the estates of the Prince of Pless in southeastern Upper Silesia, and in Ascania Nova in southern Tauria (north of Crimea), belonging to the recently deceased F. von Falz-Fein, a small number were maintained, but these animals had been imported and were not indigenous.

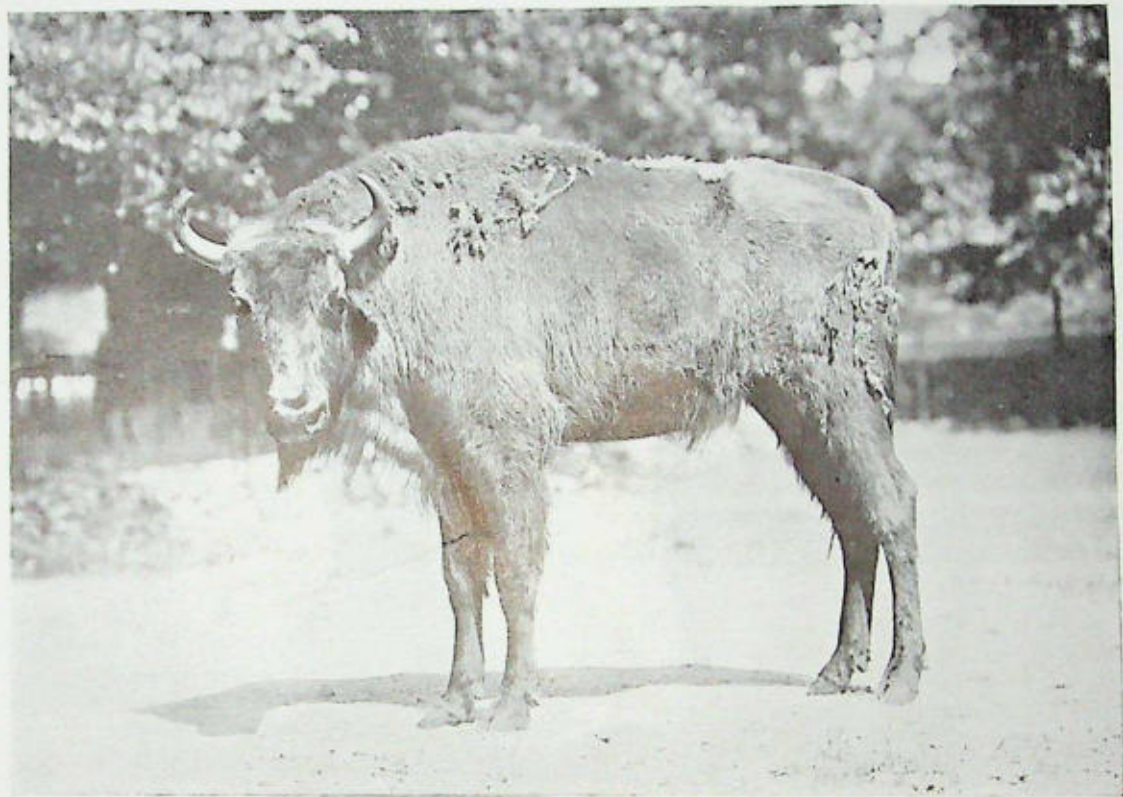
The great forest of Bieloviesh had been a royal hunting preserve since the eleventh century and wisents could only be hunted there by special permission from the ruling dynasty. The Polish-Saxon kings protected the wisents and ceased to allow any economic use of the forest. After the dismemberment of Poland, the Russian czars continued this policy of protection so that up to our own times the forest remained a carefully protected sanctuary.

To give some idea of the hunts which took place in Bieloviesh under Polish rule, we learn that at one hunt, in 1744, thirty wisents were killed; forty-two in 1752, and at the latter 1,000 peasants were forced to act as beaters to drive the game together.

Since 1820 the czars prohibited the cutting down of trees and serious efforts were made to protect game in general, and wisents in particular. In 1860 the first imperial hunt took place. Two thousand peasants acted as beaters; many foreign princes and a great number of persons of all ranks were present. Twenty-eight wisents and much other game were killed. In 1897, thirty-seven wisents were killed at an imperial hunt; in 1900, forty-five.

In 1828 Brincken remarks that: "à la fin de la dernière guerre la nombre des Bisons s'était diminué jusqu'à se réduire a 300."

Nevertheless in 1826 from 700 to 800 were counted; in 1829, 711; in 1830, 772; but in 1831, probably in consequence of revolutionary movements, 657 only. For the next fifty years this average must have been maintained; for in 1884-1885, 500, and in 1891, 479, were quoted. Thereupon a ukase of the 3/15 February, 1892, gave absolute protection to the wisents for all time, so that at the beginning of the present century more than 1,200 are mentioned. In the



EUROPEAN BISON; WISENT

One of the two animals of this species exhibited in the Zoological Park.

Photograph by Elwin R. Sanborn.

following years severe epidemics broke out, so that only 727 remained in 1914. The war was naturally disastrous, so that when the German administration of the forest started, scarcely 160 remained. Since this event the wisents were counted every month as far as possible, and in March, 1917, the count showed 121, consisting of eighteen old and eighteen young bulls, thirty old and thirty-six young cows, and nineteen calves. In 1918, after thirty square kilometers of the forest had been reserved as a natural sanctuary, the herd seems to have increased to 170 or 180 head.

The German efforts to protect the wisent began in March, 1915, when Professor Conwentz, head of the "Staatliche Stelle für Naturdenkmalpflege in Preussen" (Prussian Bureau for the Protection of Nature) called the attention of several army commanders in the East to the endangering of the wisent. The ninth army therefore caused a strict prohibition of wisent shooting to be issued, and on October 1, 1915, Captain (later Major) Escherich, a Bavarian Forstrat (forest commissioner), was

appointed commander and head of the German forest administration of the occupied district.

Owing to the energetic efforts of this active and experienced forest official, complete protection of the remainder of the wisent herd in this extensive forest, the inaccessible recesses of which rendered any control extremely difficult, was finally carried through.

As early as September 25, 1915, a ruling regarding hunting was issued by Lieutenant-General von Seekendorff, which declared: "We desire to preserve the wisent herds as far as possible, although this is enemy territory, so as to convey to posterity a natural monument of peculiar value." Thus the best hopes for the future were entertained, but then came the collapse of the German power and the revolution of November, 1918. On December 16, 1918, shortly after the revolution, Major Escherich wrote to the "Staatliche Stelle": "In consequence of the events of the past weeks the military forest administration can no longer exercise any control over the protection of game in the forest of Bialowieza and consequently the wisent herd of 170-180 head is seriously reduced. The

imminent retreat of the German troops increases considerably the danger of extermination of the animals, and thus extinction of the species is to be feared." In fact it seems that all or nearly all the remaining wisents have been shot by the inhabitants and the retiring German soldiers, among whom discipline had been undermined by the revolution. Notwithstanding, Professor Matschie of Berlin, who is well acquainted with the territory, told me that in his opinion it is very possible that wisents may still exist in impenetrable thickets of the forest. Unfortunately, there has been no corroboration of this view.

About the end of the seventeenth century the first news of wisents in the Caucasus reached Europe. Since then little was known of the species till Professor Filatow made three trips to the district between 1909 and 1911 for the express purpose of studying the animals. The Caucasian wisent varies but slightly from the type in Bieloviesh; the shape of the skull and the horns, which resemble those of the American bison, being the chief peculiarities. It is known as *Bos (Bison) bonasus caucasicus* Greve. At one time the Caucasian wisent lived in the district of Mount Elbrus, but its territory has been reduced to a comparatively small area in the Kuban region in northwestern Caucasia. Cutting down of the forests was the chief cause for the diminution. The last known area, where Caucasian wisents lived is as follows: Its northern limit is south of the towns of Atscheha and Atscheschbok, then along the bend of the Umschten and Schischa Rivers to the mouth of the Besymjanka, and somewhat south at the mouth of the Maltsepa. The whole area is fifty versts between east and west and twenty versts between north and south. According to Filatow, the number of animals was "scarcely fewer than 100, but under no conditions as many as 1,000." Since the revolution the Kuban cosacks have demanded the return to them of these hunting grounds, which had been leased by them to the Grand Duke Sergius Michailowitsch, who endeavored to protect the wisents there, and thus an extermination of the species is also to be feared. Professor Matschie thinks that the remaining Caucasian wisents have abandoned their old range and emigrated to other regions, at present unknown.

The herd of Pless above mentioned was founded in 1864 or 1865, when a bull and three or four cows were presented to Prince Pless by Czar Alexander II. and the former placed them in his extensive estates in southwestern Upper Silesia. The animals increased there considerably. In 1893, five more cows were

introduced from Bieloviesh. In 1918 there were about sixty animals there, but according to Professor Pax of Breslau the animals in Pless have been severely decimated since the German revolution and total extermination is to be feared at the hands of poachers.*

The present war between Poland and the Bolsheviki has again passed over the Bieloviesh region, continuous disturbances are taking place in the Caucasus, and Upper Silesia is in perpetual unrest because of the differences and antipathies between Poles and Germans. Besides the wisents still extant in Pless, and possibly in Ascania Nova, there remain a few specimens in zoological gardens. But, if we sum up, we must nevertheless conclude that the extinction of the species is imminent.

DR. ALWIN K. HAAGNER

ON February 20, at its Charter Day Graduation exercises, the University of Pittsburgh conferred upon Alwin K. Haagner, of Pretoria, the Honorary Degree of Doctor of Science in recognition of the work of the recipient in zoology and wild life protection in South Africa. Mr. Haagner's name was presented by Dr. W. J. Holland, Director of the Carnegie Museum at Pittsburgh and a Trustee of the University, and the diploma was received by Dr. William T. Hornaday to be transmitted to the absent recipient. In a brief address Dr. Hornaday laid much stress upon the value of academic recognition, by great institutions of learning, of the work of isolated scientists on the frontiers of civilization, where only the bravest and the best men can cope with the difficulties surrounding scientific work.

Dr. Haagner is Director of the National Zoological Gardens of South Africa, situated at Pretoria, President of the Transvaal Game Protective Association, and Vice-President of the South African Biological Society. His published works include "The Birds of South

*The above reference recalls to the officers of the Zoological Park a very disagreeable episode. In 1903 Mr. Carl Hagenbeck bought of the Prince of Pless three adult pairs of supposedly "breeding" European bison. One pair was purchased for the Zoological Park, and the other two pairs went to zoological gardens in Germany.

After a lapse of about two years, it was discovered by all parties in ownership of those bison that each male bison had been so operated upon that breeding was entirely impossible. The operation was very simple, entirely new, and conceived and executed with such devilish cunning and skill that it was for two years absolutely invisible.

We have good reason to remember his highness, the Prince of Pless.—W. T. H.



VERY FINE YOUNG WHITE-FRONTED MUSK-ON
Female, received in December, 1920, from Franz Joseph Fiedl, East Greenland.
Photograph by Elwin R. Sathorn.

Africa," "South African Mammals," and many scientific papers. On his visit to the United States, two years ago, Dr. Haagner brought three fine living specimens of his recently described new species of South African baboon as gifts to the zoological parks of New York, Philadelphia and Washington.

ZOOLOGICAL PARK NOTES

By RAYMOND L. DITMARS

The Season.—Despite some predictions to the contrary, the present winter is turning out to be one of the "old fashioned" variety. The ponds and streams have been solidly frozen over since late December. There has been almost continuous skating, and the few thaws have been short and immediately followed by cold waves. The health of the outside animals is good, as always is during a dry, cold winter. Recalling observations that we made in the autumn, we remember that the beavers stored a generous quantity of food-wood, the squirrels and chipmunks were very busy storing nuts and acorns, and the prairie "dogs" built unusually high mounds about their burrows. These appear to be fairly accurate signs of a cold season, yet we distinctly remember assertions that this was to be an "open" winter.

The Hibernating Instinct in Our Bears.—The steady cold has resulted in a decided tendency among the bears to hibernate. There have been winter seasons when the bears played about their dens every day, and consumed about the same quantity of food as during the warm months. But not so this winter. Only about one-half our bears are to be seen outside, and they are out but part of the time, and feed sparingly. Several have retired altogether. Among these is the black bear from Anticosti Island, at the mouth of the St. Lawrence River. Although his home territory experiences degrees of cold that we have never recorded here, "John Anticosti" has decided to go to sleep. He has not fed nor been in view for about three weeks, and the keepers daily hear him snoring in the depths of his den, whereunto he gathered masses of leaves last autumn.

Monkey Finger Prints.—In adding to our collection of monkey handprints and fingerprints, which has been of much interest to a number of scientific observers, Curator Ditmars visited the Department of Criminal Records at New York Police Headquarters, to investigate the most up-to-date methods. Through the courtesy of Detective-Sergeant Hammersley, a well-known expert, several ac-

cessories were obtained and used at the Park. Preparing a thumb-print of our orang-utan Gabong, then placing a human print beside it, Mr. Ditmars again visited Police Headquarters with the idea of obtaining expert opinions regarding the difference between the two, the similarity in lines, spacings and concentric rings being striking. It was startling to discover that among the staff of experts it was the unanimous opinion that the thumb-print of the orang-utan could not be distinguished from that of a human, and that the particular arrangement of lines in the anthropoid print fitted within a classification of human thumb-prints filed in the department.

A Long-Haired Orang.—Gabong has furnished us with other interesting experiences the past few months. When he arrived at the park the past summer from Singapore, via San Francisco, he possessed the longest hair of any orang we have ever exhibited. A fiery mop of hair tumbled forward over his head and his shoulders were clad in a veritable cape. Extremely happy in his generous quarters, he developed the hilarious habit of standing on his head and turning somersaults. This worked a transformation with Gabong. Every vestige of hair has been worn from his head and shoulders, and from the long-faced, solemn and rather surly specimen of a few months ago has emerged the round headed, clownish ape, which in late weeks has caused crowds of children to shout with glee at his antics.

The King Cobra.—Head-Keeper Toomey has been keeping notes of the number of snakes consumed by the king cobra, a strictly cannibalistic species. This formidable and wonderful specimen, nearly thirteen feet long, arrived last October. He feeds upon black snakes, water snakes and other kinds that are sent every other month from Texas, where the feat of capturing a hundred pounds of serpents consumes but a few hours. Mr. Toomey has noted that the big cobra is very emphatic in indicating an appetite. It restlessly prowls about the cage, and frequently comes to the observation port at the rear and peers down the service passageway. Making a note of the length of each snake consumed by the king cobra, the Head-Keeper states that it has eaten over eighty-five feet of serpents at the time that the Bulletin goes to press.

Notable Visitors View Reptiles.—Among our visitors the past month we had the pleasure of entertaining Mrs. Kermit Roosevelt and Sir Charles Radcliffe. Going through the Reptile



SPRINGBOK

Photograph by Elwin R. Sanborn.

House Mrs. Roosevelt's attention was called to a long and very slender black snake called the *Mussurana*. This specimen has been in the building more than five years. This particular reptile figures in one of the illustrations of the late Col. Roosevelt's book "Through the Brazilian Wilderness." It is shown swallowing a deadly "jararaca," while Col. Roosevelt raises it from a table to be photographed. The photograph was taken in the laboratory of the Institute of Serum Therapy, at Sao Paulo, immediately before Col. Roosevelt departed on his trip down the now famous Rio Duvida, or River of Doubt, now officially called Rio Teodora. Some time later Dr. Vital Brazil, Director of the Institute, visited the United States and brought the snake with him, as a gift to the park. Captain Kermit Roosevelt joined the party at the Reptile House, a short time after, and was much interested to note this snake, which he immediately recalled as having been described by Dr. Brazil as a wonderfully useful creature in South America, where the species plays an important part as a destroyer of a number of deadly reptiles.

A Tame Woodchuck.—In a big collection like that at the Park, there are always a number of particularly tame specimens, which the keepers regard as especial pets. For the first time, however, we have recorded an absolutely tame woodchuck. This species is usually timid, and

resents any attempt at familiarity. The tame specimen was acquired last October. It follows Keeper Landsburg like a dog, can be turned loose for hours without fear of wandering away, and more remarkable still, can be handled by children without the least show of impatience or nervousness.

Peacocks in Winter.—Indian peacocks always suffer embarrassments in winter, but appear little disturbed by the difference in our climate from that of their radically reversed home environment. They develop their gorgeous trains during midwinter and it is a common sight on a snowy morning to note some sadly embarrassed birds. These have incautiously roosted close to the ground, the long tail feathers resting thereon like a gorgeous mat. On these the snow falls, as on everything else, and when the peacock awakes it finds hard work ahead. We have often noted a phlegmatic bird walking sturdily with several pounds of snow resting on his tail. The morning may be well advanced before the thought occurs to jump into a low tree and, working upward branch by branch, to shake the weight from the overloaded plumage.

The English Sparrow.—There is one wild bird species in the Park, and not a legitimate exhibit, that cares little about the winter, and



AMERICAN ELK — IN VELVET

Photograph by Elwin R. Sanborn.

that is the English sparrow. Every autumn these birds enter all of the hoofed stock buildings, where there is seed from the hay, and then in the genial heat among the big rubber plants and palms, build nests and rear large families, thus eclipsing by several broods the outdoor species that must wait for the spring. There are several nests immediately over visitors' heads in the Elephant House, and the daring little birds may be observed hopping about between the elephant's feet, or even perching on the back of the rhinoceros. They bathe at the edge of the hippopotamus pool and appear delighted with their surroundings. On a very mild day the entire flock may leave the building through one of the overhead ventilators, but only for an hour or so. During really cold weather they never venture out of doors.

The Pheasant Monograph, Vol. III.—The Society's quota of 350 copies of Volume III of "A Monograph of the Pheasants," by William Beebe, arrived on February 23, 1922, and its distribution to subscribers was completed during the following week. The work is quite up to the standard of the two preceding volumes. There are 202 pages of text, covering a total of forty-four forms of the pheasant family, comprising the Koklass (*Pucrasia*), Cheer (*Catreus*), True Pheasant (*Phasianus*) and Long-tailed (*Syrnaticus*) groups.



AMERICAN ELK — VELVET SHED
Photograph by Elwin R. Sanborn.



SABLE ANTELOPE
Photograph by Elwin R. Sanborn.

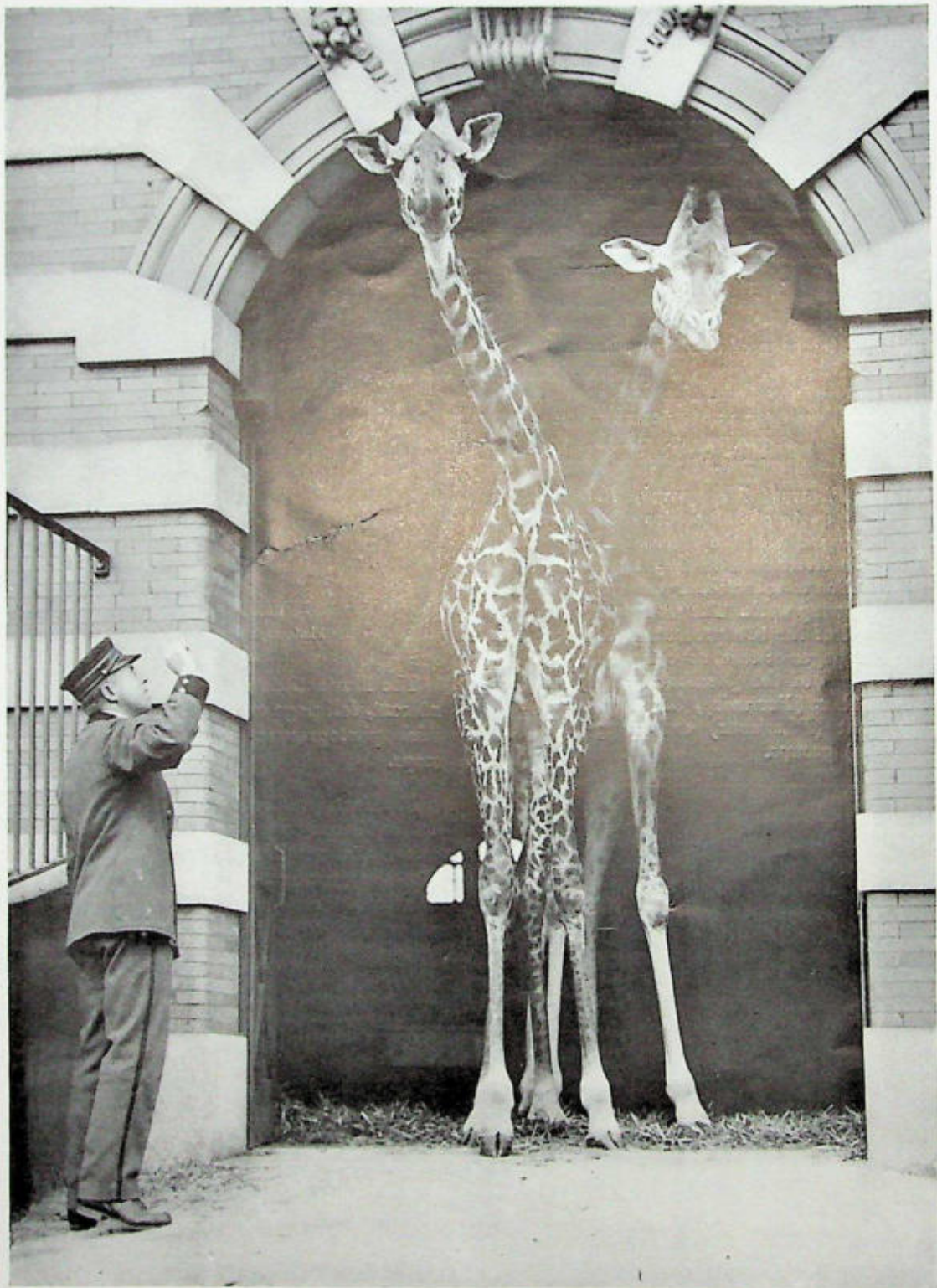
The illustrations consist of twenty-four magnificent, full page color plates, twenty-one beautiful photogravures and four distributional maps.

L. S. C.

Reindeer for Michigan.—From a correspondent in Norway we have received the following information: "I have now recently learned that sixty young animals are being shipped to Michigan, the state of Michigan being the purchaser, and further export of such animals being probable."

MR. STEFANSSON'S "FRIENDLY ARCTIC"

MR. VILHJALMUR STEFANSSON'S new book, "The Friendly Arctic" (Macmillan) contains many observations on wild animals that will be of keen interest to all zoologists who give thought to wild animal intelligence and habits. In fact, the author is a zoological explorer, and he saw and recorded much that is new of the musk-ox, caribou, bears, wolves, foxes and other species. He paid close attention to the comparative vision of arctic animals, besides which he painstakingly recorded seemingly everything that he saw in the arctic fauna. Some of this is quite new, and some of it confirmatory.



NUBIAN AND MASAI GIRAFFES

Our male Nubian Giraffe has contracted a curious habit; one that is most amusing to everybody but his keeper. Nothing can persuade him, except strong-arm methods, to pass the threshold of the door. He is just as much confined when the door is open as when it is closed. It is exactly the same if he is outside. He marches bravely to the door, looks eagerly inside, meditates gravely, and soberly walks away. He is hauled in and hauled out, is perfectly happy with the methods used, and entirely serene after the performance is over.



TROPICAL RESEARCH STATION
OF THE
ZOOLOGICAL SOCIETY
BRITISH GUIANA



Contribution No. 100

THE Department of Tropical Research of the New York Zoological Society has established itself as a successful undertaking, credited with five expeditions to the Research Station in British Guiana, and with having afforded opportunity for scientific investigation and artistic work to twenty-two persons. It has contributed one hundred and eight publications relating to its activities. The greatest source of satisfaction to the Director is the fact that the Department has been and always will be so inseparably a part of the Zoological Society, Park and Aquarium, being merely a new path of opportunity for extending the activities and influences of these institutions.

The object of this division of the BULLETIN is to keep the members of the Society informed, month by month, of the discoveries made in the jungle by the staff of the Research Station and to adumbrate in popular language the researches, which in their entirety will appear later in the Society's scientific publication *Zoologica*.

Grenada, February 9, 1922.

S. S. Maraval en route to British Guiana.

FIFTH EXPEDITION OF THE TROPICAL RESEARCH
STATION.

This left New York on February 1st, with a membership of eight,—the Director, William Beebe; John Tee-Van, Assistant; Isabel Cooper and Helen Damrosch, artists; Henry Seton of Harvard, a Research Assistant new to the Station who replaces Inness Hartley; Ruth Rose to take Mabel Satterlee's place, as the latter is at present studying bacteriology at the Sorbonne in Paris, and Paul G. Howes and Mrs. Howes. Mr. Howes is an entomologist, Curator of the Bruce Museum at Greenwich, Connecticut, and was a member of the first expedition of the Research Station in 1916. He takes the place this year of Prof. J. F. M. Floyd who has been recalled to his duties at Glasgow University. The expedition will reach Kartabo about February 20 and begin work at once.

RECENT PUBLICATIONS

Thirteen numbers of *Zoologica* relating to the work of the Station have just been issued. Prof. Henry Fairfield Osborn has reviewed the objects of the work in the tropics, followed by a list of all the publications thus far issued. Dr. Schultz of Johns Hopkins has compared embryo twin howling monkeys with human embryos. Professor Wheeler in a long paper tells of the relations of fifty organisms, ants, beetles, etc., to the ant-plant *Tachigalia*. He found that the beetles were associated with honey-secreting coccids, as our ants are with their aphid-cows. H. E. Anthony of the American Museum has contributed a list of fifty-six mammals found at the Station, four of which, including two peccaries or wild pigs, a mouse and a spiny rat are new to science. Any of these papers may be had, free of charge on application, by the members of the Zoological Society. A second volume of essays, "Edge of the Jungle," relating to animal life at the Station, has just been published by William Beebe.

THE ACID TEST FOR BOOKS

To read a book in the presence of its subject is the crucial test. I once reread "Kim" at the top of the Himalayas after I had followed his footsteps along the Great White Road to Shamlegh—and found it more vivid and true than ever. On the present steamer trip we ran into a three days' storm off Hatteras with waves twenty to twenty-five feet high, the vessel rolling forty degrees and making no progress for hours at a time. When it was over I took H. M. Tomlinson's "The Sea and the Jungle" and read the account of the storm from page 22 on, and I found it, as I have always considered it, the finest in the English language. It survived the acid test of direct comparison.

W. B.



GIVING OUR AFRICAN ELEPHANT AN OIL BATH

To keep an elephant's skin in a comfortable and satisfactory condition for the owner, requires an occasional application of neat's-foot oil. After thoroughly washing the elephant, the oil is applied with a big sponge. He emerges from this soothing operation and proceeds to eliminate every trace of his treatment by throwing dust over his entire body.



MALE NILGAI LARGEST ANTELOPE OF INDIA



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MUSEUM OF THE NATIONAL COLLECTION OF HEADS AND HORNS
To be dedicated and opened to the public in May, 1942.

ZOOLOGICAL SOCIETY BULLETIN

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MAY, 1922

NUMBER 3

THE HEADS AND HORNS MUSEUM

By WILLIAM T. HORNADAY, Curator

Illustrated from photographs by Elwin R. Sanborn

WITH the dedication and opening on May 25 of the Museum of the National Collection of Heads and Horns, another dream comes true. It is complete in almost every detail, and it far surpasses the original hopes of its founders. In the beginning no one dared to conjure up, even in his mind's eye, this spacious and elegant structure that now stands for an accomplished fact. In arranging the various units of the collection, we did our work on the theory that our results will stand for at least 200 years.

So far as the building is concerned, this prospect is by no means an idle fancy. Its thick walls and floors of solid masonry are good for much more than two centuries, provided the Goths and Vandals of civilized society do not wantonly destroy it. It owes its existence to the generosity and good-will-to-man of the persons whose names are as follows:

MRS. FREDERICK FERRIS THOMPSON
MRS. RUSSELL SAGE
JOHN D. ARCHBOLD
JACOB H. SCHIFF
GEORGE F. BAKER
MRS. ANDREW CARNEGIE
ANDREW CARNEGIE
EDMUND C. CONVERSE
SAMUEL THORNE (In Memoriam)
GEORGE D. PRATT

It is only just that early and decisive acknowledgement should be made of the fact that we owe this Museum building largely to the initiatory foresight, energy and good will of

MRS. FREDERICK FERRIS THOMPSON

The total cost of the building and its equipment is about \$140,000. Mr. Henry D. Whitfield is the architect and the Miller-Reed Company are the builders. The case work is by

David Lupton's Sons and the electric lighting is the work of the Pittsburgh Reflector Company.

The architectural style of the building is the classic, and the materials are buff brick and Indiana limestone. The inscription carved over the entrance reads

NATIONAL COLLECTION OF HEADS AND HORNS

The flanking exterior tablets at left and right are inscribed as follows:

ERECTED
by the
NEW YORK
ZOOLOGICAL SOCIETY
1922

IN MEMORY OF THE
VANISHING BIG GAME
OF THE WORLD

The structure is two full stories in height. Its extreme dimensions are as follows: Length, 91 feet; width without loggia, 56 feet; height of side walls to cornice, 33 feet. The walls of the great exhibition halls on the main floor are 18 feet in height, lighted both by daylight and alternately by a powerful system of mirror reflectors fitted with 314 75-watt electric lights. This system is the result of three months of experimenting, and we believe that it represents the last word in the lighting of high wall exhibits of miscellaneous objects.

The lower story contains a spacious exhibition hall 52 by 42 feet, in which has been installed a really great general collection of duplicates for reference and study. For the present, this hall will be open only to sportsmen, students, investigators, zoologists, and educators.

The two public exhibition halls in the main floor carry out to the letter the original plan for two distinct and equally complete series of heads and horns, zoological and geographical. The Zoological Hall has been arranged in close



BAIRD'S TAPIR, FROM PANAMA
Gift of Col. David T. Abercrombie.

conformity with the system of nature. The only exception in the grouping by families and genera occurs with the small but odd groups of large and small specimens that represent the elephants, rhinoceroses, hippopotami, tapirs, swine, equines, giraffes and walruses. All the other families are arranged very much to our mind.

The Geographical Hall very adequately represents the families of Europe, Asia, Africa, North America and South America, to which is added the very interesting "Combat Collection" and the "Collection to Illustrate Horn Development and Anatomy."

It is well to state here that there is no collection of freaks, and the number of freak heads to be seen in this Museum is exceedingly small. In the three halls

there is not one specimen without a special reason for its presence there.

The new Museum of Heads and Horns is to be open daily throughout the year, but it is quite possible that it may be decided to turn on the electric lights only after 1 P. M. each day. The two public exhibition halls have been so planned that at least 60,000 visitors can pass through them in a day, with every visitor seeing every specimen, and *at no point, from entrance to exit*, will there be any possibility of cross currents of humanity. We have a suspicion that this plan is new.

Concerning the character of the collections it is impossible to speak adequately at this time. During the past year a special gift fund of \$10,000 has been expended very successfully in procur-



HIGHEST RECORD HIMALAYAN IBEX
Gift of John H. Eagle and others.

ing large and important desiderata, and in filling up gaps. In this feature of our task, our good fortune has been remarkable. At the final showdown of actual arrangement we have ourselves been surprised by the zoological richness of our collections. In due course of time—and human endurance—it will be in order to call attention in this BULLETIN to some of our newest prizes, and to gloat a few gloats over their possession.

In a short time a comprehensive and well-illustrated guide to the collection will be published and placed on sale, at fifty cents per copy. Meanwhile, we take great pleasure in publishing herewith a complete list, up to May 1, 1922, of the public-spirited men and women,—sportsmen and others interested in wild life and the education of the people,—whose generous gifts of specimens and of funds with which to buy selected specimens, have brought together and breathed the breath of life into the National Collection of Heads and Horns.

There are many thoughtful men who believe that never again will it be possible to bring together another collection to equal this, because



RETICULATED GIRAFFE, BRITISH
EAST AFRICA

Deposited by David Mackenzie.

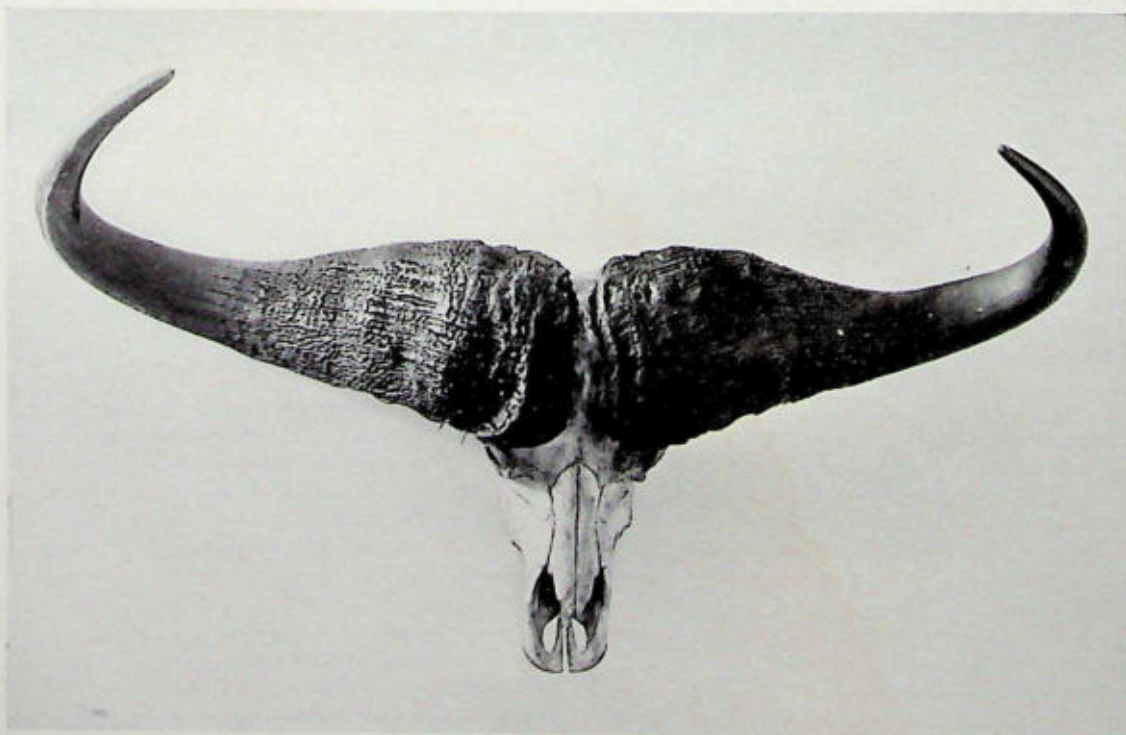


BURMESE BANTING
Gift of Mortimer L. Schiff.

so many of the species here well represented have either become very rare or have disappeared from the list of availables. There is altogether too much ground for this belief. As wild animal extermination now is proceeding all over the world, it is saddening to think that one hundred years hence many of the species now shown in our collection will have become totally extinct.



LITTLEDALE'S SHEEP FROM WESTERN CHINA
Gift of W. Redmond Cross.



AFRICAN CAPE BUFFALO (*BOS CAFFER*). HIGHEST RECORD AT THIS DATE 53 INCHES
Gift of Mortimer L. Schiff.

LIST OF CONTRIBUTORS TO THE NATIONAL COLLECTION OF HEADS AND HORNS

Complete to May 1, 1922.

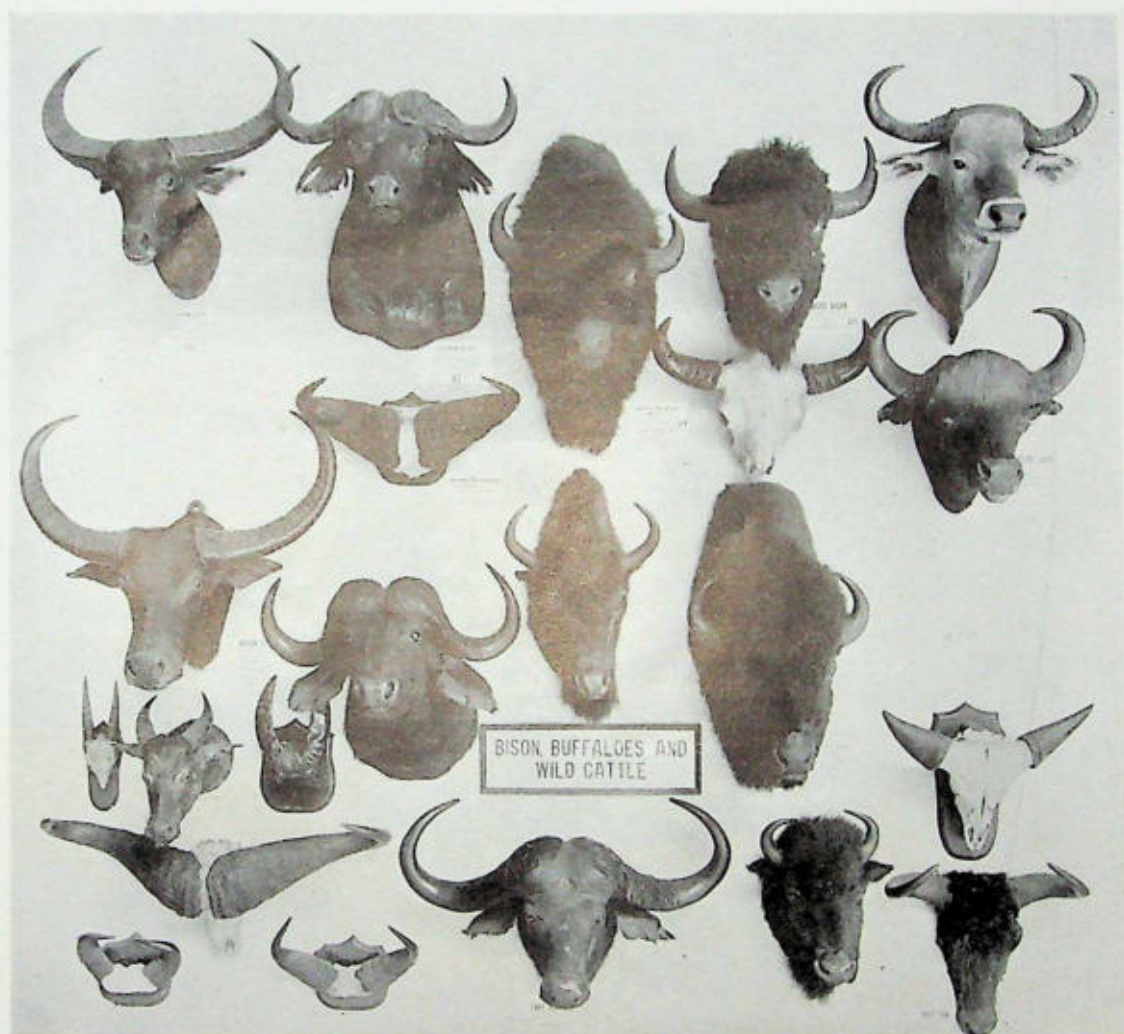
(The residences of contributors are New York City, unless otherwise stated.)

CONTRIBUTORS OF COLLECTIONS

- | | |
|--|---|
| EMERSON McMILLIN:
The Reed-McMillin Alaskan Collection. | PERCY C. MADEIRA, Philadelphia:
British East African collection. |
| CLARENCE H. MACKAY,
Collection of Alaskan Moose, Elk and Bison. | GEORGE L. HARRISON, Jr., Philadelphia.
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| CHARLES T. BARNEY:
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| GEORGE J. GOULD:
The A. Donaldson Smith African collection. | FRANK HART, Doylestown, Pa.:
African collection. |
| LISPENARD STEWART:
One-third of F. H. Barber African collection,
and other African desiderata. | JOHN R. BRADLEY:
Asiatic and African collection. |
| F. AUGUSTUS SCHERMERHORN:
One-third of F. H. Barber African collection. | JOHN W. NORTON:
British East African collection. |
| EZRA RIPLEY THAYER, IN MEMORIAM, through
ETHEL RANDOLPH THAYER, Boston:
Special desiderata. | FREDERICK G. BOURNE:
Part of F. H. Barber collection. |
| GEORGE F. BAKER:
Special desiderata. | CHARLES F. DIETERICH:
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| PERCY A. ROCKEFELLER:
Special desiderata. | WILLIAM D. SLOANE:
Part of F. H. Barber collection. |

CONTRIBUTORS OF MISCELLANEOUS SPECIMENS

- | | |
|--|--|
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| WILLIAM N. BEACH. | WILLIAM E. COFFIN. |
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THE MOUNTAIN SHEEP OF THE WORLD

A sample group in the Zoological Hall.

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MASON MITCHELL, Queenstown, Ireland.

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NATAL MUSEUM, Durban, South Africa.

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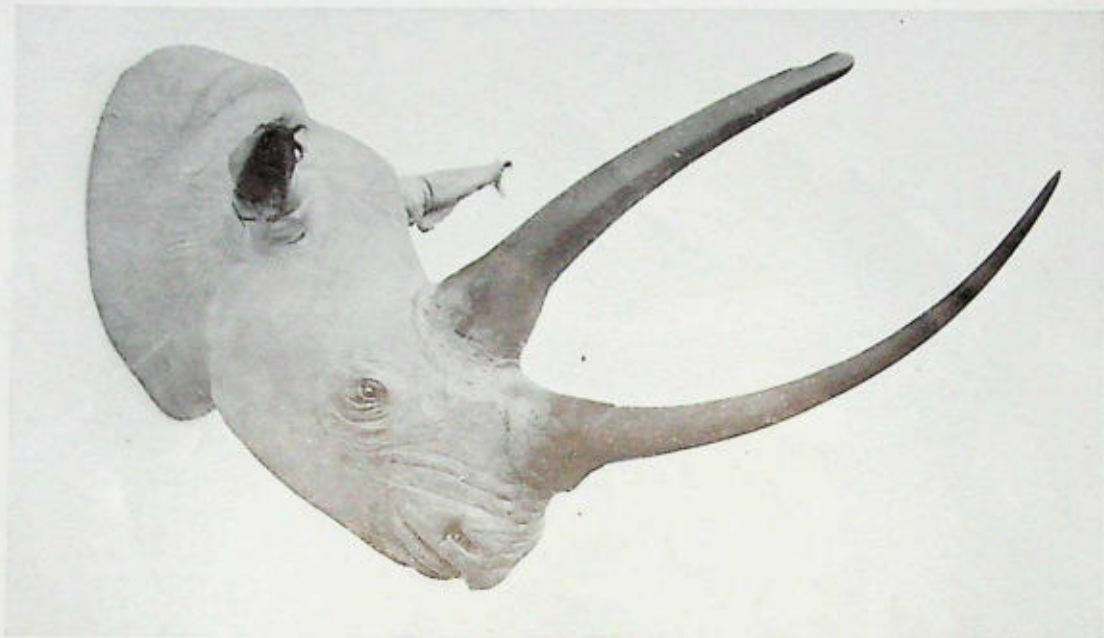
EDWARD RUSS.



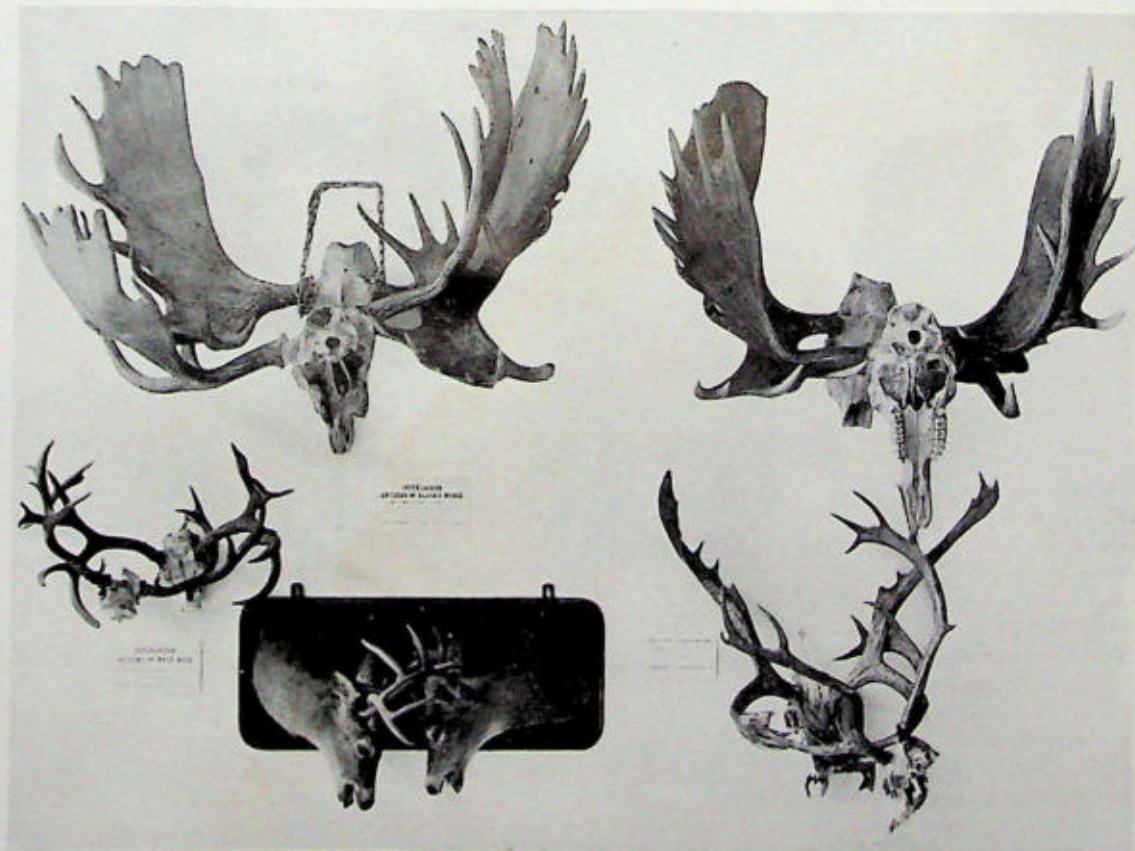
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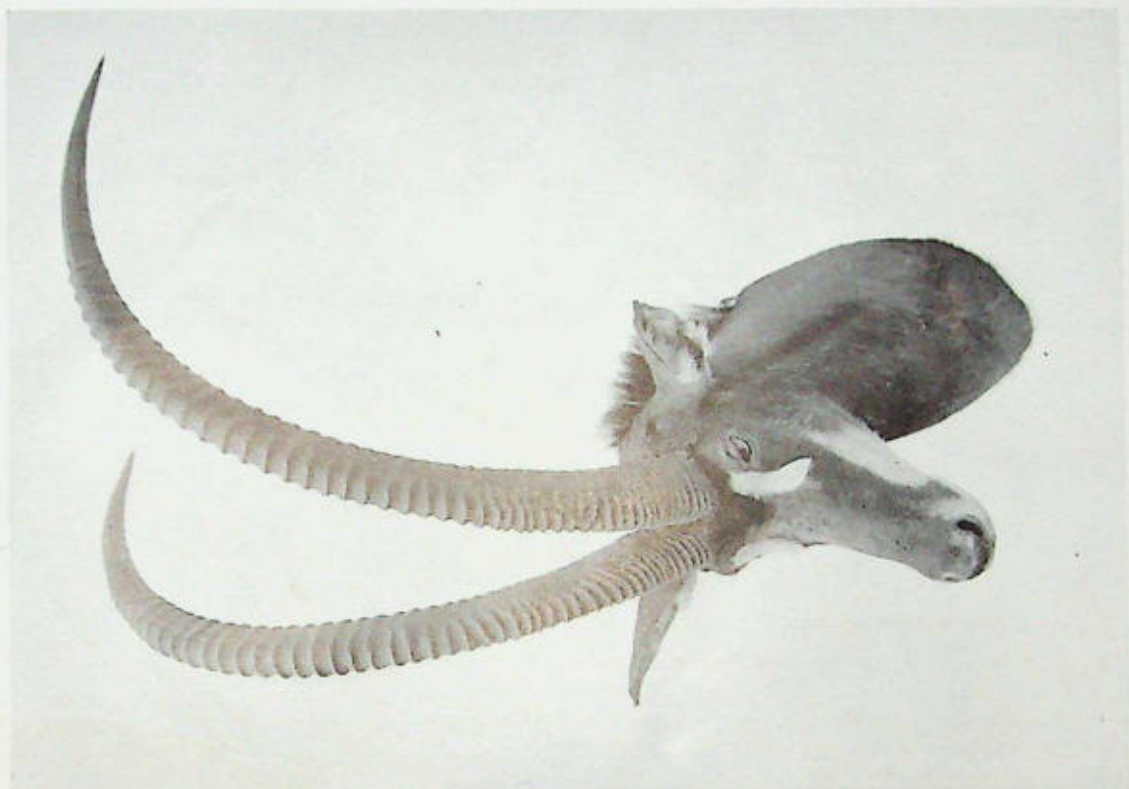
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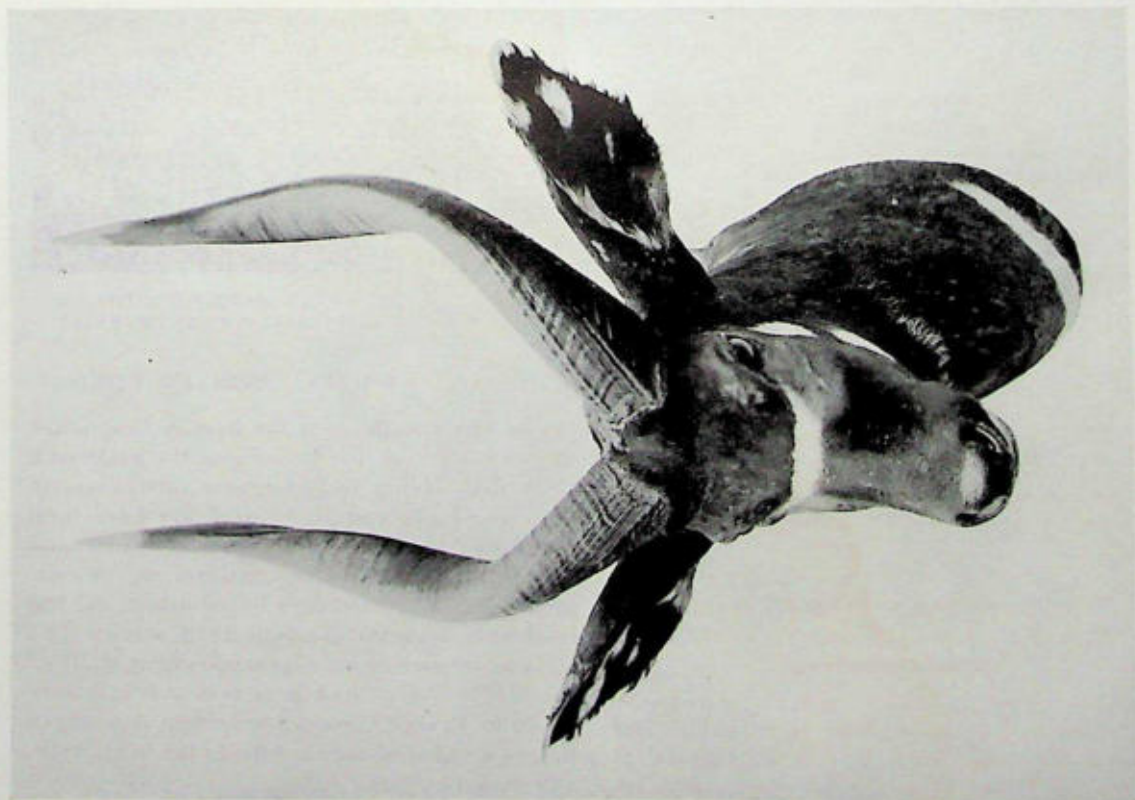
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GIANT SABLE ANTELOPE, FROM ANGOLA
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THE BARE AND BEAUTIFUL BONGO, FROM CENTRAL AFRICA
Gift of Irving K. Taylor.

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ELWIN R. SANDOZ, *Editor*Each author is responsible for the scientific accuracy
and the proof reading of his contribution.

VOL. XXV MAY, 1922 No. 3

Commissioner JOHN H. WALLACE, Jr.,
of Alabama

The wild birds and beasts of America have lost a brave and tireless champion. The untimely passing of Col. John H. Wallace, Jr., State Conservation Commissioner of Alabama, leaves a wide gap in the foremost rank of the defenders of wild life.

In the South, Commissioner Wallace was a true pioneer in the field of wild life defense. He "organized" Alabama, and put it on the map as a thorough-going game-protecting state. He was as fearless as he was tactful; and southern men and women love a leader who is not afraid to lead.

For at least ten years there has not been one wild life campaign of national interest that was not actively promoted and pushed by Co. Wallace. He worked for the regeneration of Florida when some of the rest of us had abandoned that state as a hopeless case. Although far from Washington and New York, his boundless activity and vitalizing force made it seem as if he lived in Newark instead of Montgomery. From the council chamber and the firing-line the brave and helpful spirit of John H. Wallace will be sadly missed as the next twenty years go by.

HOWARD EATON, *Outdoorsman.*

One of America's finest and best loved outdoorsmen has gone over the great divide, and entered the Valley of Rest. In the hospital at Sheridan, Wyoming, on Wednesday, April 19,

after an operation for appendicitis, Howard Eaton passed away. We had been confidently expecting the news that he had safely passed the crisis.

For twenty-five years "the Eaton Brothers Ranch," first on the Little Missouri, at Medora, North Dakota, and afterward at Wolf, Wyoming, was the Mecca of literally thousands of city men and women who annually felt the call of the open plains, the bad-lands and mountains, and kindred spirits of the ranch and trail and campfire. Jolly, picturesque, and interesting Howard, the senior member of the inseparable brothers, attracted outdoors people as a magnet attracts nails. To know him was to love him. Straight as a gunbarrel and clean as a mountain stream, a sportsman, a game protectionist, a plainsman and exponent of life in the open, he led thousands into the outdoor trails that tend to soundness of body, brain and morals. He knew his West as very few men know it. He conducted parties to everything that was worth seeing; and his patience was boundless. He was a man of a million friends, with no enemies, and his passing will be widely and deeply deplored.



FACSIMILE OF THE NOTICE POSTED FOR THE PROTECTION OF NEW BIRD SANCTUARIES IN FRANCE

WILD LIFE PROTECTION IN FRANCE

The latest *Bulletin* of the French League for the Protection of Birds contains the gratifying news that during the past year thirty sanctuaries for birds and other wild life have been established in France through the efforts and under the auspices of that organization. A complete list of these refuges is published and the total area amounts to about 1977 acres. The League announces its expectation that in 1922 one hundred more such preserves will be established in France. Special reference is made to the recognition of public duty to the birds valuable to agriculture.



TROPICAL RESEARCH STATION
OF THE
ZOOLOGICAL SOCIETY
BRITISH GUIANA



Contribution Nos. 111, 112, 113

LIVE BIRD COLLECTIONS IN FRENCH GUIANA*

By M. JEAN DELACOUR

Président de la ligue Française pour la Protection des Oiseaux; Président de la Section d'Ornithologie de la Société d'Acclimatation; C.M.N.Y.Z.S.; C.M.A.O.U.; M.B.O.U.; F.Z.S., etc.

(INTRODUCTORY NOTE: M. Delacour is well known as one of the leading aviculturists and ornithologists of the world, and a prominent official of the Société Nationale d'Acclimatation de France. Before the war, on his beautiful estate and park at Villers-Bretonneux, he had as many as two thousand birds of about five hundred species, all living in aviaries or in semi-freedom. What the Germans did not destroy by shelling, they wrecked deliberately by hand, leaving not a single living creature. M. Delacour has now acquired a new Chateau with a park of sixty acres at Clères, and for six months has been travelling in Venezuela, Trinidad and French Guiana, seeking new specimens to restock his collections. I have had the good fortune for the past week to have M. Delacour as a guest at the Research Station, and I have persuaded him to write a short article for the tropical research department of the BULLETIN about his interesting work in the little known Colony of French Guiana.

WILLIAM BEEBE, *Kartabo*, March 17th, 1922.

OUR little steamer *Antilles* has just left the muddy waters of the Guyana coast, and now it is in the Maroni, between the far distant French and Dutch banks, all clad with mangroves and manicole palms; large yellow and blue macaws fly over the river.

What first strikes me in this Guyana river is the almost complete absence of life in the water or on the banks; a month before I was on the *Apure* in Venezuela, where thousands of huge crocodiles and salt-water dolphins, as well as clouds of shore-birds were to be seen everywhere.

We reach St. Laurent-du-Maroni, whose name is synonymous with Hell in the minds of French subjects in the five parts of the world,—the Capital of the Penitentiary Administration, which owns all the northern part of the Colony, and where all the convicts from France and French colonies land to begin their life of hard labour. I find St. Laurent very attractive, with its broad avenues shaded by large trees, well-kept grass lawns, and comfortable brick-built villas,—the official town of "la Penitentiare."

* Contribution No. 113, Tropical Research Station.

The Director of the Administration has come to the shore to meet me,—a most kind and refined black Creole, whose help to me is capital in this Maroni district, where he is the absolute master. He gives me a spacious house with a large garden, and a score of convicts to take my luggage; this is a very important business, as apart from my many private cases and those of my secretary and assistant, F. Fooks, I carry through South America dozens of tins and boxes with food, cages, traps, dead collections, and over a hundred live animals and birds, collected in Venezuela! Everywhere in St. Laurent one sees convicts, clean-shaved, clad in white linen, with large hats that they make themselves of palm leaves. They are most useful in every way and one very soon forgets entirely that he is living among the worst six thousand men that France has produced in present days.

In a few days, spacious aviaries and cages are built in my garden, a large gallery is turned into a bird room, another one into an elementary laboratory, and we can begin to collect in the country. I have two convicts to help with the live collection, under Fook's supervision. I discover that one of them comes from my very

own village, Villers-Bretonneux, destroyed in the last war! The old man, who has been in Guyana for thirty-five years, is so delighted to see a member of my family that he weeps!

In Venezuela, most of my live birds had been caught with birdlime. In French Guyana I engage a few convicts who make a profession of catching and stuffing birds. They know perfectly well when and where the different birds can be found, and they knock them down with blow-pipes. I instruct them to use soft earth for their bullets, so that they do not kill the birds but simply stun them. I myself use some trap cages. My garden is full of Blue, Palm, Black, and Silver-beaked Tanagers. Within a week we have in our aviaries more of them than we need. The seed-eaters, also very abundant near the house, are not nearly so easy to catch. Every day I go to the jungle. The second growth begins two miles from the town, beyond the more or less cultivated marshy land. Some low trees are covered with fruit; my bird catchers become busy hitting the numerous yellow-winged sugar-birds which feed on the trees. In the cage they quickly recover from the shock. We also procure in the second growth, turquoise, black-headed, and purple sugar-birds.

The convict camps are scattered in the forest as far as ten miles from St. Laurent. The men are employed in cutting timber. Light railway lines connect the camps and afford very convenient means of transport through the wonderful virgin jungle. On a truck pushed by two Arab convicts, I go in all directions, stop where I want to, and then walk through the jungle.

Life is plentiful in French Guyana, but the jungle is so dense in some parts, the trees so tall in others, that it needs much patience and careful watching to see its inhabitants. I sit on a log, motionless, and soon agutis and acushis come out to eat the "Momba prunes" or wild plums. The aguti is similar to the British Guyana one, the acushi, common in the Maroni, is a charming diminutive of its relative, with a curious unaguti-like tail. A pair of big curassows also make their appearance; tinamous and rufous pigeons walk about. On the trees, a flock of yellow-headed manakins hop among the branches; green and violet trogons chase insects. I intend to stay there for hours, but the terrible mosquitoes have soon discovered me; I am surrounded by a cloud, my face and hands are covered with hungry insects. I must move to kill them,—and all animal life disappears with frightened cries.

On the little railway line I occasionally have a glimpse of marail guans, tinamous, and

acushis, and a snake is not infrequently met with. Then my Arabs stop, and with their long sticks try to kill the poor reptile, which they always consider as most venomous. When I catch with my hands some inoffensive snake, they think that I am an unnatural person!

Two of the most beautiful birds of Guyana, the Royal Topaz Hummingbird and the Paradise Tanager, are rather common in the jungle, but the flocks of tanagers keep to the tree top, while the Topaz feed amongst the crimson spikes of a liana which blossoms a hundred feet high. Little hope to catch them.

Beyond the camps, the only trails in the jungle are the telegraph lines. The director of the Telegraph Service in French Guyana is a very keen sportsman, who takes much interest in nature. Every twenty miles he has a small camp, where a few convicts live to keep the line in good condition. In his company I leave St. Laurent and for a fortnight we walk through jungle and savannas. The Guyana jungle gives me a very strong impression; undoubtedly it is not so charming as the tree-fern woods of the hills of Martinique, nor so beautiful as the few virgin forests still existing in the mountains of Venezuela, but it has a grandeur that I had not seen before. These enormously tall and comparatively slender trees (an Angelique that we felled proved to be 160 feet high), covered with lianas and epiphytes, creates a very special atmosphere, while the various palms and heliconias growing between them accentuate the equatorial aspect of the jungle. Another beauty of the Maroni forest is the particularly numerous butterflies that it contains. The various Morphos shine everywhere, slowly flying with metallic blue wings, while green and black Uranias are common in the town, and even on the river. Unfortunately, in some districts, progress in the jungle, even on the trails, is made very difficult by the dampness of the soil, which is simply mud in many places. Clouds of mosquitoes often prevented me from watching wonderful sights of flocks of birds in the trees, while various ants, the uncontested masters of Guyana, become a real nuisance.

Every day my catchers bring in animals and birds; agutis, acushis, armadillos, are forced into their holes by dogs and captured. Sugar-birds, tanagers, manakins and hummingbirds fill my cages. Tinamous and doves come now and then; sometimes a surprise; some Cayenne crane or a Topaz. It is by no means easy work to accustom to captivity and keep in good health many of these inhabitants of the jungle. Fooks is up every day at five o'clock to feed

the delicate birds, and now that we have some three hundred specimens, he hardly has time for his meals. Hummingbirds require very careful attention. They are not really difficult to keep in captivity, but any omission in their regime is fatal. Hummingbirds have to be caught in the morning and brought before mid-day. This gives the time to feed them sufficiently before the night comes. If brought in the afternoon, they cannot take enough food to survive during the night and are found dead in the morning. When the catcher brings them in they generally look like corpses. Each of them is put into a small box cage, where is some of the usual mixture (Mellin's Food, condensed milk and sugar) in special covered feeders with a small hole just allowing the bird to plunge its beak into the food. (Otherwise the feathers would become sticky with food and death would soon occur.) We have to catch each bird every ten minutes and plunge its beak into the food. Generally after two or three minutes the bird begins to drink. The effect of the food is wonderful and immediate; a bird which was lying on the bottom of the cage can be seen merrily buzzing a few minutes after he has fed. But he loses the strength with equal rapidity and before he shows signs of weakness he must be caught and fed again. Generally after six hours a hummingbird has realized that the tin pot of food is the equivalent in usefulness of a flower, and comes on the wing to plunge his beak into the delicious cream. He feeds about every minute, taking little food at one time. I noticed that full-colored males are more difficult to accustom to the food and we often had to feed them by hand for twenty-four hours.

The wonderful Topaz is the most difficult. It is very wild when first caught and will never feed the first day. The great difficulty in the tropics is to supply hummingbirds with always fresh food. The mixture soon becomes sour and is dangerous. It has to be replaced several times a day. Hummingbirds are so pugnacious that one cannot keep more than one in a cage. The average losses on caught hummingbirds, when properly attended to, are very slight and do not exceed ten per cent.

One difficult part of my enterprise remains; it is bringing to France my collections without too many losses and I do not dare to think of what the journey will be! But when I have come back to my old Normandy home, where men have worked for five hundred years to make it safe and pleasant, and have continually tried to improve the natural beauty of the surroundings, hummingbirds and tanagers will remind

me of the charm of the South American wilderness, that men have not yet succeeded in touching.

Nous tous, en France, qui ne nous contentons pas de travaux de Cabinet, mais essayons d'étudier la Nature vivante, nous avons applaudi, il y a six ans, à la fondation de la "Tropical Research Station." Nous avons pris un vif intérêt aux recherches qui y ont été poursuivies, et tellement apprécié les résultats obtenus que, cette année même, la Société Nationale d'Acclimatation de France a décerné à Mr. William Beebe sa Grande Médaille à l'effigie d'Isidore Geoffroy-Saint-Hilaire; depuis de soixante ans, cette récompense nous sert à rendre hommage à ceux qui, d'une façon particulière et remarquable, ont contribué à l'avancement des sciences naturelles.

Aussi une visite à Kartabo présentait-elle pour moi un attrait exceptionnel. L'idée, pourtant flatteuse, que je m'étais faite de la Station, a été largement dépassée par la réalité. Je suis vraiment émerveillé qu'en pleine Forêt Vierge, il ait été possible d'établir un laboratoire, d'y réunir des savants et des artistes, et de procéder, sur place, à une étude complète de la Vie tropicale dans toutes ses manifestations. Rien n'y est laissé au hasard; pas un être vivant n'est rencontré, qui ne soit examiné à fond, sous tous les aspects, à tous les points de vue. Que de laboratoires européens pourraient prendre exemple sur l'esprit de méthode et d'organisation qui règne à Kartabo!

Les Naturalistes du monde entier doivent être reconnaissants à la New York Zoological Society d'avoir créé la "Tropical Research Station"; je souhaiterais que tous pussent venir la visiter; ils en reviendraient en emportant, avec la compréhension de la Vie Tropicale, l'admiration de ceux qui, infatigablement, travaillent dans la Jungle à en déchiffrer les passionnants mystères.

MARCH MAMMALS AT KARTABO *

By WILLIAM BEEBE

IN a tropical jungle, as indeed in many other parts of the earth, birds and insects are the dominant types of animal life. Both in numbers and variety, brilliancy of coloring, prevailing sounds and adaptive radiation they are far ahead of all the other groups put together. In such a relative summary at Kartabo, mammals (the group to which we ourselves belong), must be reckoned as seventh, preceded by birds, insects, fish, spiders, reptiles and amphibians. We realize that the age

* Contribution No. 111, Tropical Research Station.

of reptiles and mammals is past, and that the present is the age of man, insects and birds.

Up to the present time we have recorded seventy species of mammals from Kartabo,† and yet it would be possible to spend a month in careful search and see only a small fraction of these. Many are nocturnal, almost all are dull-colored, and their senses of eye, ear and nostril are so keen that they are difficult to approach. An unusual number of mammals has been observed during the first month of our stay, owing perhaps to our absence for a year, as well as to the fact that many of the Indians have fallen victims to influenza and the remainder have done little hunting.

Only a few days after our arrival a herd of about forty wild peccaries, the collared species, came down within a hundred feet of the laboratory, and rooted up fallen logs and jungle floor in search of grubs and tubers. Mr. Howes found a tree where a hacka was feeding on five successive days, and a pair of them on the sixth. When alarmed the hacka rushes down the trunk, paying no attention to the observer, no matter how close he may stand, and dashes off through the jungle. A few days ago a splendid black yaguarondi cat trotted past me, unburied and in full view. I do not do any shooting within the quarter mile of area under close observation, and hence let him go unharmed. So again, when sitting on the old stelling, when an ocelot came and sat down on a rock—we looked at each other and went our ways in peace. Three times I have started deer near the trail, and at least half a dozen of the big rodent agoutis have scampered away from their feast of fallen fruit with the commotion of a whole drove of animals. A jaguar has been about ever since our arrival. I found an aguti partly devoured, and the tracks of the big feline show him to be a full-grown animal.

Every night three families of red howling monkeys roar across the river, and fresh-water dolphins come close to the shore at high tide and sigh as they exhale. Within our own area, there are at least two bands of howlers, two of cebus and one gang of beesa monkeys.

Strangely enough we have not seen a single opossum this year, but they are here in numbers and I occasionally hear them at night on the dining room table and running along the partitions of the bungalow. A tamandua anteater was found up a tree just back of the station and a great anteater eight feet in length, was killed a short time before we arrived. In

the stomach of the tamandua were two hundred thousand white ants or termites. Of course it would be impossible to count all these insects: Our method is to take ten cubic centimeters, and divide it into ten equal parts. In each of these there is an average of one hundred and twenty white ants, and when this is divided into the accurately gauged mass of the remainder, the result of two hundred and three thousand insects is obtained. When we realize the terrible damage which these insects do to houses and furniture, it would seem the wise thing for tropical planters to encourage these long-tailed tamanduas as much as possible. With a flock of tamanduas to keep the termites down and a colony of giant marine toads to attend to leaf-cutting ants, much more success would attend tropical agriculture.

In the pits dug for frogs we have recently taken a spiny rat, a rodent normal in appearance until we rub its fur the wrong way, when the hairs of the back feel like the spines of a porcupine. We keep as pets the beautiful little brown and white mice which come to glean from our crumbs after dinner. Bats are abundant, and we have captured forty-three of the dusky blunt-nosed species in the bungalow, only six of which are males. Two other species have been shot, one new to us, and vampires fly around the tents every night, although no one has been bitten. My Indian hunter has brought in agutis, a wild pig and many monkeys for food, and a beautiful twenty-six pound margay cat. The arboreal character of this animal is shown by its food, it having fed upon a Cebus monkey, while the skin of the stomach was punctured in several places by spines of the tree porcupine.

Thus during the month of March, without any especial search, in the course of tramps for materials dealing with special problems, we have seen twenty species of mammals, with a conservative estimate of one hundred and fifty individuals, divided as follows:

	Individuals
Fresh-water Dolphin . . . <i>Inia</i> sp.	2
Great Anteater <i>Myrmecophaga t. tridactyla</i>	1
Collared Peccary <i>Tagassu pecari beebei</i>	40
Gray Deer <i>Nazama nemorivaga</i>	2
Agouti <i>Dasyprocta aguti flavescens</i>	10
House Mouse <i>Oecomys guianae</i>	2
Jaguar <i>Panthera onca</i>	1
Yaguarondi <i>Herpailurus yaguarondi unicolor</i>	1

† Zoologica, Vol. III, No. 13.

Tamandua	<i>Tamandua t.</i>	1
Spiny Rat	<i>Neacomys guianae</i>	1
Hacka	<i>Tayra barbara</i>	2
Ocelot	<i>Leopardus</i> sp.	1
Margay Cat	<i>Margay tigrina</i>	1
	<i>vicens</i>	
Red Howling Monkey.....	<i>Alouatta seniculus macconelli</i>	15
Beesa Monkey	<i>Pithecia pithecia</i>	6
Cebus Monkey	<i>Cebus apella</i>	12
	<i>apella</i>	
Blunt-nosed Bat	<i>Molossus obscurus</i>	43
White-bellied Bat	?	1
Leaf-nosed Bat	<i>Phyllostomus</i> sp.	1
Vampire Bat	<i>Desmodus</i> sp.	6

It is interesting to consider these mammals as a whole, and see what part they play in the ecology of this region. As far as we know they form about two-sevenths of the entire mammalian faun, and are classified as follows:

	Species	Individuals
Aquatic	1	2
Terrestrial	4	51
Arboreal	8	39
Aerial	4	39

When we add to the arboreal species those which spend much of their lives in trees we have fifteen species of ninety-five individuals, or seventy-five per cent. of the species, and sixty per cent. of the individuals, adapted for life in the trees of the jungle. As to feeding habits:

8 are vegetarians, 5 are carnivorous, 5 are insectivorous, 1 is a blood feeder.

Six species (peccaries, agutis, red howlers, cebus monkeys, beesa monkeys and blunt-nosed bats) are social—the remaining fourteen are usually solitary.

The mammals which may be classed as noisy are six in number, and it is most significant that after enumerating them, I found the list identical with those which I had already listed as social, the solitary ones being markedly silent, or else uttering calls at infrequent intervals.

BIRDS OF PARADISE IN THE WEST INDIES*

By WILLIAM BEEBE

EVER since I first heard of the introduction of one of the forms of the Lesser Bird of Paradise, *Paradise minor* native of New Guinea, into the island of Little Tobago, I have been extremely anxious to learn definitely of the results. This I was able to do in February when visiting Trinidad en route to British

Guiana, through the kindness of Mr. Henry D. Baker, American Consul at Port-of-Spain. Mr. Baker takes a very keen and intelligent interest in science and natural history and recently paid a visit to Little Tobago for the express purpose of learning something about these magnificent birds. He has very kindly furnished the accompanying photographs and has allowed me to present the information which he gained.

The introduction of birds and other forms of life into new countries is a very serious undertaking, and the English sparrow and starling in America, the mongoose in the West Indies and the rabbit in Australia should be warnings against the indiscriminate acclimatization of foreign organisms. But it is difficult to imagine birds of paradise becoming a pest, and the chief reason for concern in this case was the very probable chance of the birds failing to survive or to breed.

About eleven years ago Sir William Ingram, the well known English publisher, secured about seventy-five of the lesser birds of paradise, both males and females, and at great trouble and expense brought them to Little Tobago, where they were liberated.

For the first year or two the birds diminished in numbers, owing either to competition with native birds or initial difficulty in finding food and water. After that time they held their own, and during the last five or six years have increased largely in numbers, so the experiment may be pronounced a decided success. These splendid birds have been provided with a new lease on life, with the chances of extermination greatly reduced.

From Port-of-Spain, Trinidad, the little coastal steamer *Belize* makes a trip around Tobago every week, and at a place called Spey Side on the latter island, an hour's row carries one to Little Tobago itself. This channel is passable only in good weather and is always swept by a very strong current. Off Milford, the supposed site of the wreck of Robinson Crusoe's ship, the breakers are sometimes enormous. The reef often resembles a terrific naval engagement, white waves following the line of coral with the speed of a torpedo and then breaking into a mass of spray one hundred feet or more high, like the geyser explosions of depth bombs. So the birds of paradise are well protected from invasion in their island home.

Mr. Baker describes Little Tobago as "saddle-shaped" in appearance, the highest

* Contribution No. 112, Tropical Research Station.



WATERING TREE OF BIRDS OF PARADISE

Photographed by Rev. C. H. Dick, Port of Spain, Trinidad, B.W.I.

parts rising over five hundred feet above sea-level, and densely wooded almost throughout. In the central depression is the house of the caretaker of the island, Mr. Banfield, and near by are a number of papaw trees, which have been especially planted with the object of providing abundant fruit for the birds at all times of the year. Before these trees were planted, the birds of paradise had to depend mainly upon such insect life as they could find, and on the fruit of the wild gartapple tree which, when ripe, splits open into about eight divisions, inside of which are deep cavities filled with bright red seeds, which the birds pull out with their beaks.

During dry weather there is sometimes a serious scarcity of water on the island. As the birds live in the tops of the trees and are never observed at ground level, such water supply as they may obtain, must ordinarily be in the hollows of trees, which might, during certain per-

iods become altogether dried up. The scarcity of water may have been the main reason why originally the birds after being brought here, seemed to diminish seriously in number. Now, however, water pots holding about one gallon of water each, have been placed about thirty-five feet up in three of the most conspicuous trees of the island, in the area where the fruit trees are most abundant. These water pots are refilled about twice a month by the caretaker, from water caught from his roof. Occasionally when this is not available, it has to be brought from the Tobago mainland."

The cock bird of paradise develops its plumes in the island between May and January, and after the breeding season these are molted. Many of these feathers are found on the fallen leaves, especially under the trees in which the water pots are placed. Mr. Baker found a number, some of which measured seventeen inches in length.

The birds are found in all parts of the jungle, from end to end of the island, but are easily seen only from six to eight in the morning and again in the afternoon from four to six o'clock. They are rarely visible during the heat of the day, as at this time they probably seek the deeper, cooler recesses of the interior woods. As many as fifteen have been observed at one time in the top of their favorite trees, and they are more readily approached during the period of full plumage development.

Besides the birds of paradise, Little Tobago possesses a considerable number of native birds. The most conspicuous is the great black cacique or giant "yellow-tail," *Ostinops decumanus decumanus*, which, strangely enough, is rather closely related to the birds of paradise themselves. The two birds seem friendly and are often seen together. At a distance, the flash of yellow from each may momentarily confuse the observer. The caciques visit the field of corn cultivated by the caretaker, which *Paradise* never does. The sea-birds along the coast never interfere with any of the birds of the interior, no attacks from hawks have been noticed, and the birds of paradise have never been seen to attempt the two-mile crossing to the mainland of Tobago.

Although considerable effort and expense have been incurred to find their nests, up to the present time neither nest nor egg has been seen, and so nothing is known about their breeding habits. They are nervous and active, and not



LITTLE TOBAGO, BIRD OF PARADISE ISLAND

Photographed from Tobago by H. D. Baker, American Consul at Trinidad, B. W. I.

easily trapped, keeping away from anything of a new or suspicious character.

* * * * *

Little Tobago is at present offered for sale by Sir William Ingram. As Mr. Baker said to me, it would be a splendid thing to have this beautiful little island with its wealth of native and introduced bird life, acquired by some society or individual who would hold it as a perpetual sanctuary of wild tropical life, where perhaps other interesting creatures on the verge of extinction might find a haven of safety.

Kartabo, March 15, 1922.

A PIONEER AND HIS DOGS

Roaming all around Woodchopper, Alaska, prospecting, is a valued friend and correspondent. As a sketch of life on the frontier, and the helpfulness of wise dogs, the following letter is of much interest.

W. T. H.

Dear Doctor:

Yours of Jan. 10th reached me, or rather I received it a few days ago, after a 50 mile mush behind the dogs. Am on the trail now, so please excuse this pencil. Ink freezes in a tent, and it was 41 below zero this morning.

Well, the injured foot is nearly as good as ever, only if I am on snowshoes all day it gets

very sore before night. May have to go out for an operation on it this summer as the bone is slivered.

Was hurt ten miles out. Had to crawl over a mountain to home cabin, but had not hauled out my winter supplies, so was out of grub and medicine, and 15 miles from any one and the foot was in very bad shape. You can judge as I drove a pick through it one and one-half inches back of the large toe. Well, the dogs were the only messengers I had to send. It was rather hard to make them leave me, something they have never done before. They would go a short distance then run back and smell the bandaged foot, then stand and watch to see if I could not get up and come. I took nearly one hour to make them understand I wanted them to go without me. And when they did they went in a round about way to a friend's cabin. He tried to drive them away, but thought it was queer as he knew they never left me. They would not leave him until he found the note which had worked under the necks. They would not leave him until he came with them. They were as pleased as two kids when they got back with him. And some will call that instinct.

W. D. McLaughlin.

Woodchopper, Alaska,
March 9, 1922.



SPIKE-TAILED LIZARD

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ZOOLOGICAL SOCIETY BULLETIN

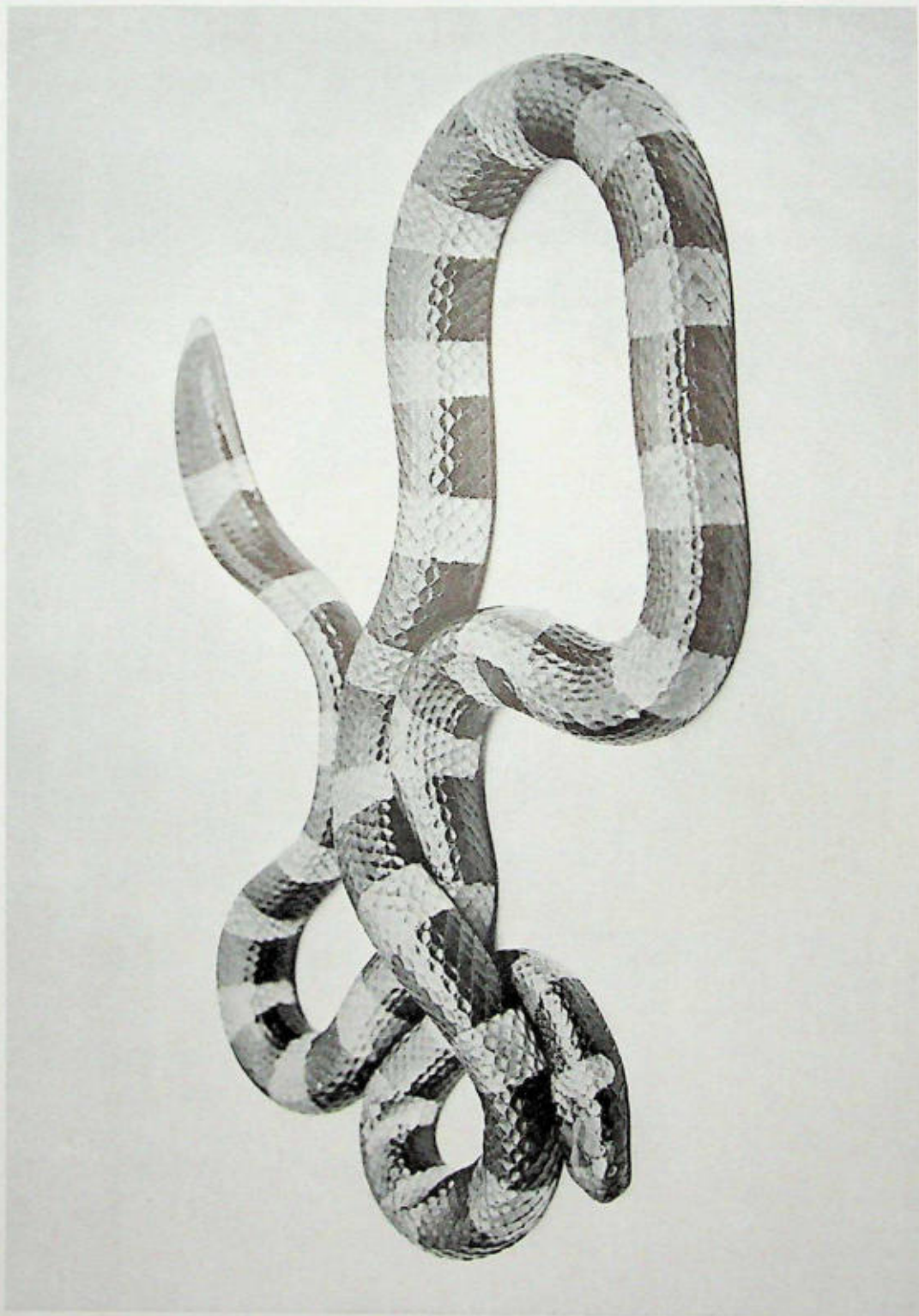
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A TRUE SEA SERPENT

As far as we know there has been but one true sea snake ever exhibited alive in the United States before the Society acquired the specimens now on exhibition in the Reptile House. One of the remarkable characteristics of these reptiles is the flattened or paddle-like tail. There are over fifty species. The greater number are brilliantly colored, and all are venomous.

Photograph by Edwin R. Sanborn.

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THE FIRST HOATZINS IN CAPTIVITY*

By WILLIAM BEEBE

ON March 27 of the present year, I sent John Tee-Van to the Berbice River on the coast of Guiana, eighty miles due east of Kartabo, to find whether the Hoatzins were breeding. The seasons are so variable and the local information so indefinite that direct investigation is the only certain method. This year we had two objects in view, in connection with these intensely interesting birds, the securing of moving pictures of the quadrupedal nestlings, and the capturing of living birds for the Zoological Park. Mr. Tee-Van was fortunate enough to accomplish both and should be given full credit for the entire achievement.

It is a remarkable fact that, although Hoatzins are by far the most spectacular birds living on the earth to-day, nearest in many ways to their reptilian ancestors, yet no zoological park has ever possessed a specimen, this in spite of the fact that they are birds of weak flight, and occasionally live and nest fairly within the limits of man's settlements. They are, however, confined to the dense growths along muddy tidal zones and swampy creeks, and are therefore extremely difficult to reach. Their food, too—the harsh leaves of the mucka-mucka arums and thorn trees—would seem hard to replace with a more sophisticated diet. Our birds were caught at earliest dawn when still asleep, by an East Indian coolie fisherman, who crept up and threw a circular shrimp net over them.

I have described these birds and their habits several times.† To repeat in brief, their dominant interest is the fact that the wings of the nestlings are armed with two well-developed claws, and the young birds clamber about the branches in a reptilian, but wholly unbirdlike manner. The power of flight of the full-grown

birds is very weak, owing to the encroachment upon the muscles and their wing attachment by the huge crop, which is needed to grind up their coarse, leafy food.

We had no idea how they would adapt themselves to confinement, but instead of a long period of constant alarm and thrashing about, they settled down at once in apparent contentment within a cage six by five, by five feet in height. Even when one of us entered with bundles of food-leaves, the alarm of the birds quickly subsided and within ten days they would hop to the nearest perch and begin to feed while we looked in through the open door, only a few feet away. When given a choice between mucka-mucka and wild caladium, they chose the latter, and of these they preferred the red- to the white-spotted. With cabbage and lettuce available, the caladiums were still eaten in preference, but when the latter was reduced in amount, the first hints of hunger broke down all restraint, and the lettuce and cabbage leaves were taken freely. One hoatzin was seen even to feed from a head of cabbage lying on the ground.

During the first few days they frequently uttered their creaking, hissing call, but after becoming accustomed to their surroundings they were silent. They now preen their plumage,

*Tropical Research Station, Contribution No. 117.

†1909—Ecology of the Hoatzin, *Zoologica*, I. No. 2, pp. 45-66.

1910—Our Search for a Wilderness, pp. 26-29, 350, 365-375.

1917—Further Notes on the Life History of the Hoatzin, *Tropical Wild Life*, pp. 155-182.

1919—Jungle Peace, Chapter V, A Hunt for Hoatzins, pp. 92-122; Chapter VI, Hoatzins at Home, pp. 123-139.



HOATZINS IN THEIR CAGE: KARTABO

These are the first of their kind ever to be kept alive in captivity.

Photograph by John Tee-Van

are interested but not alarmed at what goes on around them, and one which lost its tail in the flurry of capture is sprouting out new feathers; all signs of satisfactory conditions of life after six weeks of captivity.

THE LAND MINNOW OF KARTABO*

By JOHN TEE-VAN

Assistant, Tropical Research Station

Illustration by author

FROM an evolutionary standpoint the emergence of animals from their original aquatic home, marks a significant period in the development of the higher forms of life. The adoption of a new, dryer habitat was first accomplished among the higher animals, as far as we know, by the amphibians, who emerged from the water along the shores of the primeval seas and marshes in the Devonian period, twenty millions of years ago.

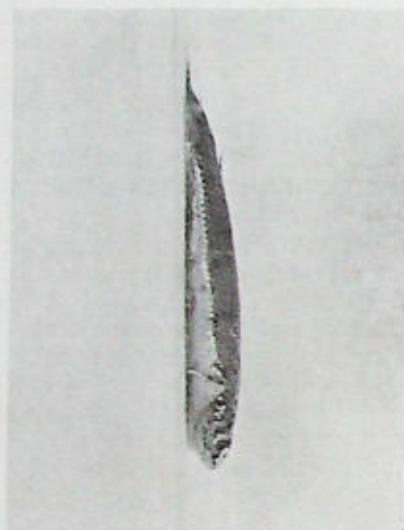
At Kartabo, this change of environment from water to air is shown by a number of species of fish, notably by some of the armored catfish,

Plecostomus, and by various species of the genus *Rivulus*.

The genus *Rivulus* as represented in Guiana, contains a number of dull, rather elongate, almost cylindrical, flat-headed fish of small size. They rarely reach three, and are usually from one to two inches in length. There is a single dorsal fin, placed far back on the body, quite near the tail. The tail is usually rounded and, in a number of species, carries near its base a black ocellus. In most of the species the males are less brilliant than the females. The only one so far found at Kartabo is *Rivulus stagnatus* Eigenmann.

These fish are commonly called "Tooth-Carps" and belong to the same group as the killifishes of the northern United States. They are included in the order *Microcyprini* and assigned to the family *Poeciliidae*,—a group which includes the interesting viviparous fishes *Poecilia*, found in great numbers in the streams and canals of the coastlands of Guiana, and extremely important to man by reason of their destruction of untold numbers of mosquito larvae. Because of their great multitudes these

* Tropical Research Station, Contribution No. 116.



(1)

fish are aptly called "millions" by the natives of the country.

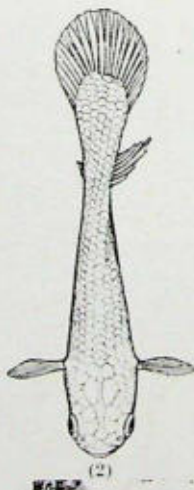
The peculiar "four-eyed" fish *Anableps* is another close relative, and is found along the sea shore and river shores of Guiana, occasionally being seen on the mud flats of the Penal Settlement, three miles below Kartabo, and rarely beneath the mangroves at Kartabo.

The four-eyes represent one stage in the emergence of fish from their liquid home. When the surf is quiet and small waves are washing up on the shore, these fish may be found rolling in on a wave, receding slightly with the outgoing water, and remaining on the moist sand until the next rush pushes them farther up the beach. Here they spend hours, washing inward and outward, disappearing into the sea with a mad scramble if one comes too close to the point which they consider marks the limit of safety. If one approaches them in a boat they are likely in their wild movements to get away, to rush up on the beach and wriggle about on the shore, before realizing that they are not in their right element, and passing back into the water. But, as far as we know, they never entirely leave the water or the shores for any length of time, and certainly do not travel about on land.

Rivulus represents another stage in these temporary changes from one element to another, quite different from that of *Anableps*. These fish are capable of hurling themselves entirely out of water and becoming attached to leaves

and stones by the adhesive power of their tail, remaining out of water for a considerable time. In the aquariums at Kartabo these fish have stayed out of water for nine days at a stretch, lying on the sand, covered with small pebbles, and as alert as if they were in normal circumstances. By wriggling and moving their tail much in the same manner as they would use it for swimming, they are able to progress quite rapidly along the ground. When alarmed they flip along, throwing themselves through the air at a much greater rate of speed than when moving along the ground. These actions have been ascribed to the necessity of leaving their own pool when the water supply has become too low, or to a diminution in the food supply of the pool.

When alarmed or dissatisfied with their surroundings, they start out of the water with a rapid rush, attaching themselves to the glass sides of the aquarium or to the leaves and rocks near the shores of their pool, as the case may be. This first rush is always made at high speed, and fish using all its energy and landing from one to three inches above the surface of the water, head upward and with the body vertical. From this point, upward locomotion becomes more difficult for the fish, and in order to progress, it must use its powerful muscles, bending its body into a bow, then releasing the bow and hurling itself onward and upward, always landing, unlike the initial leap from the water, upside down, pectoral fins wide-spread, and attached by its tail. This type of progression is used mostly when alarmed and not when the fish is moving quietly about.



(2)



(3)

LAND MINNOW, *RIVULUS STAGNATUS* EIGEN.

1. Clinging to vertical surface out of water; side view. 2. Drawing showing flattened tail and spread supporting fins. 3. Side view of *Rivulus stagnatus*.

Professor Carl H. Eigenmann in "The Fresh Water Fishes of British Guiana" writes of a *Rivulus* that he found near Kaieteur Falls, on the Potaro River,—“One of these fishes taken in Shrimp Creek jumped against the vertical face of a huge rock and clung by the adhesion of its tail. From this point by another flop it made and clung to a point much higher up the face of the rock.” This movement which Professor Eigenmann describes, has happened many times in the aquariums at Kartabo, and in the pools wherein *Rivulus* have been observed.

The ability to move about on land more or less independently of aquatic conditions, has brought about some interesting complications in the distribution of these fish.

On a flat surface the method of progression is quite different. When not alarmed the fish may be found resting flat on the ground with the pectoral fins outspread and forming props to support the body. The posterior part of the body is twisted around so that the tail lies flat on its side on the ground. By shifting the tail from side to side with a thrashing motion and wriggling the body, the fish moves in a forward direction, and is able to traverse relatively long distances in this manner. One individual which was left on a table near a bird's nest formed of small sticks, reached the nest, climbed within the interstices, and with a little wriggling penetrated deep within the nest, from which it was with difficulty extracted.

These fish are quite abundant in the jungle and occasionally along the shores of the rivers near Kartabo. They are not dependent for their existence upon any type of surrounding, the only necessary factors in their distribution being quiet water and shade. We have found them in small streams, in pools in the ground within the jungle entirely isolated from other water, within small water pockets in great buttress tree roots, and about the roots of trees extending into the river.

A typical habitat is to be found on one of the small islands in the Cuyuni River. Within a space of four hundred feet, entirely within the dark, shaded forest, a small stream starts as a series of connected shallow pools in the higher portion of the island, passing downward through a group of flat rocks where the pools become narrower and deeper, meandering around the roots of trees, before entering the river, through broad, shallow, leaf-filled, mud-bottomed pools, where the water is from two to four inches deep. *Rivulus* are to be found

throughout the stream, in greater numbers in the broad pools and fewer in the more swiftly-moving narrower parts farther up.

Most of their time is spent beneath leaves, either resting or using the protection of the leaves as a convenient place from which to dart out and capture insects which alight upon the surface of the water.

They are not difficult to capture, but slow movements of a net near their pools are futile,—the fish becoming alarmed and dashing away at the first sign of any moving object. When using a small landing net, the best method is to dip the net as deeply and as rapidly as possible into the pool, drag it along the bottom, gather in some of the leaves and pull it straight up and out. The fish will be found among the leaves in the bottom of the net, lying quietly until disturbed. They then jump about, landing on the sides of the net, and if not speedily caught, continuing their flipping until they escape over the top.

Given two or three inches of water in an aquarium they live well, distributing themselves through the water, preferring to be neither near the bottom nor at the top. They are somewhat pugnacious, and when hungry are likely to chase and bite off the tails of their aquarium mates.

The food of *Rivulus* consists mostly of insects, with occasionally a small amount of vegetable matter. Examination of the stomach contents of a number of freshly killed fish reveals ants as the most plentiful item of diet, flies and beetles following, miscellaneous insects and vegetable matter last. In captivity they will eat scraped meat and insects of all kinds. Grasshoppers and other insects over three-quarters of an inch are attacked, but the fish are not enthusiastic about them and prefer smaller prey. Mosquito larvae, earthworms, ant cocoons and larvae, are all devoured with great eagerness.

NOTE.—It will be gratifying to members of the Zoological Society, as it has been to the Staff of the Research Station, to read what the eminent naturalist, Prof. T. D. A. Cockerell, writes of the work of the Station in "Science," No. 1422, pp. 350-351. His words apply with equal force to birds, reptiles and fish as well as insects. "If we are to take full advantage of the wealth of biological opportunity afforded by the insects, we must turn to the tropics where the number and diversity of species is at a maximum. In the tropics essentially similar climatic conditions have persisted for ages, permitting the development of biocoenoses which may be



OCELLATED STING RAY AND HER FIVE NEWLY BORN YOUNG

Photograph by John Tee-Van.

compared with old and highly diversified civilization. But the detection and analysis of these requires resident study or permanent stations, as the English naturalist, A. R. Wallace, long ago insisted. Expeditions, traveling rapidly over the country, appear more adventurous or romantic, and often return with very large collections; but anyone who has occasion to study the specimens so collected, must keenly realize the lack of biological information.

"For all these reasons, the Tropical Research Station in British Guiana, established by Mr. William Beebe, is certain to become classical ground. Not only is the station most favorably situated for research, but it is securing the interest and cooperation of some of the most brilliant American naturalists. Although much work has already been done, it represents no more than a minute inroad on the resources of the locality. But whatever may be accomplished hereafter, it will not often happen that any more interesting story will be written than that by Dr. W. M. Wheeler on the insects associated

with the plant *Tachigalia*." (Zoological Society's *Zoologica*, Vol. III. Nos. 3-11).

KARTABO FISH LIFE*

By WILLIAM BEEBE

FISH and their life have been summed up in a masterly way in a single sentence:† "Moving with great freedom in three dimensions in a medium that supports them and is very uniform and constant, able in most cases to get plenty of food without fatiguing exertions and to dispense with it for considerable periods if it is scarce, multiplying usually in great abundance so that the huge infantile mortality hardly counts, rarely dying a natural death but usually coming with their strength unabated to a violent end, fishes hold their own in the struggle for existence without much in the way of mental endowment. Their brain has more to do

*Tropical Research Station, Contribution No. 115.

†Thompson: "The Outline of Science," p. 156.



THE CROCODYLIAN FAMILY

Among these obviously contented reptiles are several specimens hatched from eggs in the Reptile House over twenty years ago, and others that were captives long before the Zoological Park was established. The largest specimen—over eleven feet in length, is a Florida crocodile. Every year the Reptile House receives many small alligators, brought north by tourists. In the improper quarters that these misguided seekers for strange pets keep the little reptiles, they refuse food. Ultimately they find their way to the Park, where in the humid warmth of the Reptile House they thrive and steadily grow.

Photograph by Elwin R. Sanborn.

with motion than mentality, and they have remained at a low psychological level."

Dr. Carl H. Eigenmann in his splendid work on "The Fresh-water Fishes of British Guiana" has recorded three hundred and sixty-two species from the Colony. At the Tropical Research Station of the Zoological Society at Kartabo we have only begun work on the fish fauna, but every specimen and note is of interest, for Eigenmann omitted from his reconnaissance quite one-third of the whole of Guiana,—the regions drained by the great rivers of the Mazaruni and the Cuyuni, whose waters bound our station. Without any thorough seining or systematic netting of the waters, we have notes on sixty-five species which occur in or near the junction of the rivers in front of the laboratory or in the jungle swamps and creeks in the area of observation immediately behind.

While the low mentality of fish is undoubtedly a fact, yet this is compensated by the interest of their great diversity of form and size, marvellous beauty, and remarkable habits, and perhaps most of all by their vital suggestions of past evolution and the vivid evidence of evolution going on to-day, which they express in their bodies and their life habits.

As in the jungle, so the tropical waters teem with unexpected and strange organisms, and there is no level or niche left unexplored or unoccupied by one or more species of fish. In a brief, introductory article such as this it is possible to mention only a few of the many interesting aspects of fish life about the station. In extremes of size we find schools of little Sword-finned Minnows close in shore, measuring less than an inch in length, while farther out great lau-lau catfish swim about, broddignagian bull-heads six to twelve feet in length, with grinning mouths two feet wide. They will occasionally take the hook but put up no more fight than would a barrel of cement. The largest fresh-water fish in the world and one of the most gamey also inhabits Guiana waters, the arapaima, which reaches a length of fifteen feet and a weight of over four hundred pounds. The flesh of all these fish is most delicate.

Many of the fish are very beautiful, but on the whole there is hardly an average of greater brilliancy of pigment than in the fishes of temperate waters. Scarlet eels and golden catfish with fins of flame color are rather astonishing when they swim up through the brown water; and many-colored ocelli or eyed spots are rather common both on fins and bodies. As to variety of form there is no end. To take mouths alone, there is the elongated tube of the

pipefish, the swordfish-like needlefish and the halfbeak with its minute upper mandible, and enormously lengthened under jaw. Most frightful looking fish come up in the seine, such as the silvery biara or dog-toothed fish with teeth so long that they pass clear through the head and project into the water above, yet which is a fish wholly innocuous; on the other hand a meek appearing sunfish is in reality the notorious Perai, one of the most dangerous of all fishes. Nothing more hopeless can be imagined than to be attacked by a school of these razor-toothed little fiends.

The sand gobies, when frightened, flatten out on the bottom, and draw over themselves a mantle of color identical with that of their background; the comical green and black-banded puffers, *au contraire*, distend themselves with air into a taut, skinny, inedible ball, and float out of reach upon the surface until danger is past.

The fish about Kartabo show three important radiations: first, intrusions from the salt water of the open sea, fifty miles away by water line; second, aerial attempts, and third, terrestrial trials. As unexpected intrusions from the sea we find the Gobies,—the commonest species hereabouts being as yet undescribed; the young gar or needlefish are also essentially marine. Most remarkable are the sting rays, two species of which have deserted salt water and inhabit our rivers. The last ocellated ray which we caught on a set line, gave birth to five young rays in the boat; in an aquarium the little rays flapped slowly about on the sand and the back of the mother.

The four-eyed fish is also essentially a lover of salt or brackish water but occasionally it enters the fresh waters about Kartabo. It is, however, as an invader of the air that it holds greatest interest, the upper part of the eyes being modified for atmospheric vision, while it appears unable to remain more than a foot or two beneath the surface. The second aerial aspirant is the fresh-water flying fish, built rather on the lines and method of operation of a hydroplane than an airplane, as it rises with a rush and slithers along the surface, its deep keel usually cutting a tiny furrow as it goes.

The piscine land invaders are of extreme interest, both on account of their individual specializations and their evolutionary significance. If a pool forms after a heavy rain, deep within the jungle, or on a hillside well away from water, it may soon contain fish as well as tadpoles and whirligig beetles; fish not descended with the rains, but which have scrambled and

leaped and firmed their way from the abundance of their element in the great rivers to this meagre, temporary cupful of water in the midst of a host of terrestrial dangers. Why the impulse comes to them, or to them and not to many others, we cannot even imagine; how it is done, at least by one species (*Rivulus*), is well told by Mr. Tee-Van in the present BULLETIN.

Other land-living fish are the primitive Has-sas or armored catfish, which come out at low tide and flip about the mud, regardless of sun or drought. These and the marsh eels are most unsatisfactory aquarium fish, for they are continually climbing out and seeking the seclusion of dusty corners. We may here only mention the astounding electric eel with its double dynamos of living flesh, and the nurse fish, whose young find sanctuary by the half hundred in the mouths of their parents.

While there is no lack of fish, large and small, near the Station, yet the least successful method of capture is by rod and line. This is due to several reasons, chief among which is the low visibility of the brown jungle water, combined with the abundance of natural food which the fish find ready at hand. The arrows of the Indian, set lines, and seining, yield more certain results.

APPENDIX OF SCIENTIFIC NAMES

Sword-finned Minnow.....	<i>Tomeurus gracilis</i> Eigen.
Lau-lau Catfish.....	<i>Brachyplatystoma vaillanti</i> (Cul. & Val.).
Arapaima	<i>Arapaima gigas</i> (Cuv.).
Scarlet Eels.....	<i>Gymnorhamphichthys hypostomus</i> Ellis
Golden Catfish.....	<i>Phractocephalus hemiliopterus</i> (Bloch & Schneider.)
Pipefish	<i>Doryrhamphus lineatus</i> (Valen.)
Needlefish or Garfish.....	<i>Potamorhaphis guianensis</i> (Schomb.)
Halfbeak	<i>Hyporhamphus roberti?</i>
Silvery Biara.....	<i>Hydrolicus scomeroides</i> (Cuv.)
Peraí.....	<i>Pygocentrus niger</i> (Schomb.)
Sand Goby	<i>Gobius</i> sp.
Puffer	<i>Colomesus psittacus</i> (Bloch & Schneider.)
Ocellated Ray.....	<i>Potamotrygon hystrix</i> (Mull. & Trosch.)
Four-eyed Fish.....	<i>Anableps</i> sp.
Fresh-Water Flying-fish.....	<i>Carnegiella strigata</i> (Günther)
Land Minnow.....	<i>Rivulus stagnatus</i> Eigen.
Hassa or Armored Catfish.....	<i>Plecostomus plecostomus</i> (Linne)
Marsh Eel	<i>Symbranchus marmoratus</i> Bloch
Electric Eel	<i>Electrophorus electricus</i> (Linne)
Nurse Fish	<i>Geophagus surinamensis</i> (Bloch) and <i>Geophagus jurupari</i> Heckel

NEW MEMBERS

The membership of the Society has been increased during the current year by the addition of nineteen life and of 353 annual members.

Since the last BULLETIN was published, the following new members have been obtained:

Life Members

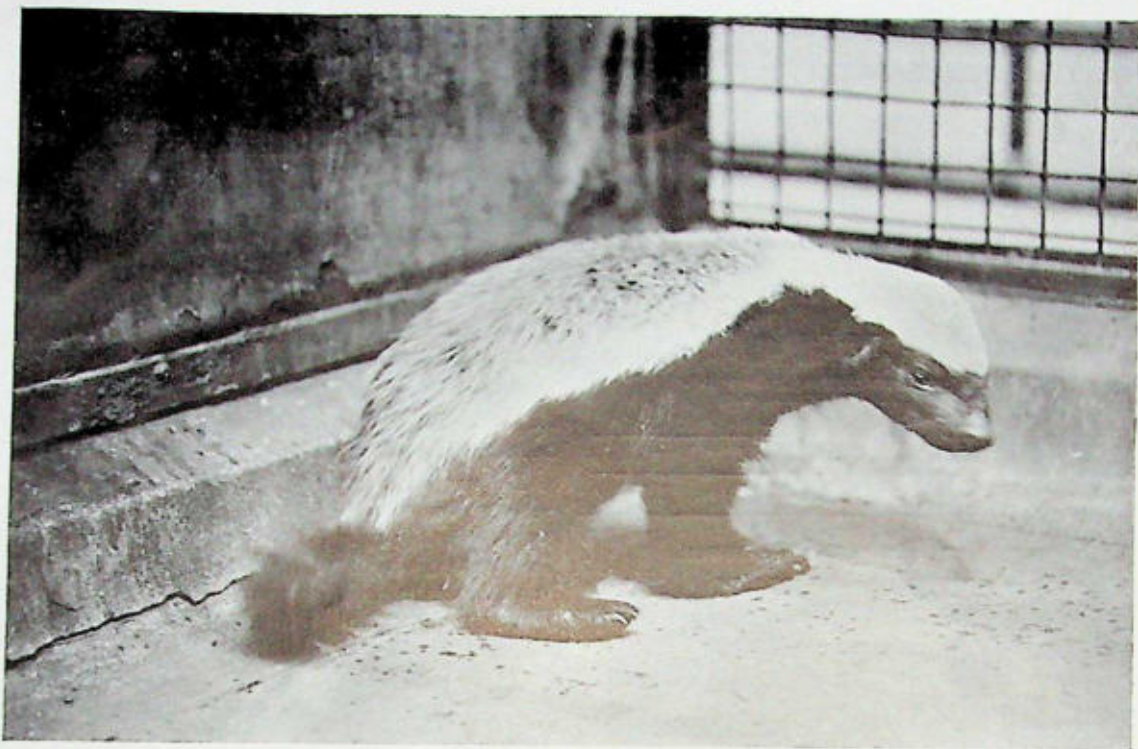
Miss Dorothy Bull
Theodore R. Hoyt
Miss Grace Scoville
Dr. John F. Erdmann
John E. Berwind

Annual Members

Gen. Avery D. Andrews	Miss Beth Marienhoff
Mrs. Milton John Budlong	Mrs. George W. Mann
Mrs. Jonathan Bulkley	Edwin H. Mulford
Mrs. Joseph Blake	John A. Robinson, M. D.
Spotswood D. Bowers	Miss Alice L. Sand
Gordon W. Burnham	Mrs. Robert Sedgwick
Paul Burleigh Conkling	Dr. Joseph S. Wheelwright
Mrs. George P. Cammann	Charles M. Connfelt
Joseph Warren Darling	Arthur Duane
Laurence La T. Driggs	Dr. Ten Eyck Elmendorf
Mrs. Finley Peter Dunne	Mrs. Alfred P. Dix
Frank Damrosch	Harris Fahnestock
Edwin H. Denby	Temple T. Berdan
Charles W. Dayton	Miss Katherine Blake
James B. A. Fosburgh	Miss Joan Blake
F. Herbert Filley	Wm. Alexander D. Blake
Frederick P. Fox	Mrs. James May Duane
Benjamin T. Fairchild	Mrs. Sidney de Kay
Lyman P. Hammond	Mrs. Thomas A. Edison
Seymour Worrall Hyde	Armand Schmoll
Mrs. Marjorie V. Hudson	Miss Augusta N. Tompkins
George S. Hoyt	John Tucker
Miss Anna P. Livingston	Dr. Ernest V. Hubbard
Edward de P. Livingston	Howard W. Starr
Sam A. Lewisohn	John H. Fulle

GEORGE F. BAKER'S GIFT

On May 19, 1922, Mr. George F. Baker, Member of the Class of 1923 of the Board of Managers, made a gift of \$100,000 United States Victory Loan 3 3-4 per cent. Bonds to the Society. Under the terms of Mr. Baker's gift, the income from these bonds is to be used for the corporate purposes of the Society. The Executive Committee decided to create a special fund known as the George F. Baker Endowment Fund in commemoration of this notable gift. The additional interest will be applied for the general purposes of the Society and will be of great help to the Society.



CAPE RATEL—HONEY BADGER

A South African species rather similar to our badger, but less nervous in captivity and easily tamed.
 Photograph by Elwin R. Sanborn.



FISHER—PENNANT'S MARTEN

One of the largest members of the Marten family in America and rarely seen in captivity. It is a bold, active tree climber, industrious hunter and an aggressive fighter.
 Photograph by Elwin R. Sanborn.

ZOOLOGICAL SOCIETY BULLETIN

Departments:

<i>Mammals</i>	<i>Aquarium</i>
W. T. HORNADAY.	C. H. TOWNSEND.
<i>Birds</i>	<i>Reptiles</i>
LEE S. CRANDALL.	RAYMOND L. DITMAR.
WILLIAM BEER, <i>Honorary Curator, Birds</i>	

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ELWIN R. SANBORN, Editor

Each author is responsible for the scientific accuracy and
the proof reading of his contribution.

VOL. XXV JULY, 1922 No. 4

EMERSON McMILLIN

The loss of this good friend is indeed a sorrowful event. Mr. McMillin belonged to the small group of great-souled men whose later lives have been one long round of sacrifices for the good of mankind in general, and the welfare of New York in particular. Looking backward we behold him as a good soldier of the Civil War, a great captain of industry, and advocate of peace, but a strong helper in the last war, a generous patron of zoology and art, and above all a deeply sympathetic and helpful friend of mankind.

Mr. McMillin was a Founder in Perpetuity of the New York Zoological Society, and had been an active member of the Board of Managers from 1909 to 1922. He was especially interested in the National Collection of Heads and Horns and in the gallery of animal paintings. His keenest interest, however, and his most profound sympathy was manifested by augmenting the salaries of the employees of the Zoological Park on certain occasions only too well remembered.

At all times Mr. McMillin's influence on public affairs and institutions was broadminded, constructive and helpful. By those who really knew him he was sincerely beloved, and also admired, and his great store of sympathy and human kindness was ever open to the causes and the men whom he approved.

The golden chain of memories left behind by Emerson McMillin constitutes a heritage of priceless value.

W. T. H.

CHARLES R. MILLER,
DEFENDER OF WILD LIFE.

The wild life of the world has lost a great friend and champion. For a much longer period than that enjoyed by any other editor of our acquaintance, Mr. Charles R. Miller's twenty-five years of keen sympathy, true vision, dauntless courage and tireless industry in supporting movements and causes for the conservation of wild life, and in defense of the rights of animals, rendered him in this field the foremost editorial force of the world.

There was no cause too hazardous for him to venture, and none too humble to be helped. The most valuable of all newspaper help in a wild life protection campaign is that furnished by the editorial page in leading articles, and it was then that Mr. Miller fired great broadsides in support of the foot soldiers in the field. But for his untimely and unexpected passing from life, he would shortly have received the gold medal of the Permanent Wild Life Protection Fund for distinguished services to wild life.

Mr. Miller's interest in zoology was very keen, very scholarly, and as wide as the world. He was a genuine naturalist. He actively helped to found the New York Zoological Society, and for a number of years was a diligent member of its Board of Managers.

The wild life of the world has lost a gallant defender, and the army of the defense has lost a powerful ally beside whom it was an honor and a pleasure to work.

W. T. H.

SAGE AND CONVERSE BEQUESTS

On February 21, 1922, securities in the amount of \$146,808.04 were received from the Sage Estate. In May, payment of the balance of \$25,000 due from the Estate of Edmund C. Converse was made, making a total of \$50,000 received from this estate.

THE DESTRUCTION OF "PEST"
ANIMALS

With the continued disappearance of mammalian, bird and fish life, we hear annually more and more about the depredations of the so-called animal "pests." There is also a crescendo note of demand for the destruction of the so-called pests. Now, in view of all this, we

are reminded of a passage in the experiences of "Alice in Wonderland."

"The time has come," the walrus said,
"To speak of many things."

In the first place, we find that man is entirely too ready to charge up against the animal kingdom the results of his own follies and crimes against wild life. We find that in some cases wild species have been charged, tried, condemned and executed without their day in court, and without any witnesses for the defense having been heard. Certain specifications on this point have already been published, and if necessary, will be cheerfully furnished anew.

The most conspicuous recent instance in the line of endeavor mentioned above is to be found in Alaska. The salmon cannerymen have been so heedless and so destructive of the salmon supply, that last winter the results of the industry were made the subject of a searching special investigation in Congress. Therein specific demands were made for a two-year absolute close season on salmon catching, in order that the depleted herds might recuperate, and thereby save the industry.

At this very moment the salmon supply in the Yukon and Copper Rivers has fallen so low that the Indians living along the banks of those streams, unable to secure their normal and imperatively necessary annual supply of salmon, have been compelled to take to the mountains and kill mountain sheep, moose and caribou in order to escape starvation. To many persons this will seem incredible, but it is incontestably true. Their effect on the big game easily can be imagined,—progressive extermination.

Now, the salmon fishermen have made such an outcry about the destruction of salmon by birds and seals that a general massacre of Alaskan white-headed eagles already has taken place. We are now informed by the last report of the Alaska Territorial Fish Commission that "authority has been granted by the Department of Agriculture, and the fish wardens have been instructed to kill gulls and terns during the coming season." In addition to this a general slaughter of hair seals is in progress, and it is officially reported that on the Copper River Flats 1,325 seals have already been slaughtered. The infinitesimally small extent to which the killing of gulls, terns, eagles and hair seals is likely to go in saving the salmon industry of Alaska certainly will appeal to every person of intelligence.

Here in the east a tidal wave of resentment against "pest" species of game destroyers, is

rolling in. Mr. Madison Grant has pungently pointed out, through his own personal experiences, that today throughout New York and Pennsylvania, with the exception of the song birds every wild thing in the woods except rabbits, ruffed grouse, gray squirrels and deer are catalogued as "pests," and slated for destruction. He cites the hawks, owls, crows, blue jays, blue heron, night heron and kingfisher, foxes, minks, weasels, skunks and red squirrels. These facts should furnish all eastern conservators of wild life serious food for thought. It looks very much as if the pest pendulum is swinging altogether too far.

And now, at the very last moment before going to press, we received a friendly call from the owners of Little Tobago Island, in the West Indies. On that insular possession the greater bird of paradise has been successfully colonized, and today the number of individuals of that species are estimated at about 500.

The island of Little Tobago also is inhabited by perhaps 200 individuals of the giant cacique, a bird so rare in captivity that very few visitors to zoological gardens and parks ever have seen one. This is the bird that builds the wonderful hanging nest, from two to five feet in length, which we have cited as one of the most remarkable instances of modern bird architecture.

The gentlemen who own Little Tobago showed us some fine photographs of nesting colonies of the giant cacique, and then casually remarked that they were having those birds destroyed, because they had been advised by a naturalist of Trinidad that the caciques were very destructive to other birds, "by picking out their eyes, and killing them." As soon as we had recovered breath with which to speak we asked our visitors how many of the caciques had been killed up to date, and the reply was, "about 100."

Our reaction to this shocking disclosure was a strong protest against the proceeding, and the assurance that it was totally wrong to kill caciques for the reason alleged. The owners of Little Tobago expressed surprise and consternation, and said:

"We had supposed that Mr. A—— was a good authority, and we thought that we were doing right to act on his advice. We will cable to Little Tobago tonight, and have the killing immediately stopped!"

The idea that caciques on the island of Little Tobago would be so destructive to the bird life of that island and its vicinity as to merit wholesale destruction is preposterous, and the destruc-

tion already effected constitutes a genuine tragedy.

There are times and places wherein the killing of animal pests is justifiable; but each case needs to be tried and judged on its own merits. A sweeping rule is like a two-edged sword, as dangerous to the user as to the usee.

It seems incredible that many persons of intelligence pay so little attention to the balance of nature; but in these topsy-turvy days we must expect a percentage of mistakes in man's dealings with wild animals.

W. T. H.

THE NEW CHICAGO ZOOLOGICAL PARK

THE best and the strongest men of Chicago have resolved that the present is an auspicious moment for the founding of a Zoological Park for that city which shall be thoroughly modern and up-to-date, and adequate to the needs of the second greatest city in the United States. To this end strong forces now are concentrating their influences and their efforts. Primarily these forces consist of the Cook County Forest Preserve Commission (Frank J. Wilson, Chairman Zoological Committee), the Chicago Zoological Society (John T. McCutcheon, President), and the Chicago Commercial Club.

The desire to create an institution that shall be carefully planned, and executed, in every way worthy of the city of Chicago, seems to be unanimous. The fine tract of suburban land presented to the Forest Preserve Commission by Mrs. Edith Rockefeller McCormick, with a view to its possible utilization as a site for the new institution, proves to be well located and

thoroughly eligible. It is situated on the east and west axis of Chicago, only eight miles from the lake front, and in close proximity to the well built area of the city. It is equitably accessible to the people of Chicago from the north, east and south, and no section can complain of having to travel unnecessarily in order to reach it.

Like all the land in the central district of Chicago, the site is practically level, but it has the advantage of being bounded on one side by the Des Plaines River, a stream of substantial importance and beauty which will constitute a great asset to the attractions of the new institution. The site is bounded on the west by Salt Creek, which as its name implies, is a smaller stream but which in its turn will also be very useful. These two streams are bordered by a natural forest, and the interior of the two-hundred acre tract is wide open for artistic landscape treatment. The art of the landscape architect and the skill of the engineer can alter this plain into hills and knolls, ponds and sunken gardens, which will completely transform it and produce a generally pleasing effect.

The groups of men responsible for the creative work and management of this undertaking are proceeding with commendable studiousness and caution. It is their intention to develop it on a scientific-popular basis which will place it unquestionably in the ranks of the educational institutions of Chicago. There is every reason to believe and hope that in ten or fifteen years the new Chicago Zoological Park will constitute one of the great show places of its home city and yield recreation and instruction annually to millions of visitors and take its place in the front rank of the zoological parks of the world.

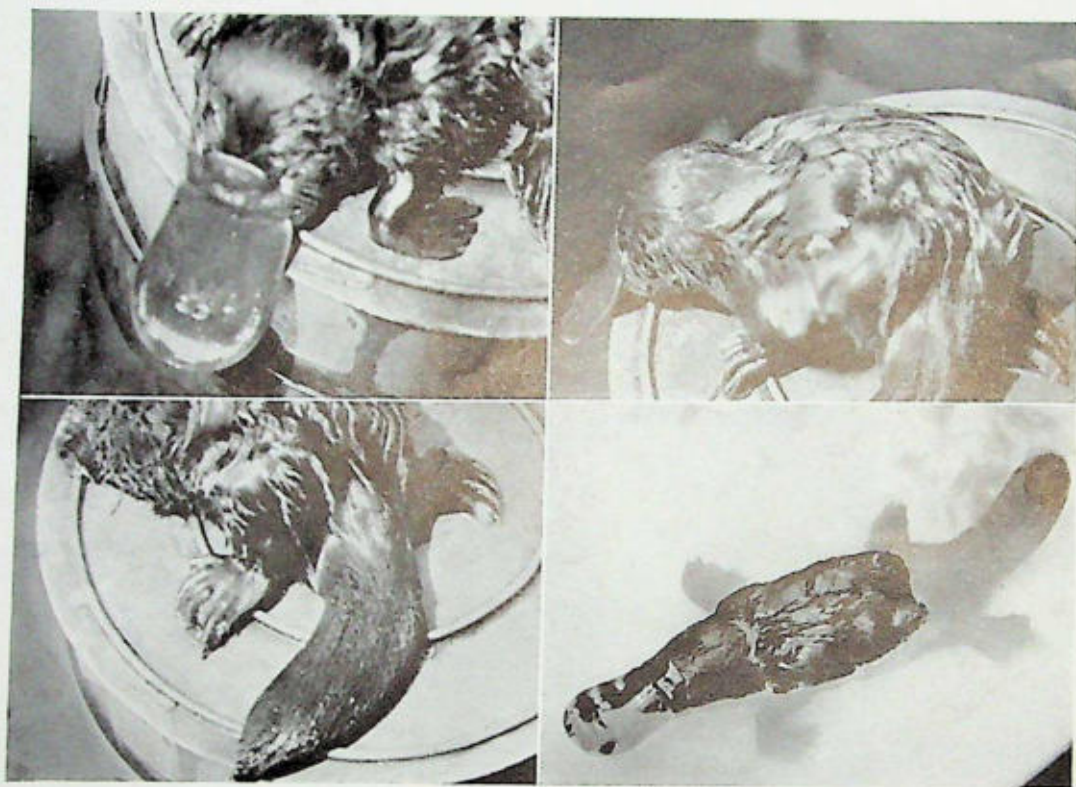
W. T. H.

ARRIVAL OF A LIVING PLATYPUS

ON July 13 Mr. Ellis S. Joseph arrived directly from Australia with one living duck-billed platypus and a large collection of kangaroos, birds, lizards and snakes. He brought to the Zoological Park the first and only platypus, whose other name is *Ornithorhynchus paradoxus*, that ever landed alive in any country outside of Australia. Its arrival alive represents the final triumph of the efforts of Mr. Joseph throughout five years to find out how to keep the platypus alive in captivity and transport it. Thus far not a single specimen of this animal ever has reached Europe, and even in Australia it has not been considered

possible to keep it alive in a zoological garden, and exhibit it. But Mr. Joseph has accomplished the impossible, showing that even the most difficult animal in the world not only can be kept alive in captivity in Australia on his own farm, but can be delivered in good health and as good as new at New York's Zoological Park.

The contrivance in which it has been brought to America is a wonder, beside which the most complicated incubator ever created is as simple as a child's toy. In due course this wonderful tank home and its many-celled substitute for a bank burrow will be fully described.



PRELIMINARY STUDIES OF THE PLATYPUS

A very complete series of photographic studies is being prepared of this rare and exceptionally interesting animal, the first to arrive alive in the United States. These views show the duck-like bill and the extensively webbed feet.

The wonderful thing about this species, which is about the size of a musk-rat, is that it reproduces by laying eggs. It has webbed feet and a broad, flat bill slightly resembling the bill of a duck. It is covered with short, brown hair, and its tail is broad and flat. The mother has no nipples but is able to exude the milk through the skin at the milk glands and the helpless young can lick and draw it off the fur and so obtain nourishment. It is known throughout the world as the lowest of the mammals now living, and the connecting link between the classes of mammals and birds. Its nearest relative is the egg-laying echidna, which has more stamina in captivity and which has on several occasions been kept alive in the Zoological Park.

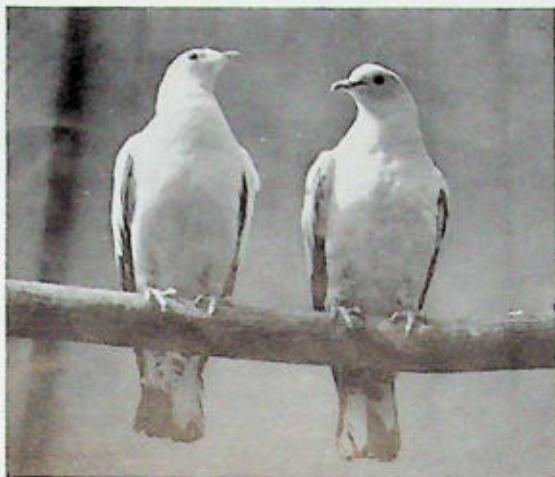
Judging by our new and untamed specimen, it appears that a platypus is about the worst exhibition animal in the world, and it is probable that only a very few people of New York's millions will be able to see this one. The animal is very nervous and will not permit itself to be handled or even to be touched, and it is perfectly certain that if it is disturbed too

much it will speedily die. Its peculiar temperament and its tank life demand for it a secluded room and inspection by visitors limited to about one hour daily. If the animal survives for any reasonable length of time, a considerable portion of animal lovers who will be interested in seeing it will, if they are patient, secure their turn. The exhibition schedule has not yet been determined. At present all efforts concerning the animal are being devoted to getting it settled down on a living basis.

The food of the platypus consists of angle worms and small shrimps.

At present the little animal is greatly wearied by its very trying journey by steamer from Australia to San Francisco and from San Francisco by rail to New York. Four other specimens perished in transit, one before leaving the coast of Australia, and two in the neighborhood of Honolulu.

Naturally this strange little creature, which represents a mountain of labor and very considerable expenditure on the part of Mr. Joseph, cost the Zoological Society a substantial sum; but large as it is, it does not represent more



NUTMEG PIGEONS



SPUR-WINGED GOOSE



HAWAIIAN GEESE



SILVER PHEASANT



MALLEE FOWL

Photographs by Elwin R. Sanborn.

than one-half of the effort and expenditure that has been devoted to the experiments of which it is the living fruit.

W. T. H.

ITEMS OF INTEREST

Birds

By LEE S. CRANDALL

Rheas Now Rare.—Since 1917, there have been no rheas in the Zoological Park. Always obtainable in the open market in pre-war days, rheas have become conspicuously missing from dealers' lists. All of the large, ostrich-like birds are important items in collections and the absence of any of the groups leaves an annoying gap. In spite of the difficulties of war times, certain large estates in Europe managed to retain their flocks of rheas, which often live in large enclosures in nearly perfect freedom. Recently, we were fortunate enough to secure a pair of these birds, not quite fully grown. Their perfect condition and obvious juvenility, lead us to believe that they first saw the light of day in some secluded park, far from the broad pampas of South America. Fortunately, they represent the species known as the common rhea (*Rhea rothschildi*), which we have found much harder in captivity than the really more abundant great-billed species (*R. americana*).

Hawaiian Geese.—Like so many other fine species of birds, the Hawaiian goose is a rapidly disappearing form. Until 1921, it had never been represented in our collection and so rare is it that we had little hope of ever securing specimens. In the spring of that year, a female that had come by chance into the collection of a California friend, was offered to us in exchange. The transaction was gladly consummated and the bird arrived safely. By a strange coincidence, not more than two months later, Mr. F. E. Blaauw, the well-known Dutch naturalist, wished to know if we might possibly desire an extra, male Hawaiian goose. We said "yes" as quickly as the cable would carry the message, with the result that we now possess a true pair of these rare and beautiful birds.

Nutmeg Pigeons.—Ordinarily, one does not think of wild pigeons as being particularly beautiful birds. The reason is, perhaps, that in America we have none of the wonderful group known as fruit pigeons. Here colors run riot and while every law of chromatic combination is grossly outraged in one species or another, the general effect is often very beautiful. Fruit pigeons, because of their delicacy in captivity,

have long been bugbears to the aviculturist. In recent years, largely through the importations of Mr. Ellis Joseph, we have come into possession of a considerable number of these lovely birds, of several species, and have become quite successful in persuading them to live. At the present time, we have no less than seven species in our collection, some individuals being of several years' standing. The nutmeg pigeon is one of the largest forms and while it presents no startling pigmentation, it is very pleasing with its quiet combination of black and white. These birds eat only soft fruits and berries, avoiding the hard seeds and grains which form the diet of ordinary pigeons.

Colonized Birds.—Birds at liberty are always a great attraction in any garden, and we have tried, not always with success, to have them in our Zoological Park. Peafowl and turtle doves have met every requirement, and the guinea-fowl were equally satisfactory, until the fondness for the flower-beds resulted in their final banishment. Several attempts with other sorts of birds have been less successful. A tame brush turkey roamed the Park for a time and built a huge mound near the Beaver Pond, but too great trust in the friendliness of mankind brought him to an untimely end. We have tried pheasants with indifferent success, most birds finally wandering off into the wilder park lands above us. A pair of silver pheasants finally became established and reared a brood of young but the splendid male was eventually killed in broad daylight by a weasel, which was seen to leap upon the bird as it walked along a tiny brook. The female is still with us and vies with the squirrels for the food tossed by friendly visitors.

Mound-building Birds.—The brush turkey of Australia is well known as the bird that lays its eggs in a mound of earth and rubbish, and leaves them to be hatched by the natural generation of heat of the decaying vegetable matter. A fine pair of these birds in the Pheasants' Aviary has a great mound of sand and the male often may be observed digging small holes near the top, presumably for the reception of expected eggs, though apparently none has been laid. Less familiar, but equally interesting, is the ocellated megapode or Mallee fowl. This bird also hails from Australia and is a relative of the brush turkey, though there is little family resemblance. The Mallee fowl builds its mound and leaves its eggs just as the brush turkey does, though its habits are less well

known than those of its more common congener. Unlike the brush turkey, the Mallee fowl is a quiet and inoffensive creature, and our specimen shares a compartment at the Ostrich House with a varied assortment of companions.

Mammals and Reptiles

By RAYMOND L. DITMARS

Raiding a Snake Den.—Our first real collecting trip was scheduled for the 7th of May and was for the purpose of obtaining a series of rattlesnakes, copperhead snakes and blacksnakes for shipment to the Antwerp Zoological Gardens, in Belgium, in re-establishing their reptile collection, and for our own exhibition series. This trip was to a "snake den," about 125 miles from New York, having a direct southerly exposure, thus bringing the serpents out early. Ordinarily they would have emerged several weeks earlier and be well scattered by early May. We ascended the mountain on an ideal day and found the reptiles emerging from the crevices in the rocks. We captured a large series of rattlesnakes, copperheads, blacksnakes and serpents of other species. Some of the blacksnakes were of exceptional size, ranging in length to seven feet and over. They represented two species, the "racer" and the mountain blacksnake.

Many Snakes But Few Bites.—In our collecting trips for the capture of poisonous snakes and the discovery, year after year, of "dens" where these reptiles hibernate in large numbers, the writer has sought all possible information about records of accidents in the neighboring areas. It appears that some of the rattlesnakes, leaving the den after the spring emergence and after a few days basking in the stimulating sun, wander into the lower meadows or the farmlands, and are encountered and killed. It appears certain, however, that the greater number move away into the rocky portions of the mountains and are never met by human observers. Where they spend their time,—unless they are nocturnal and hide by day,—is a mystery, as the writer for years has tramped these forests and the sight of a rattler is the rarest of events. Occasional specimens are seen on the barrens or in the open spots among the low huckleberry bushes, but these examples and those that wander into the meadows beneath the mountain are but a small portion of the large number that return each autumn to the hibernating ledge or den. And as to the danger of humans from the wanderings of these serpents, our queries elicit remarkable information. At the base of the

great den visited this spring is a long stretch of farmland that has been owned through several generations of one family, since the days immediately following the American Revolution. The living descendants of this family, particularly intelligent people and thoroughly versed in the history of the region, have never heard of an accident from a rattlesnake in this locality, or the surrounding mountains. At the base of another mountain, below a ledge on which we captured forty-four rattlesnakes in a few hours and noted as many more that escaped into the crevices, is a town of a few hundred inhabitants. In the history of the town there was one record of rattlesnake bite and this resulted fatally. It occurred to an intoxicated alien who was pulling down a stone wall to obtain building materials for a foundation. He heard the snake sounding its warning in the wall and a companion warned him to keep his hands away from the stones, but he cursed such superficial beasts as rattlers and finally placed his hand squarely on the serpent itself—and then stubbornly refused to see the village doctor.

Sea Snakes.—For the second time in fifty years, an actual sea serpent is on exhibition in New York. We have, in fact, on exhibition at the present time, two of these creatures, brilliantly ringed with black and yellow and provided with a flattened tail, exactly like a paddle in outline. Owing to many sensational stories about so-called sea serpents, our visitors may be disappointed in the size of these specimens. They are in a glass tank about three and one-half feet long, provided with sea water. The snakes are about a yard in length. There are about sixty distinct species of strictly marine sea snakes, all with paddle-like tails. The largest attain a length of eight feet. These creatures swim in the open ocean and are seen a thousand miles from land. They come to the beaches, to the higher tidal pools, where the young are born. All of them are very poisonous and represent close allies of the cobra group that through evolution have taken to the sea. Their food consists entirely of fish. Only one other living specimen ever reached the United States and that was exhibited in the Aquarium opened by the world's great pioneer showman, the late P. T. Barnum. The specimen lived about six months and is now preserved in the American Museum of Natural History. The specimens in our Reptile House were captured on the beach of New Caledonia and reached us through the perseverance of Ellis S. Joseph, who has provided us with many rare and interesting specimens from remote regions.

A Frisky Elephant.—The joy of his first spring promenade resulted in automatically punishing our big African elephant, Kartoum, bringing to an immediate close for the time being his outdoor holidays. During the warm days of April Keeper Richards turned the Indian elephant, Alice, outside into her big yard for the first time since last autumn. Alice ran in great shuffling circles, waving her trunk and trumpeting in high glee. Kartoum, at the other end of the building, responded in a thunderous voice and pounded on the door to attract Keeper Thuman's attention. Thuman swung open the massive doors and the great beast was immediately on the run, flapping his huge ears, tearing up great clods of turf and tossing them high over his neck, and otherwise greeting the outside air of a wonderful day. All would have gone well if Kartoum had been satisfied with these manifestations, which brought a crowd of visitors to enjoy the sport, but he decided to speed up the fun by butting the fences. There had been a bad bend in one of the massive top rails, which we had in mind as a job for the blacksmith. This was produced by the elephant's antics directed from the adjoining yard during the spring of 1921. Kartoum headed for this bulge in the fence and with one well-directed blow of his ponderous head he straightened it as thoroughly as if the iron-workers had been at work for a day.

But this failed to close the performance. Noting his success at short range, he backed well up and charged the partition gate, which is reinforced with heavy railroad iron, and the gate was bent over more than three feet at the top, heavy bolts were stripped of threads and the structure reduced to a state of ruin. As Kartoum gleefully swung around to aim a drive at the other gates, he was hurriedly escorted indoors by Keeper Thuman and there he remained until his exuberance materially calmed down.

A Queer Nursery.—Now is the time to observe the kangaroo babies at their best. During the early spring a number of mothers, including the swamp wallaby, ring-tailed wallaby and the Woodward kangaroo, have been steadily carrying their long-legged infants in the pouch. The babies have grown to such a size that they are able to leave the pouch and hop about the mother, but are still a bit timid and jump back into the pouch at frequent intervals. Several of them are too big for a comfortable fit, but the patient mothers do all they can in assisting their progeny to stow away their long legs and tails. It is only for about a month that these kangaroo

youngsters are so frequently in and out of their mother's pouch, and during that time they are of great interest.

Peafowl Idiosyncrasy.—There is at present a peacock, with decidedly straggling tail, that has selected a very beautiful spot near the service building, to spread its plumes and proudly strut in circles. Whether from fighting or not we do not know, but this peacock has several very distinct gaps in its semi-circle of tail feathers. It displays before a background of rhododendrons, an ideal setting. Quite in contrast to this performance are the antics of an albino peacock, with perfect tail, which ranges near by. This latter bird would be in magnificent contrast with the rhododendron background, but the ways of animals are often eccentric from the human point of view. The pure white peacock has elected to strut and spread its filmy fan in front of a large pile of pipes and old lumber near the tool shops, and not long ago, when the writer sought this bird to record a moving picture of its plumes, he found that it had selected as a background a number of old and rusty stoves that had been discarded from the deer barns.

Wild Animal Friendships.—It is well worth while to visit the Small Mammal House and note a strange phase of friendship among animals of utterly different types. This is exhibited by a South American wild dog and a Ring-tailed monkey, that have been reared together since infancy. Ordinarily these wild canines are savage and resent all attempts at familiarity. We have never seen one that was "tame," nor does the present specimen permit Keeper Landsberg to get anywhere near him. The monkey, however, sleeps affectionately by the side of his carnivorous friend, takes immediate possession of all the food that goes into the cage, enjoys several bites of the fresh meat provided for the dog, then calmly relinquishes it to his cagemate, who submits to all this without so much as a growl.

A Lusty King Cobra.—Our cannibal King Cobra continues to keep us busy obtaining large serpents from Texas to form his meals. Head Keeper Toomey is keeping account of the footage in serpents consumed by this spectacular specimen and advises the writer that it is approaching the two hundred mark. Visitors from India, who are familiar with the zoological collections at Calcutta and Singapore, tell us that this is the largest King Cobra they have ever seen.



XONURUS—SPIKE-TAILED LIZARDS

An African species that digs burrows, which they enter head first. It is thought that the spiny tail blocks the entrance and serves as a defense against enemies.

Photograph by Elwin R. Sanborn.

PHOTOGRAPHIC PRIVILEGES IN THE NEW YORK ZOOLOGICAL PARK

By THE DIRECTOR

THE experiments of the Zoological Society in the management of the photographic privilege in the Zoological Park have continued throughout the first twenty-three years of the Park's existence without any elucidation or discussion in the Society's publications. From the beginning, the members of the Society have been familiar with the Executive Committee's reasons for strictly regulating the privilege of photographing our animals, and this statement will add little to their information. In view, however, of the creation of new zoological parks and gardens throughout the world, and for the information of the public outside the membership of the Society, a brief historical record of the Society's policy and success now seems worth while.

In 1899, when the Zoological Park was about to be opened to the public, and rules for its management were being drafted, the value of fine pictures of living wild animals, either in captivity or out of captivity, was fully recognized. The very great usefulness of pictures of all kinds in what soon became known as "visual instruction," is now abundantly recognized by all educators. Great industries have been built up, and incidentally vast fortunes have been made, by the exploitation of the picture idea as a means of education.

When the Zoological Park opened to the public in November, 1899, there was not then in existence in any zoological garden or park, or in the offices of any zoological society, a fine and noteworthy collection of wild animal photographs. We know whereof we speak, because of the great efforts and expenditures that were necessary in those early days to obtain even a few good photographs of the most noteworthy and most common wild animals of zoological gardens. The Director of the Zoological Park had in previous years come in painful contact with the need for good photographs of wild animals with which to illustrate the living vertebrates in educational publications.

The efforts of artists, taxidermists, animal painters and sculptors, and also writers of books

on natural history to obtain good animal photographs were at times positively pathetic. It was the knowledge of this very unsatisfactory situation that impelled the Director of the Park to urge upon the Executive Committee of the Zoological Society the desirability of taking steps to form a really great and zoologically important collection of photographs to embrace all of the important species of mammals, birds and reptiles that might come into the new institution that was to be called the New York Zoological Park. It was pointed out that the haphazard efforts of outside photographers, either amateur or professional, never could be relied upon to produce a collection of photographs that would amount to anything of value.

The Executive Committee decided that as a duty to science and the public, and to the general cause of education, it was imperatively necessary to establish and maintain at the Park an official photographer, and to make whatever expenditures and efforts were necessary to accumulate an unprecedented store of pictorial records of living wild animals. At the same time it was decided that it was highly undesirable, from the standpoint of the practical interests of the Zoological Society and the Park, to permit free access to its collections by the millions of persons owning cameras and desirous of taking millions of snapshots without limit or control. It seemed inadvisable that the country should be flooded with poor pictures of the Zoological Park and its animals; and it also seemed inadvisable that animals shedding their winter coats of hair, that men in their working clothes, and above all, that accidents and untoward happenings should be photographed by anyone, and broadcasted.

Finally, it was quite clear that the annual use of thousands of cameras in front of the animal cages would interfere with the use of the collections by visitors, and would not be for the greatest good of the greatest number.

It was without dissenting opinion that the Executive Committee of the Society reached the conclusion that a strict regulation of the photo-



PORTRAIT OF A YOUNG CHIMPANZEE

Awarded first prize for photographs of mammals in captivity in the competitive exhibition held by the American Museum of Natural History. Prizes were awarded for two classes of entries: Mammals in the Wild State, and in Captivity. The one thousand six hundred and fifty-two photographs were judged by a committee appointed by the American Society of Mammalogists. The New York Zoological Society exhibited forty-four pictures including the one that was awarded first prize.

Photograph by Elwin R. Sanborn.

graphic privilege in the Zoological Park was both desirable and necessary in the interest of the public at large. It was declared quite inadvisable to permit commercial photographers to come in and take photographs at will on the payment of a small fee, and print and sell quite without control. It seemed best that the supply of photographs of the Zoological Park's animals should be furnished by the Society's own photographer, but that his results, one and all, should be made available to the public which desired to see them, at nominal prices, usually representing but little more than the cost of the prints themselves.

Stated categorically, the reasons of the Zoological Society for its strict regulation of the photographic privilege, as it was established in the beginning and has continued down to this date, are as follows:

1.—The Society recognizes the very great value and importance of good animal photographs in visual instruction.

2.—The Society recognizes its duty to science and general education to make photographic records of all the important species of wild mammals, birds and reptiles that come into its possession, and make those results available to the public on a reasonable basis.

3.—It is against the interests of the Society and the public to permit the production and dispersal of inartistic and poorly executed photographs of the animal collections.

4.—It is against the interests of the Society to permit the photographing of animals shedding their winter coats, employees in their working clothes, attempts to capture escaped animals, sick or dead animals, or calamities of any kind.

5.—In order to obtain the best possible results in wild animal photography, satisfactory in quality and in quantity, it is absolutely necessary to maintain a skilful photographer on the Zoological Park staff, with superior facilities, always ready for service and diligent in obtaining records of newly arrived animals.

6.—It is to the public interest to extend the photographic privilege to animal illustrators, painters, sculptors, taxidermists, the staff photographers of daily newspapers, and educators desirous of utilizing the animal models of the Park in ways which would be of interest and value to the public; but none of these persons can be permitted to enter the ranges, corrals,

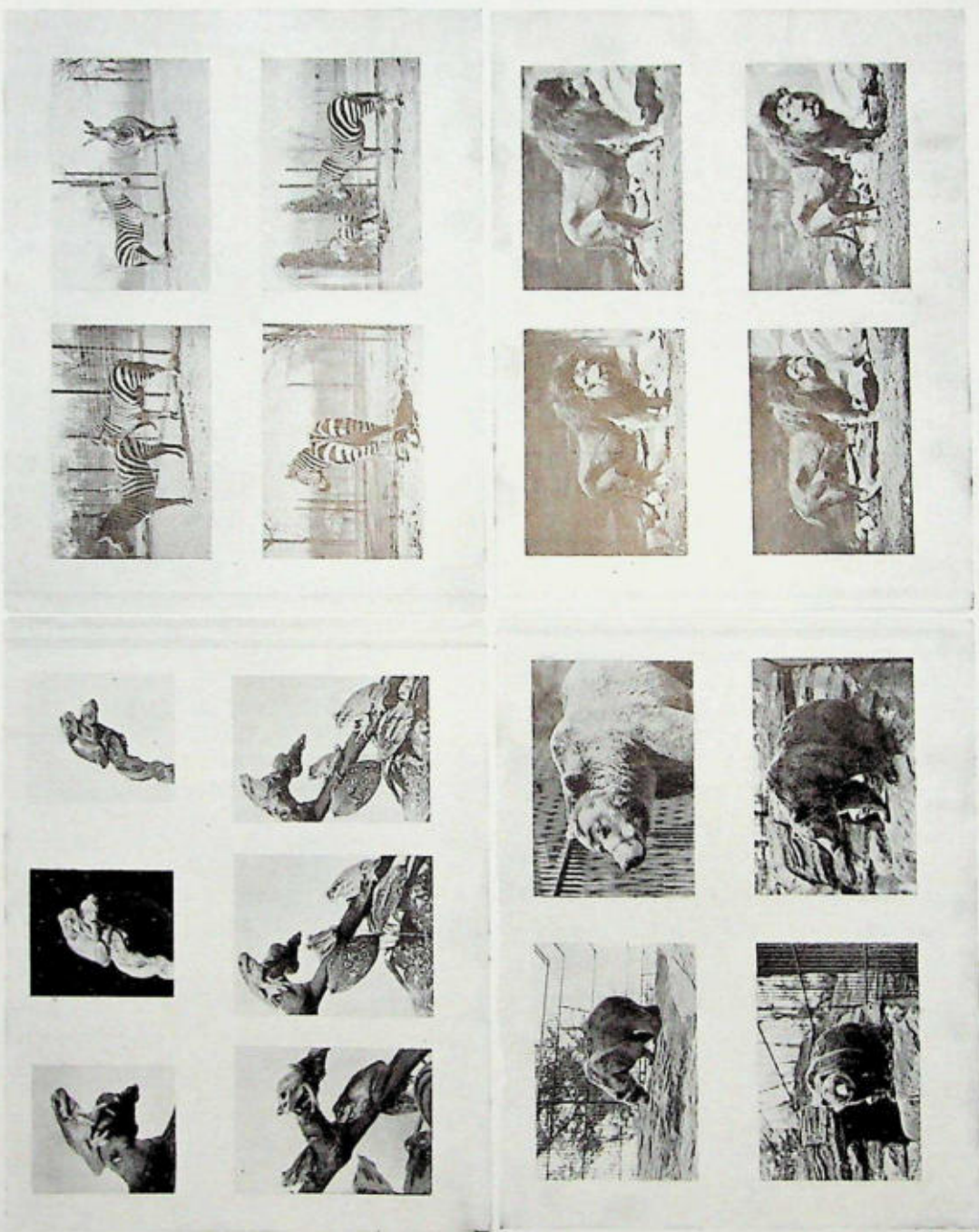
dens or cages of dangerous animals, as our staff photographer feels compelled to do.

7.—It is impossible to permit commercial photographers to take photographs by the payment of a fee without opening that privilege to every other owner of a camera who might choose to pay the fee, or without nullifying the Society's efforts.

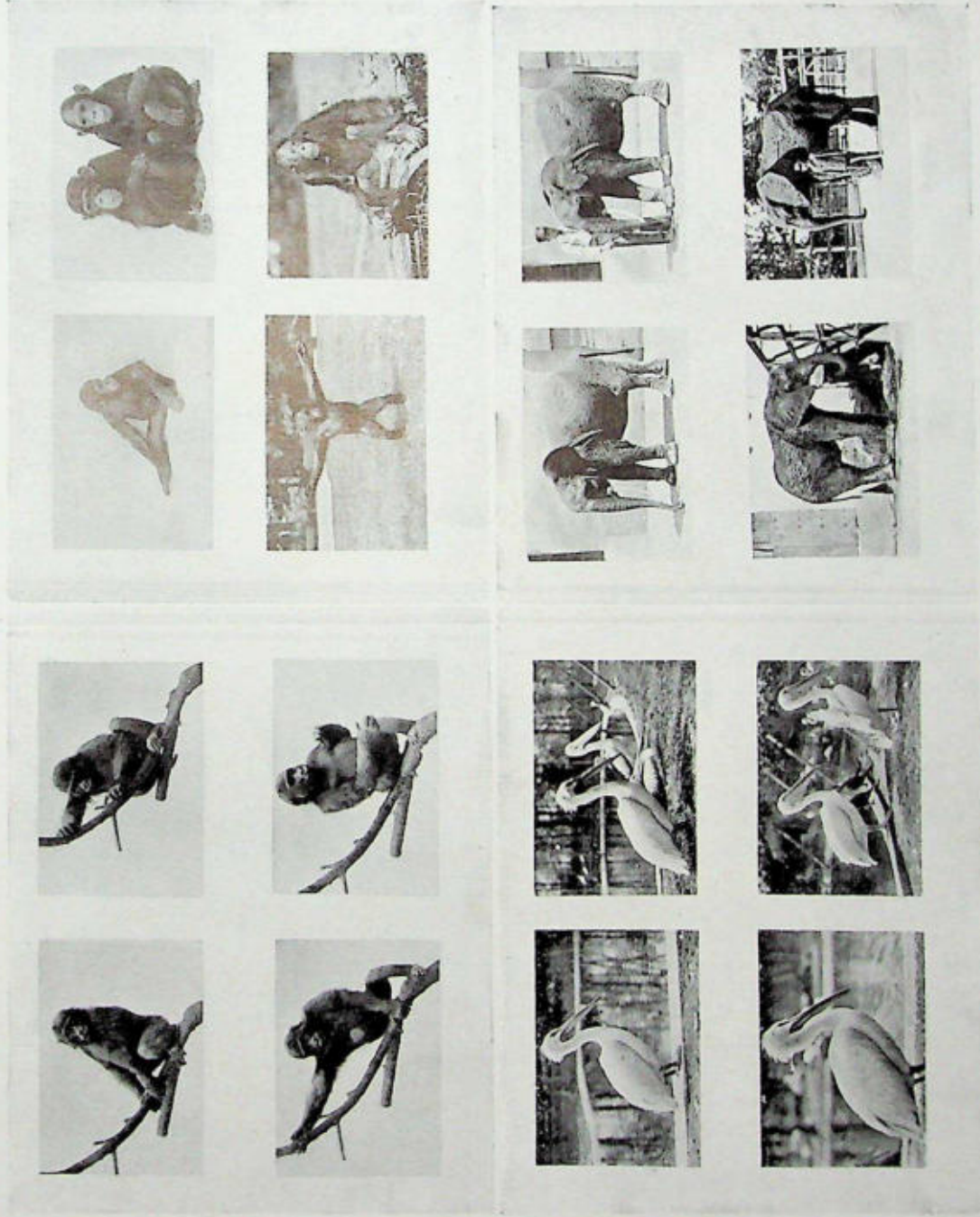
8.—It is the rule that representatives of the educational and scientific institutions of foreign countries shall receive special consideration in photographic privileges, and also practical assistance in obtaining good results.

The above regulations represent the Society's determinations of the methods necessary to secure from the photographic privilege the greatest amount of good for the greatest number of people. They have insured the making and publishing of fine pictures of the Park and its animals and the suppression of poor pictures. In establishing the above regulations it has in no manner departed from the regulation of photographic privileges that obtain in all the great museums, art galleries and libraries of New York City and of the world at large. The Society maintains that its right to utilize *its own animals* in the Zoological Park for the greatest good of the greatest number is exactly the same as the control rights of the American Museum of Natural History, the Metropolitan Museum of Art, the Brooklyn Museum, the New York Public Library and similar public institutions in the city of New York. It happens to be a fact, however, that a very few persons have demanded privileges in the Zoological Park who would not dare to demand similar privileges in any of the museums or art galleries of this city, even though they too are founded and maintained precisely on the same principles which operate for the existence of the Zoological Park.

In pursuance of the Society's regulations, and its expenditures and sacrifices, there has been created in the Zoological Park a collection of wild animal photographs of enormous extent and priceless zoological and artistic value. No such collection as this exists anywhere else in the world, because no other organization or institution ever has put forth an effort equal to that of the New York Zoological Society. The Society's negatives now number over 9,000, and they cover a wide range of subjects,—all in perfect order, and safe from fire. The small profits derived from the sale of animal photographs



SAMPLE PAGES FROM OUR INDEX ALBUMS OF ANIMAL PHOTOGRAPHS
 Amphibians, Zebras, Bears and Lions.
 Photograph by Elwin R. Sanborn.



SAMPLE PAGES FROM OUR INDEX ALBUMS OF ANIMAL PHOTOGRAPHS
 Gorilla, Chimpanzee and Orang-Utan, Pelicans, Elephants.
 Photograph by Elwin R. Sanborn.



CARD FILES OF NEGATIVES

Left: Numerical index of published negatives.

Right: Alphabetical index of negatives.

Photograph by Elwin R. Sanborn.

On the whole, the Zoological Society has the satisfaction not merely of believing, but of knowing, that its efforts in photography in the interest of science and education are fully appreciated by the American people.

The idea that the Zoological Park should be thrown open to the cameras of the world is thoroughly illogical, and it seems to be entertained by only a very few people. There is no evidence, and there never has been any evidence, that the taxpayers of New York who furnish the greatest amount of money for the maintenance of the Zoological Park, are in any way dissatisfied with the Society's management of the photographic privilege. Each year perhaps half a dozen persons inquire "the Society's reasons" for the ban on free photographing in the Park, and when these reasons are stated, the majority of inquirers are perfectly satisfied with the facts and their logic. If so much as three per cent. of the taxpayers of New York are dissatisfied with the Society's management of the photographic privilege in the Zoological Park, we are totally unaware of that fact. We do not for one moment believe that any considerable number of people ever will demand that the Zoological Park shall be thrown open for a carnival of free and unlimited commercial or other exploitation by persons who never have helped to create it, or that the Society's management of the Zoological Park shall be placed on a different basis from that on which the museums and art galleries of New York now stand.

In the early days of the Zoological Park we

sometimes,—though not often,—underrated the grinding and pulverizing power of millions of human beings steadily applied.

At first we thought that we could permit all our visitors to wander at will through our woods, even in the enclosed grounds. Impossible! The tramp of the feet of our annual millions would in one year ruin any forest floor, beyond all hope of restoration, and *kill* trees beyond all predicting. In our fenced area, where the millions mobilize, every walk and road *had* to be fenced all along with wire barriers, to protect the adjacent grass and shrubbery from quick ruin. Our original guard rails had to be strengthened and extended upward,—some of them to a height of nine feet. *For the protection of the best interests of the public, for the greatest good of the greatest number, our regulations have steadily been made more strict, and more strictly enforced.*

Any zoological society, or any municipal government that pursues any other policy than that of strict regulation of all activities is bound to lose ground, and see its best creations in public parks ground

to powder under the feet of the ever increasing millions of our cities.

W. T. H.



NEGATIVE STORAGE CASE

On the cover, is the case number and list of negatives.

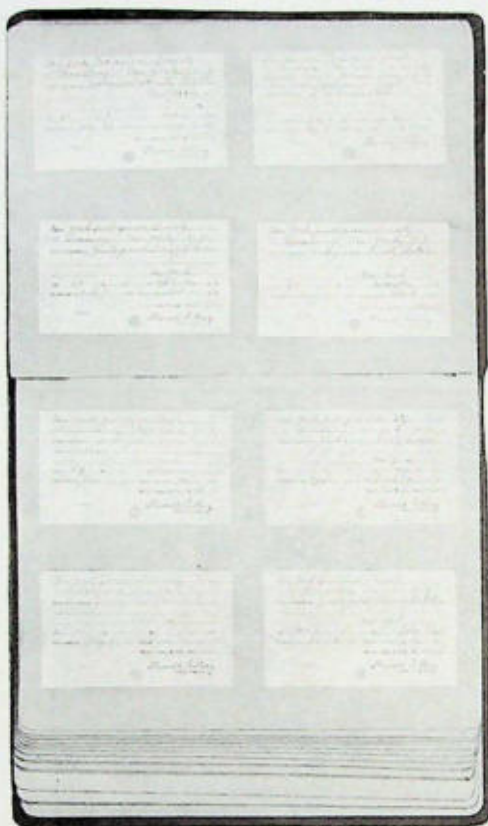
Photograph by Elwin R. Sanborn.



NEGATIVE ENVELOPES

On each envelope are the case and negative numbers, and other data.

Photograph by Elwin R. Sanborn.



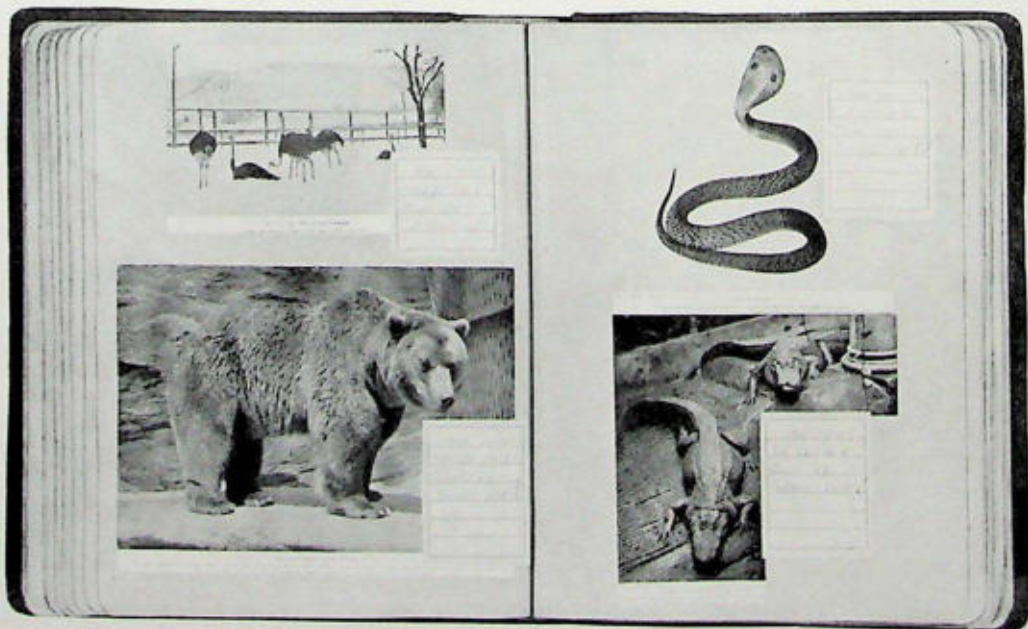
COPYRIGHT RECORD

Each copyright card on receipt from Washington is mounted in a scrap album. A letter-book copy of the application is kept as well.



RECORD OF PHOTOGRAPHS ISSUED

Each order for photographs is made out on a form printed with copying ink. An impression is made in a letter-book and the original mounted in a scrap album.



PHOTOGRAPHS PUBLISHED BY THE SOCIETY

A picture of every cut used in the Society's publications is mounted in scrap albums, with data showing where it was used and from which negative it was made. The cuts are then filed in cases where they can be found without delay. All of these records have been in use and faithfully kept since the beginning of the Department.



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VISITORS WAITING TO SEE THE PLATYPUS

Hundreds of interested visitors stood in line and patiently moved along until they passed through the entrance which was at the spot marked A.

ZOOLOGICAL SOCIETY BULLETIN

Published by the New York Zoological Society

VOLUME XXV

SEPTEMBER, 1922

NUMBER 5

NEW YORK'S DUCK-BILLED PLATYPUS

By W. T. HORNADAY

Illustrated from photographs by Elwin R. Sanborn.

THE spell of ten thousand years has been broken.

The most wonderful of all living mammals has been carried alive from the insular confines of its far-too-distant native land, and introduced abroad. Through a combination of favoring circumstances it has been the good fortune of New York to give hospitality and appreciation to the first platypus that ever left Australia and landed alive on a foreign shore. This consummation has been wrought out by the zeal for the transplantation of zoological rarities, the intelligence and the marvellous energy of one man, Mr. Ellis S. Joseph, of Sydney, Australia.

No matter what evil fate may hereafter overtake the platypus species, nothing can rob us of the fact that New York has looked upon a living *Ornithorhynchus paradoxus*, and found it mighty interesting. It cost us \$1400, but it was worth it.

When our first platypus arrived at the Zoological Park on July 14, 1922, after a journey (of 10,000 miles) that had consumed the lives of four companions, we felt reasonably certain that when fairly out from under the excitement of foreign travel the queer little beast would die in a very few days. We hoped that it might live for one week, but we resigned ourselves to the impending loss. It lived at the Park forty-nine days, and was on exhibition daily, for one hour.

At the outset we observed that the platypus is an animal of nervous temperament, and easily excited by too many observing eyes. It was evident that one hour of daily exhibition was all that the little animal could endure, and subsequent observations proved the correctness of this estimate. We are sure that a longer

exhibition period would speedily have proven fatal to the distinguished stranger.

The platypus arrived in the most amazing contraption that we ever have seen in use in animal transportation. Nothing short of real genius ever could have conducted it from Australia to New York without a wreck in transit. It is 10 feet long over all, 3 feet wide, 2 feet 9 inches high, and it has more compartments than a Pullman car. Its midship section consists of a large tank of water 30x36x18 inches, in which the water is about 18 inches deep. The main deck forward contains an elevated pool of water which serves as the bathroom of the platypus, and this is flanked on either side by two small sandbanks.

The "quarter-deck" is occupied by a labyrinth of narrow halls, each one connected with its side partners by two holes of platypus size. All the holes are fitted with rubber gaskets, to scrape the water off the animal as it wriggles through to its burrow in the farthest corner, where it goes to sleep in a nest of dry hay.

This labyrinth is connected with the large pool amidship by an up-slanting, water-tight box of sheet metal.

The little animal swam and ate its food in the main tank, and it could retire to its burrow without exposure to the outside world. It had options on conditions that to the best of human ingenuity reproduced its river home, and its burrow,—with a submarine entrance,—in the dark depth of a bank of earth.

The exhibition of the platypus was accomplished by removing the wire-netting tops of the contraption, admitting visitors in a line, in single file, and permitting them to pass entirely around the man-made habitat of the animal. As the stream of visitors marched and counter-



PLATYPUS POSES

Never still, always moving.

marched, the platypus briskly swam and emerged, scrambled, and climbed up the wire netting walls of its main salon in efforts to get out. Head-keeper John Toomey stage-managed the display, and handled the little creature whenever its erring ways needed to be checked.

From the beginning of captivity the food supply of a platypus is a serious responsibility. In Australia, angleworms are the mainstay.

The two features of a living platypus that make the daily life of its keeper a nightmare and a burden are its food habits and its water habits. In this vale of tears there seem to be just about five kinds of food that it will consider and consume. Named in the order of their acceptability these are: angleworms, very small shrimps, wood grubs (of the kind most difficult to find!), oysters and water insects. Of any one of the three leading kinds the animal soon tires, and requires a change. The cost of digging angleworms, even if it is possible to preserve them, is quite serious; and wood grubs cost us ten cents each, with few purveyors.

While it lived our little platypus,—about half grown,—cost us between \$4 and \$5 per day to feed. Even in summer the food problem kept us moving, but we looked forward with apprehension to the horrors of winter.

One trouble lies in the voracious appetite of a healthy platypus. Mr. Joseph solemnly declared that often one will consume half its own weight of food in a day. One day's ration of our specimen was as follows:

August 6; $\frac{1}{2}$ lb. earthworms, 40 shrimps and 40 grubs.

One week's food supply for the platypus consisted of the following:

Each day, between three and four o'clock, the animal was given one-quarter of a pound of earth worms.

On Tuesday nights and Friday nights one-quarter of a pound of shrimps and one-half pound of grubs were given.

On the evenings of Monday, Wednesday, Thursday, Saturday and Sunday he received one-half pound of shrimps each day.

Concerning the food of the platypus in captivity, Mr. Joseph has kindly furnished the following statement:

"In the feeding habits of the platypus, I find that its taste varies. I have withheld food from them and then tried to feed them on oysters, and I found that two out of three would not eat them, while the third one ate

no less than twenty-two in one night. In the winter months shrimps are hard to get in Sydney, and on several occasions I put cooked shrimps in their tanks and they ate but sparingly. Only on one occasion did the animal last mentioned eat a small fish. The largest quantity of food he consumed in one night was one pound and a quarter of raw or green shrimps and one measure of a condensed milk can full of earth worms. These shrimps were headed so that the quantity mentioned was actual net weight."

Really, it seems incredible that an animal so small could chamber a food supply so large. I know of nothing equal to it among other mammals.

Contrary to my expectations, our platypus proved to be an animal of nervous temperament, and much more lively and active than we had anticipated. It swam in lively fashion, paddling rapidly, and independently, with its outspread feet. To keep it from acquiring momentum which would carry it against the walls of its main tank, and injure its bill, Mr. Joseph placed in the center of its tank a cylindrical sheet-metal tower with a flat top. Round and round this the animal swam, while feeding on the bottom or exercising, and when tired of the water it would scramble up and perch for a time on the top of the metal tower.

When on exhibition with the wire-netting cover off the tank the little beast would quickly climb up the sides of its tank and attempt to climb out. When arrested by Head-Keeper Toomey it made no decided resistance to being handled.

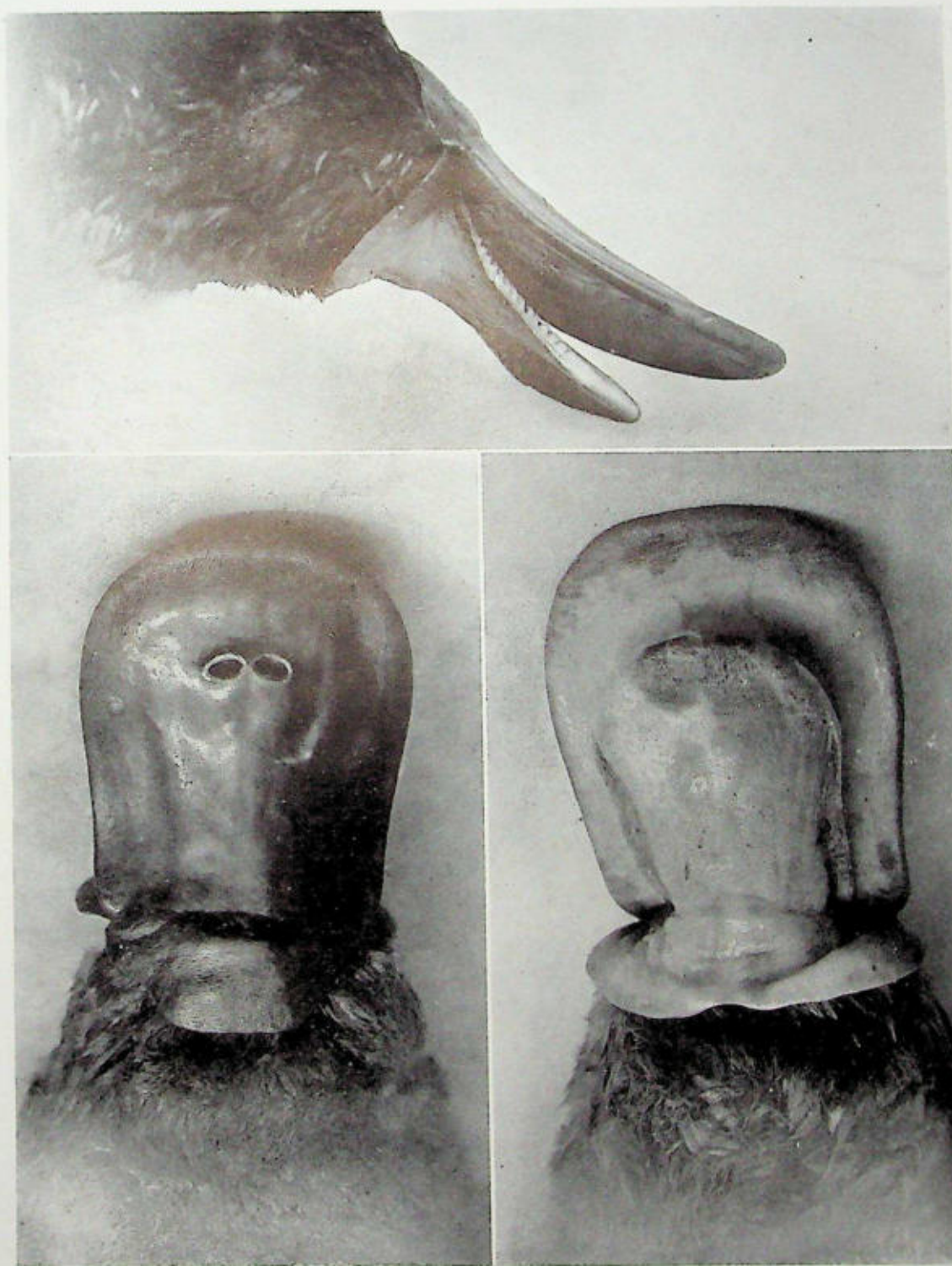
When tired of feeding and showing off, it would go up the water tunnel to its imitation bank, wriggle through the holes of its maze one by one, scraping off the water on the rubber gaskets each time it went through a hole. Finally, on reaching its nesting-place in the farthest corner it would curl up in its bed of fine dry hay, and rest.

The original home of our platypus was in the Namoy River, New England District, New South Wales, where it was captured about March 1, 1922. It left Sydney, on May 12, reached San Francisco on June 30, and arrived in New York on July 14,—very tired and thin in flesh, but full of spirit. It died on August 30, suddenly and unexpectedly, and because of the demands of science Dr. Blair refrained from making an autopsy to ascertain the cause of death. The remains were quickly turned over to the College of Physicians and Surgeons,



PLATYPUS POSES

A restless mite of activity.



BEAK OF THE PARK PLATYPUS

Upper picture, a side view of beak showing serrated edge. Lower left picture, top of beak; right picture, under side. These illustrations are very nearly life size.



FEET OF THE PARK PLATYPUS

The upper pictures are the hind feet—and the lower the front feet. The upper left picture shows the highly developed spur. About life size.

THE DUCK-BILLED PLATYPUS, FROM AUSTRALIA.

*This is the most strange and wonderful of all land animals.
It lays eggs; it has a flat bill; no teeth, and webbed feet.
It suckles its young with milk, by a strange process.
It lives in rivers, but sleeps in burrows in the banks.
It rarely comes upon land.
It feeds on angle worms, grubs and very small shrimps.*

*This is the first specimen ever landed alive outside Australia.
Brought to New York after nine years of experiments and efforts by
Ellis S. Joseph, of Sydney.
Purchased and Presented by the John L. Cadwalader Fund.
Received here July 14, 1922.*



LABEL AT THE ENTRANCE TO THE PLATYPUS EXHIBIT

This sign and the one on the opposite page attracted much attention, and were carefully read by visitors.

by which they will be investigated to the utmost.

Its measurements were as follows:

- Total length from end of beak to end of tail— $18\frac{3}{4}$ inches.
- Length of upper mandible— $3\frac{1}{8}$ inches.
- Width of upper mandible at widest point— $2\frac{1}{8}$ inches.
- Length of spur on hind foot— $\frac{1}{2}$ inch.
- Weight— $1\frac{3}{4}$ pounds.

The platypus is so odd and so unique that it deserves to occupy a mammalian order all alone, but it has been elected, from its egg-laying habit, to share the MONOTREMATA with the Echidna. To begin with, it has the astounding ability to lay eggs, and hatch them by curling around them and giving them body-heat. The eggs number either one or two, they are about three-quarters of an inch long, and the shell is leathery in texture.

The newly-hatched platypus appears in October, it is only about one inch in length, absolutely naked, and it remains hairless for the first two or three months of its life. The mother should have a good serviceable nipple an inch long, but in reality she has none, and the young animal is nourished by milk that seeps through the skin. It is a tough infant that can be nourished and reared on milk procured by that very inadequate process,—the worst on record.

The broad, flat tail is naked below but heavily haired above, and is very useful in swimming.

The fur is dark brown when dry and dull black when wet. It consists of a coarse outer coat and a fine and dense under coat that is so much like "fur" that thousands of these animals have been killed by fur-hunters. Occasionally flat platypus skins are tucked into bales of other fur from Australia,—where all mammalian life is rapidly being swept away.

Other unique features of the platypus are the broad and leathery duck-like bill, the base of which is a leathery margin that nicely covers the junction between bill and fur. The front feet are fully webbed, well beyond the ends of the toes, all of which is utilized in swimming. In digging and climbing, this exposed margin of leathery web is rolled under the toes, to give the claws a chance. The web extends half an inch beyond the ends of the claws.

The platypus inhabits a very few of the small and quiet interior rivers of Australia where it seeks its food in the water, and at other times lives in a comfortable bank burrow. One entrance to the burrow is under water, the other above it. The end of the burrow is formed into a comfortable chamber, wherein a nest of dry leaves is maintained.

MY EXPERIENCE WITH THE PLATYPUS IN CAPTIVITY

By ELLIS S. JOSEPH.

Illustrations from photographs by Elwin R. Sanborn.

IN 1913 Mr. H. Burrell, of LaMascot, Kensington, Sydney, N.S.W., told me that he had tried to keep a platypus in captivity, and in spite of the fact that he did keep one for about three months, it was considered by interested parties that it was impossible to keep them alive in captivity. When the question was asked "Can you keep a platypus?" the answer was "No."

me to say that my several years of labor and expenditure did not go for naught.

Mr. Burrell told me that he had secured five platypus from the Namoy River in Manila, N.S.W., where he was living at the time. He gave them what he considered sufficient food but in the course of a few days one died. He continued to give them the same quantity of food and a few days later a second one died.

**THE PLATYPUS, *Ornithorhynchus paradoxus*.**

This drawing is nearly twice the size of the living specimen.

The Living Specimen was collected March 1, 1922 in the Namoy River, New England District, New South Wales, Australia. Rec'd. July 14, 1922.

These were the words of Mr. Burrell to me, with the tears almost in his eyes because of the way he was ridiculed and discouraged.

His efforts certainly needed sympathy, at least from me, and there and then I made up my mind to try to keep the animals in captivity. I told Mr. Burrell that nothing would give me more pleasure than to do something that the other fellow said could not be done. From then on I made up my mind never to rest until I had accomplished the result, and I am glad now that it is possible for

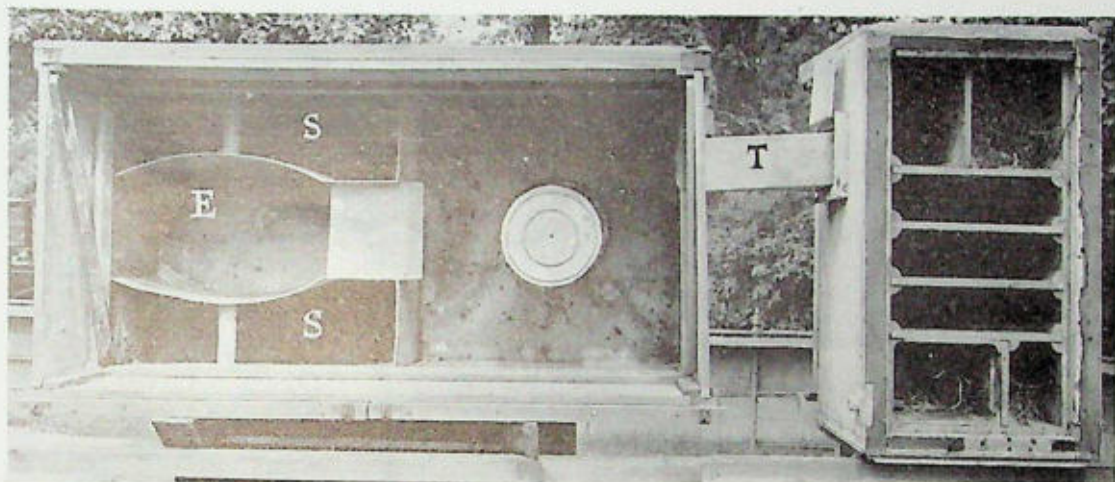


He still gave the remaining three the same quantity of food as he did the five and again he lost another one. The remaining two got as much food as the original five, and it was consumed, but unfortunately the fourth died also. He gave the remaining one the original amount of food, and to his utter surprise he discovered that the one specimen was getting away with the food. He kept the platypus for about three months, but owing to the scarcity of food suitable for it he was obliged to turn the specimen over to the authorities of



THE ZOOLOGICAL PARK PLATYPUS

This picture is very nearly one-half life size. Securing photographs of this active little animal was an arduous task as he moved about continuously.



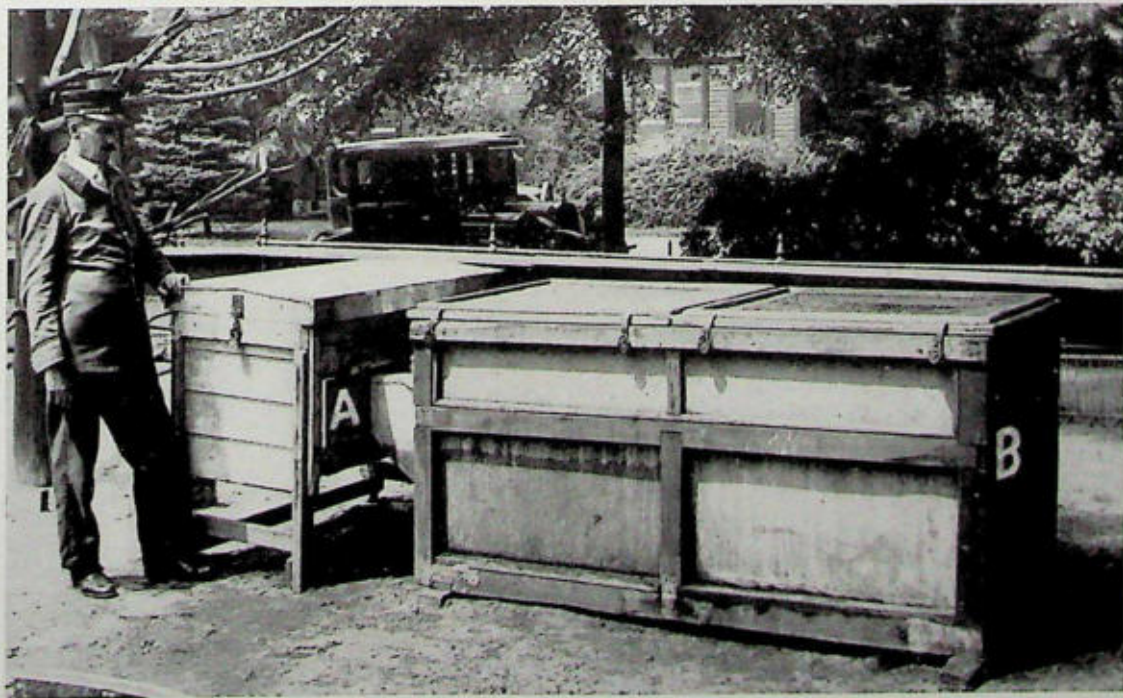
VIEW OF THE ARTIFICIAL HABITAT OF THE PLATYPUS AS SEEN FROM ABOVE

At the right is a labyrinthian substitute for the river bank with four dry burrows. At the left is shown the tank representing the river. The deep water is contained in the square section with the round metal pillar in the center. The elevated tank used as a bathroom is marked E. The two sand banks are marked S. The imitation river is connected with the substitute bank by a tunnel of sheet metal marked T.

the zoo at Moore Park. They kept it for a few weeks and then, owing to the lack of proper food and heavy expenditure, they were obliged to liberate it in one of the ponds at Centennial Park close by the zoo.

When I decided to continue Mr. Burrell's experiments, first of all I secured the tank

and incubator in which Mr. Burrell had kept his platypus. After examining them carefully, I thought that an improvement could be made in the incubator by nailing soft rubber gaskets smaller than the animal, around each hole in the partitions so that when he did go in he would be forced to squeeze through and there-



TANK AND INCUBATOR AS THEY ARRIVED FROM AUSTRALIA

Comparing the size of the man with the apparatus will give an adequate idea of the immensity of the task accomplished by Mr. Joseph. A is the incubator and B the swimming tank.



PLATYPUS CLIMBING

When walking or climbing the web on the front feet was folded underneath so that the claws or nails supported the foot.

by rid himself of a lot of water that was on his fur. He had to pass through five of these rubber openings and by the time he had gone through them all and reached his sleeping compartment, he was comparatively dry. Thus the risk of the animal contracting cold or possibly pneumonia was greatly lessened.

My first attempt to bring one to New York was in 1916 and I must say that it was not a

fair trial, either to the animal or to myself. Mr. Burrell had secured one for me from the Namoy River and it arrived in Sydney one day before I sailed on the S. S. *Niagara*, one of the Canadian-Australian liners. I kept it for exactly one week and then unfortunately it died.

On my return to Australia from the United States in February, 1917, I was unable to give the matter much attention as I was too busy getting a collection together and so deferred action until I had made another trip to America. When I returned to Sydney on October 27, 1917, I put all my energy into the keeping of the platypus alive in captivity. I secured two and kept one for 96 days and the other for 125 days. Then I got several others from time to time and kept them for varying periods, from one week to over one year. On August 27, 1918, I secured one and kept him until April 26, 1919, on which date the animal died. I honestly believe that the animal would have lived longer had it been possible for me to give it my personal attention, because for three weeks before its death I saw very little of it. I was ill with the pneumonic influenza—raging at the time all over the world—and had to depend on others to see to his keeping.

As soon as I was up, I secured several more specimens and on one occasion I had three females and one male quartered together. To my sorrow I found that the male fought them and just worried them, and in one instance there were several scratches on the bill of the female which I am sure could not have been made except by the claws, or possibly by the spur of the male. The females ultimately were afraid to go in their sleeping box for I put them in myself on several occasions in the course of a day and they would struggle hard



HEAD OF THE PLATYPUS

The eye with the deep pit or hole back of it, and the folded front foot are easily discernible.



THE PLATYPUS AT REST

He endured restraint with the greatest reluctance.

to get out. It seems to me that it was actual fear of the male.

On August 22, 1919, I secured a fine male measuring $23\frac{1}{2}$ inches, and during a period of nine months he was responsible for the death of no less than two females and one male. In August, 1920, I approached the authorities in Sydney for a permit to take this specimen to the New York Zoological Society, but was refused. Keenly disappointed, I left Sydney September 3, 1920, on the *S. S. Bellbuckle*, bound for New York, without my platypus. On October 15, 1920, while I still was on the sea, the animal escaped from his tank because the lid had not been properly secured. I certainly would have liked to have kept him till he died as it would have been very interesting to learn how long he could have lived in captivity.

When I decided to go to the United States again I felt that I should bring a platypus along as I knew the great desire of the Zoological Park authorities in New York to obtain a specimen. At first things looked black for securing a permit from the Federal Government for the exportation. In the course of a conversation with Alderman C. Willoughby of Granville, N.S.W., about the matter, he declared it was very fair and just that the animals should be exported for the New York Zoological Society, and he made arrangements for me to meet Mr. A. K. Bowden, M.L.A., who represents our District in the Federal House, and state my case to him. Fortunately Mr. Bowden viewed the matter in the right light and in turn made arrangements for me to come to Melbourne and interview the Hon. Minister of Trades and Customs, Mr. Rodgers. To Melbourne I went, and in company with Mr.

Bowden I stated the case to the Hon. Minister, and on the favorable recommendations of Sir Baldwin Spencer he decided that my application should be granted. I am glad to say that I obtained from the Federal authorities all the necessary permits that were required. I sincerely thank all those who were instrumental in enabling me to bring the platypus to America.

Having secured the federal permits, I made arrangements to get the animals. I secured six, five of which were males. Unfortunately the female died sixteen days after I received it.

I left Sydney with five male platypus on May 12, 1922, on the *U. S. S. West Henshaw* (Shipping Board Steamer), bound for San Francisco via New Castle, N.S.W., and Honolulu. On May 19, while we were still in New Castle, one of the medium-sized ones died.



KEEPER TOOMEY AND HIS CHARGE

The platypus evidenced a strong inclination of becoming a pet. He did not object to being handled—but he could not long remain quiet



VISITORS AROUND THE PLATYPUS TANK

During the exhibition hour there was a continuous line of passing visitors.



CHILDREN INSPECTING THE PLATYPUS

The younger visitors were most eager to see this curious animal from far off Australia.

The remaining four were absolutely in the best of health as far as I could make out, because they were eating well; that being about the only sign by which I could determine their condition. We left New Castle on May 20, and for six days it blew a regular gale. The seas were mountain high, and unfortunately the ship was more under water than over it, and certainly that did the animals no good. On the night of May 25, a huge sea came aboard, and rushing along the deck smashed into one of the platypus tanks, bent the metal neck and jammed it so effectively that the animals were imprisoned in the sleeping quarters for that night. From then on that pair ate less and less, but they lived till the 5th and 6th of June respectively, on which dates they died in a comparatively poor condition.

Of the remaining two, one was fine and healthy but the second was just about medium, and I am sorry to state that on the 14th of June while the ship was at Honolulu, it also died. My feelings can readily be imagined. I would rather have lost all of my shipment of a very valuable cargo of birds, animals and reptiles. This was not because the platypus was worth more (far from it) but because it was my ambition to bring one alive to America. I am glad to say that good fortune eventually favored me, since on June 30, 1922, I landed in San Francisco with the first living platypus ever brought to America.

I had to stay five days in San Francisco in order to procure a new supply of fresh worms and this I can assure the reader was not an easy matter. From Honolulu, I had sent two wireless messages to different parties to try and get some for me, but to my great disappointment on my arrival in San Francisco, I found that neither of them had been able to get any. After a lot of work, worry and expense I managed to secure sufficient to last for the trip across the continent to New York. That trip was the hardest part of the long journey, for the shaking and the jolting of the train was a very great strain on the animal. When two days out from San Francisco, the platypus began to get hungry, for he used to get out whenever the train stopped and look for food, and so I was up day and night, and whenever the train stopped for any length of time I put water in the tank and also food, and that gave the animal a chance to eat a little.

I was glad when we arrived in Chicago where I rested for two nights, and that gave the animal a fresh start. I started on the last

lap on Tuesday night and on Thursday, July 14, arrived in New York, both man and animal completely tired out.

After all, the undertaking was worth all the labor and expenditure that it had cost. I accomplished the task that I had six years previously set out to perform. I not only had attained my object, but also the great additional pleasure of knowing that the New York Zoological Park had the honor of being the first institution to place before its visitors a living platypus.

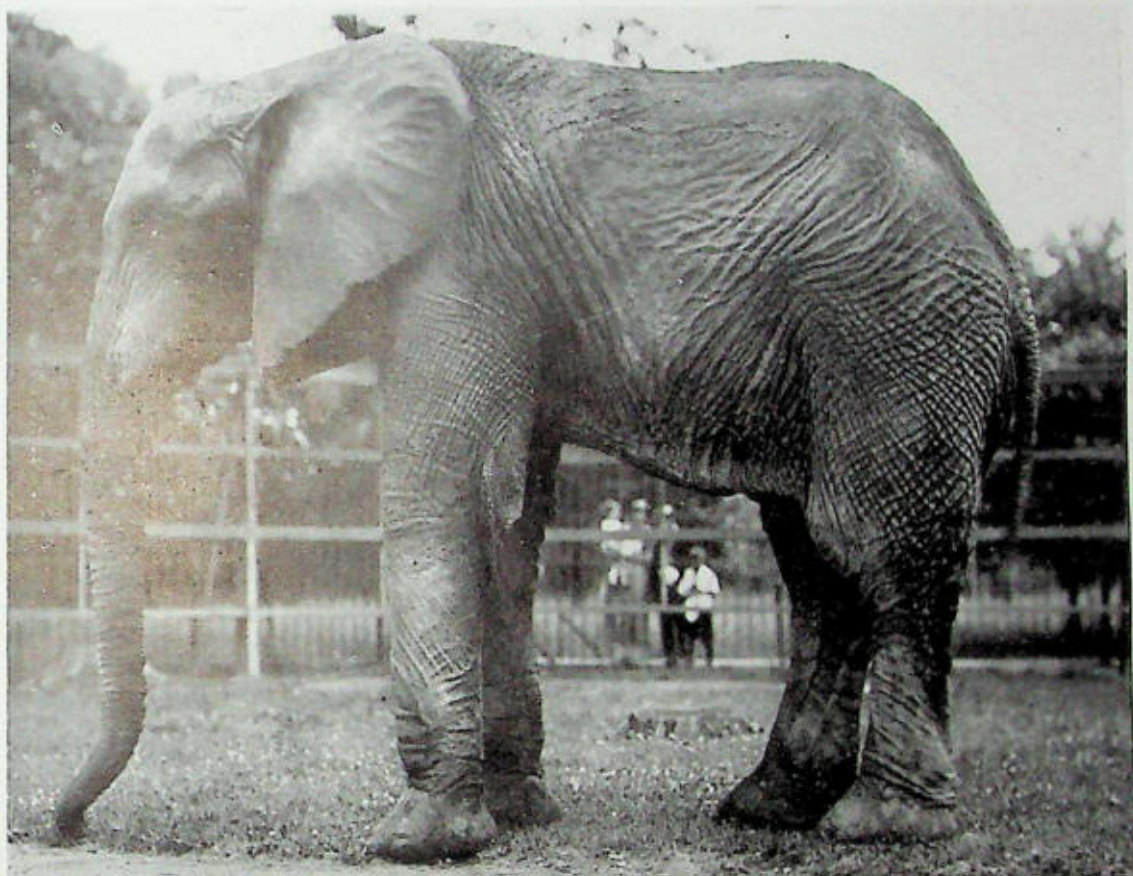
THE VANISHING PRONG-HORNED ANTELOPE

IF the people of the United States ever intend to save any of their prong-horned antelope from the *total extermination* that now is proceeding, they will have to set about it at once, and act quickly and decisively. It is a most serious matter, and it is no one-man job. It is up to the states, the nation, the man of the American people at large, and the working conservationists, who are responsible in the order named.

The Yellowstone Park herd, usually stationary in population, has suffered a dreadful decrease. Every spring the coyotes slaughter the majority of newly born young. The antelope of southeastern Oregon have been viciously attacked by alien (Spanish) sheep herders and *seventy-eight* of them were murdered in cold blood and left lying as they fell to discourage the plan under way to convert their range into an antelope preserve. The people of the United States and certain sheep-owners are due to come to a showdown very soon on game questions. For instance, the Wool-Growers Association of Idaho has, in annual convention, formally resolved to *abolish the Idaho State Fish and Game Department*. I am glad that step was taken; for it will hasten a decision of the question: Shall we destroy our forests and game in order to furnish free grass to a few sheep-owners, or shall the people protect the rights of posterity by referring the sheep back to the pastures of their owners?

The people of the United States must decide this question. Entirely aside from all game questions is the question of forest destruction by grazing sheep; and those interested are advised to read a very important editorial article entitled "Sheep and Swine" by LeGrand T. Meyer in the May number of *Field and Stream* magazine.

W. T. H.



KARTOUM AT PARADE REST

The photograph conveys an impression of the huge size of this animal, altho in the picture there are no definite means of comparison.

THE PUSHING POWER OF AN ELEPHANT.

Illustrated from photographs by Elwin R. Sanborn.

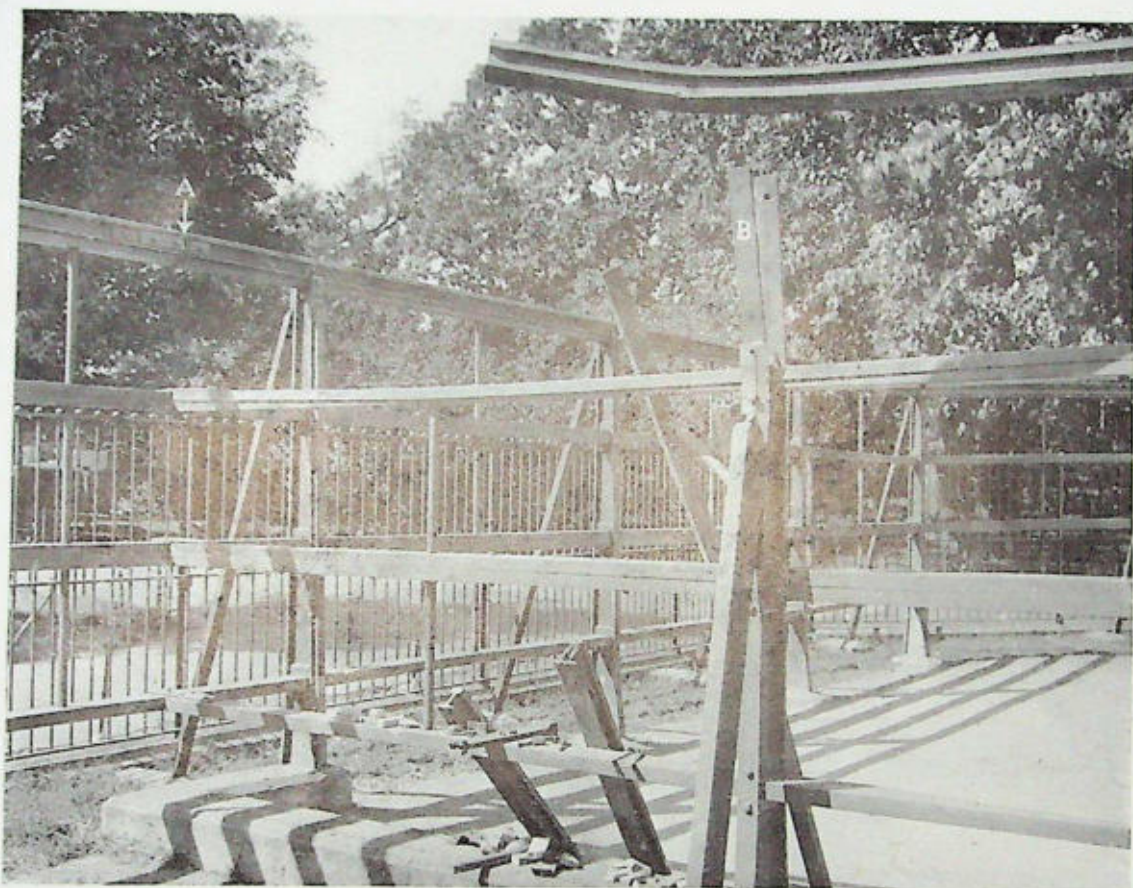
THE head-on pushing power of a growing elephant is an unknown quantity. There is no way by which it can be determined, save in terms of what it can and cannot destroy. When our elephant fences were to be planned and constructed, we called for a fence that would withstand at all parts a blow or a pushing strain of 5000 pounds. It was our estimate that an adult elephant ten feet high would weigh 9000 pounds, and that of this he could deliver a push of 5000 pounds against a fence, a gate or a door.

The late and lamented Gunda was a bad one, but his specialty was attacking man. He never phased his fences. After all, Gunda was not totally depraved.

Our male African elephant, Kartoum, now seventeen years of age, nine feet six inches high, and with about one foot six inches more to grow, is not at all ambitious to kill men. His weight must be about 8000 pounds, and he hates all cage and fence materials. With perfect impartiality he attacks brick, stone, steel and wood, whether it be expressed in wall, doors, fence or gates.

No sooner did his boyhood tusks begin to grow beyond his lips than did he begin to use them as weapons of offense in the elimination of hated spikes, cut stone and brick-work. The neatness and precision with which he could place the stub-end of tusk against the sharp end of a half-inch steel spike two inches long and break it off was very edifying to all persons save our ironworkers.

With growth in height and the acquisition of avoirdupois, Kartoum began to test out every



WRECK OF THE TOP BAR OF KARTOUM'S FENCE

The railroad iron joined the outside fence at "A." The railroad iron projecting out in mid-air was torn out from the top of a fence post at "B." Two pieces of broken railroad iron are leaning against the bottom bar.

particle of steel in his surroundings, to see what he could dislodge, bend or break. In spring weather, when the ground was wet and soft, he pushed at our steel fence-posts until he moved the great masses of concrete which embraced their roots to a depth of three feet, and bent them out of line. To thwart this industry we put huge steel braces on the outsides of the fence posts.

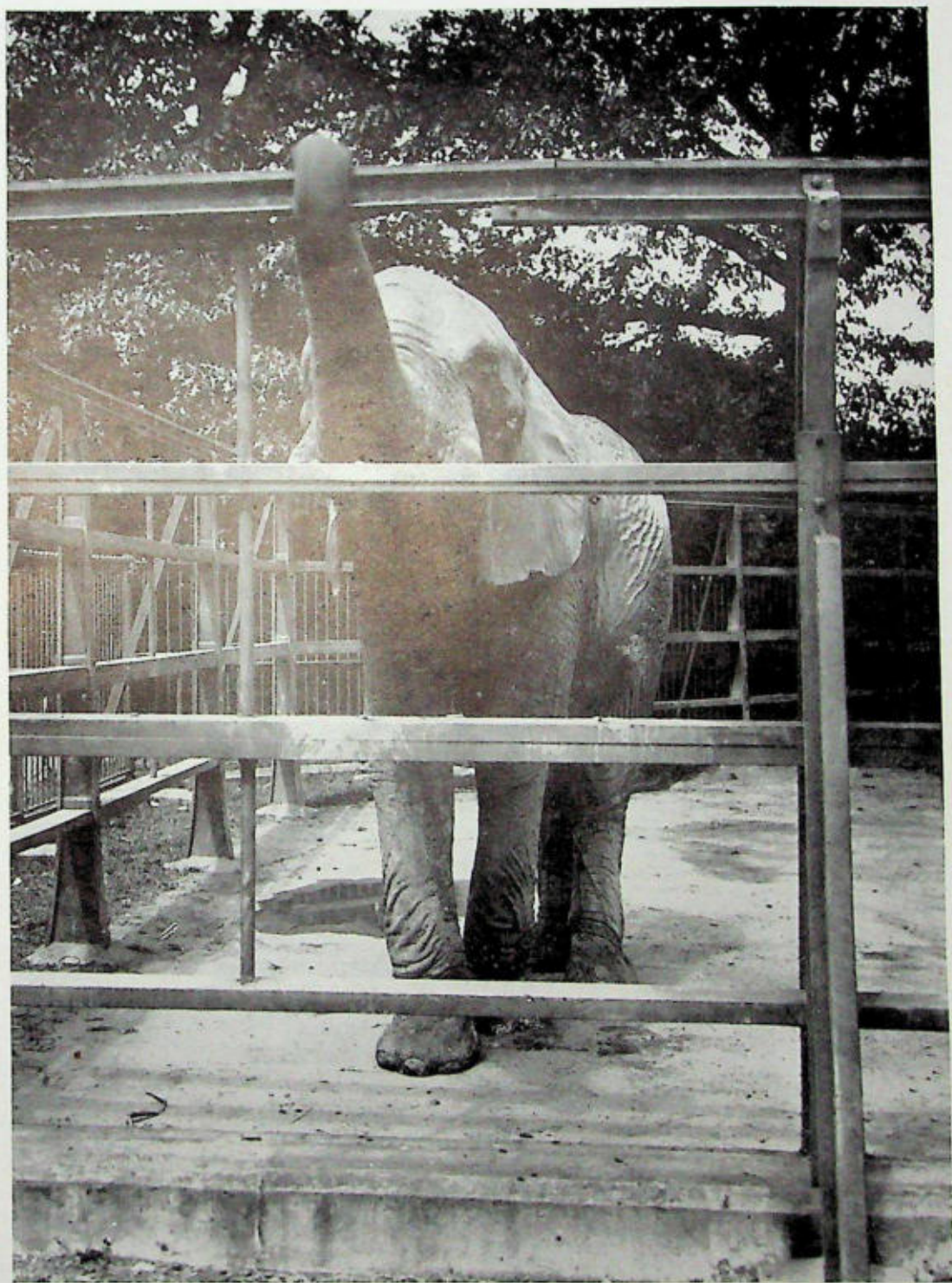
Finding by trial that the character of the top bar of the tall fence was no better than it should be, he heaved up from below and bent some of those bars, to a shocking extent. To discourage that we contributed to the support of that top bar a standard steel railroad iron weighing fifty-five pounds to the yard, and this has availed much.

But to an elephant like Kartoum, railroad irons are not quite all-in-all. They have their limitations. Last summer (1921) Kartoum pushed with his forehead against the side of one

of those irons until it broke in two, and was thrust out at the break about six inches. Four months later he went to that projecting angle on the opposite side of that partition fence, and pushed the break back into line.

On Sunday, September 17, 1922, Kartoum indulged in a diversion with that partition fence which came very near to a serious injury to a visitor. He attacked the top of his partition at the point of the original break, and closely adjoining its junction with his outside fence. The strength that he put forth, and the amount of steel that he broke and tore apart, is unbelievable until seen.

The railroad iron was broken in two in a second place, and it and its channel iron bed were torn loose from the outside fence and from the fence post to which both were attached. The long arm of the railroad iron was bent far out into midair. A middle section of rail was snapped off, and fell to the ground. The ter-



KARTOUM TESTING THE STRENGTH OF RAILROAD IRON
A favorite place on the fence for assault.

minal end of the railroad iron hung by this half-inch thick steel band to the outside fence, poised in the air, until the elephant put his head under the lower edge of it, and gave a mighty thrust upward and outward. The bar was torn loose from the boundary fence, and the fierce up-thrust threw it over the outside elephant fence, over the visitors' fence, and landed it upon the walk in the crowd of visitors. In falling it grazed the side of a lady visitor, bruised her hip, but by the mercy of heaven did not kill her.

The elephant did not pick up anything with his trunk and throw it. He does not seem to know that he can hurl a missile.

As a contribution to the world's very limited knowledge of the pushing power of a nearly adult African elephant, the following list of last Sunday's breakage is offered:

Structural Steel broken by Kartoum,
September 17, 1922.

- 1 90-pound railroad iron 4" x 4 1/4" x 2 1/4" broken in two, short piece broken free from attachment to the outside fence, and the long piece bent horizontally seven feet out of line.
- 2 Straps of flat bar iron 2 1/2" x 1 1/2", torn loose from outside fence by the breaking of 3 bolts, 1 1/2" thick.
- 1 Channel iron 3" x 1 1/2" x 5/32" torn loose at end from 3/4" bolt, bent and thrown down.
- 2 Brace rods 1 1/2" of round wrought iron, broken off at second rail from top.
- 2 Strap irons 3" x 1 1/2" holding railroad iron on top of steel posts, torn loose by the breaking of
- 2 Bolts, 5/8".

As an object lesson to zoological park engineers these broken parts will be placed on exhibition near the Elephant House and maintained for a reasonable period.

Finally, it is to be noted that despite the wrecking of the high top rail, the elephant could not climb through the high-up opening, and even if the whole run of the top rail were removed the fence would hold him in place. *W. T. H.*

SLAUGHTER OF HUMAN BEINGS BY JAGUARS

The Washington Post for August 12 printed the following special dispatch from the City of Mexico:—

"Mexico City, Aug. 11.—A pack of tigers driven from mountain homes by hunger attacked three families who were traveling from Puerto Vallarta to Mascota, state of Jalisco, yesterday, killing three women, two men, two small boys and a baby, according to *El Universal Grafico*.

"Natives who went to the rescue fought the tigers, killing one of them. The remainder escaped to the mountains."

Even after making all reasonable discounts for exaggerations in this sanguinary story in its course from its scene of action to the City of Mexico it is evident that a very unusual tragedy occurred. We never before have heard or read of such wholesale slaughter having been effected by any carnivorous wild beasts except wolves on a single group of human beings. The psychology of the occurrence is horribly interesting.

In the first place it is most unusual for members of the cat family to travel and to attack in such numbers as the story implies. In the next place it is perfectly evident that the attacking animals set out to make a wholesale killing, and were not content to kill the two or three persons which would have been sufficient to satisfy the hunger of several jaguars. It is extremely probable that all the members of the unfortunate party were unarmed and quite unprepared for such an attack, and that the strength and ferocity of the jaguars did the rest.

Pound for pound, the full grown male jaguar is undoubtedly the most powerful, and the most effective in killing, of all the members of the cat family. A lion or tiger standing three and a half feet in height and measuring from nine to ten feet in length and built on the same massive lines of the jaguar would in all probability have the strength and killing power of two of the largest lions or tigers that ever lived. Many times the story of "Lopez" of the Zoological Park has been told, and the surprising exhibition of his strength and accompanying ferocity in the murder of his full-grown female cage-mate, is now known to many persons. The neck vertebrae of the unfortunate female were completely crushed by the square bite of the treacherous male animal, and the exhibition of strength that Lopez gave on that occasion was a complete revelation to all those who saw it. *W. T. H.*

A Great Mountain Book.—Nearly all persons who are interested in birds and mammals are also interested in their most picturesque homes. The mountain faunas of America compel attention to our crags and peaks and summit divides. Mr. Le Roy Jeffers, chief exponent of the mountains of America, and founder of the Associated Mountaineering Clubs, has written a great book entitled "The Call of the Mountains" (Dodd, Mead & Co.) which we will place beside "Mount Everest" by Howard-Bury.

Surely every lover of mountains will welcome this interesting and wonderfully well illustrated volume.

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CARIBOU SLAUGHTER AT FAIRBANKS, ALASKA

MEN, WOMEN AND CHILDREN ENLIST, AND
MAKE WAR ON *Rangifer osborni*

Special dispatch to the New York *Evening Post*

Fairbanks, September 5.—Caribou, rabbits, geese and bears, which moved down from the mountains surrounding this town yesterday were mowed down in vast numbers by residents who joined in a community hunt. Miss Evelyn Houcke, assistant postmaster, was the target of a maddened caribou which charged at her automobile after the girl had fired one shot. Her second shot, and also her last cartridge, brought down the animal.

Two hundred automobilists and all the horse-drawn vehicles in town carried hunting parties. The movie men were out shooting caribou too. Even two "Chechako" professors of the new Agricultural College of Alaska, which is to open September 12, got a caribou apiece. Several were killed by school children.

Old-timers say the invasion of wild animals at this season is caused by the approach of winter weather.

Of course it was the annual southern migration of the herds of Osborn caribou in Alaska which rendered the above occurrence possible. Usually the line of migration is either eastward or westward of Fairbanks, but on this occasion the leaders of the herd made a great tactical error in steering for the most populous city of central Alaska.

The story as it came off the wire does not read well in print, but we must remember that each resident of Alaska is entitled to five caribou per year and that caribou meat constitutes an important food factor in the remote territory of Alaska. There is really no more reason why the assistant postmistress should not bag her caribou from the ambush of her automobile the same as any other citizen who goes hunting for winter meat.

At present the great caribou herd is in no danger of being wiped out of existence. There is, however, danger that the small and widely scattered bands of caribou that wander into remote regions and which, so long as they live, will be of immense value to miners and prospectors on the far-flung frontier, will be exterminated and thereby deprive the most enterprising pioneers of a food supply which at present is very valuable to them and which for a hundred years to come they will sorely need.

Eastern conservationists who are sincerely interested in the welfare of both the citizens of Alaska and the game of Alaska are disposed to do their utmost to help preserve the game on a continuing basis and to promote its utilization from year to year in such a manner that the stock will not be annihilated. To this end an important game bill prepared by Dr. E. W. Nelson, Chief of the Biological Survey, after long and careful study and prolonged conferences with persons concerned, is now before Congress. Although it is a thoroughly good bill, free from politics and free from the grinding of personal axes, the irreconcilables of Alaska are reported to be much opposed to it and it is about to be used in Alaska as a means with which to attack Delegate Daniel A. Sutherland in his coming campaign for re-election. On the other hand, many of the best men of Alaska are cordially supporting the bill, and for a score of excellent reasons it is to be hoped that Congress will speedily enact the Nelson bill into statute law.

A GRAY SEA-LION

The standard color of the California sea-lion (*Zalophus californicus*) is either light or dark chocolate brown. As it emerges from the water the animal is of the color known to artists as Vandyke brown, which is next thing to moderate black. In the standardized animal the dry coat is of course lighter than the wet, but still it is a brown animal.

In the sea-lion pool in the middle of Baird Court there is an adult female *Zalophus* that is conspicuously gray. This light tone is so striking as to render the animal conspicuous even at a distance. It is almost as light as the weathered granite coping around the grass plot. The back is slightly darker than other portions of the body, but this difference is scarcely noticeable.

This is the first time in twenty years with *Zalophus californicus* that a specimen of this color ever has come into our possession. In fact, it is about half-way to real albinism.



TROPICAL RESEARCH STATION
OF THE
ZOOLOGICAL SOCIETY
BRITISH GUIANA



Contributions Nos. 119, 120, 121

THE GIANT ARMADILLO*

By WILLIAM BEEBE

I WRITE of one of the most dangerous animals of Guiana, dangerous, that is, if cornered or wounded—the Giant Armadillo. This is an Edentate and a feeder on white ants, grubs and carrion, yet, under the conditions I have mentioned, fully as much to be dreaded as any jaguar or puma. It is of tremendous interest as a true relic of past glory of the armadillo race, when the Glyptodons with their huge arched shells reached a length of seven feet.¹ For five years I have tried in vain to capture one of these rare animals, and only in mid-July of the present year was one secured a short distance up river from the station.

By working alone and with Indians, I have seen four Giant Armadillos. The first was an unexpected meeting, at night, as I was going along a trail, when one of the animals suddenly rushed across my path, with deep grunts and a wild clawing of dried leaves. I was almost upset, and five seconds saw the beginning and end of that adventure.

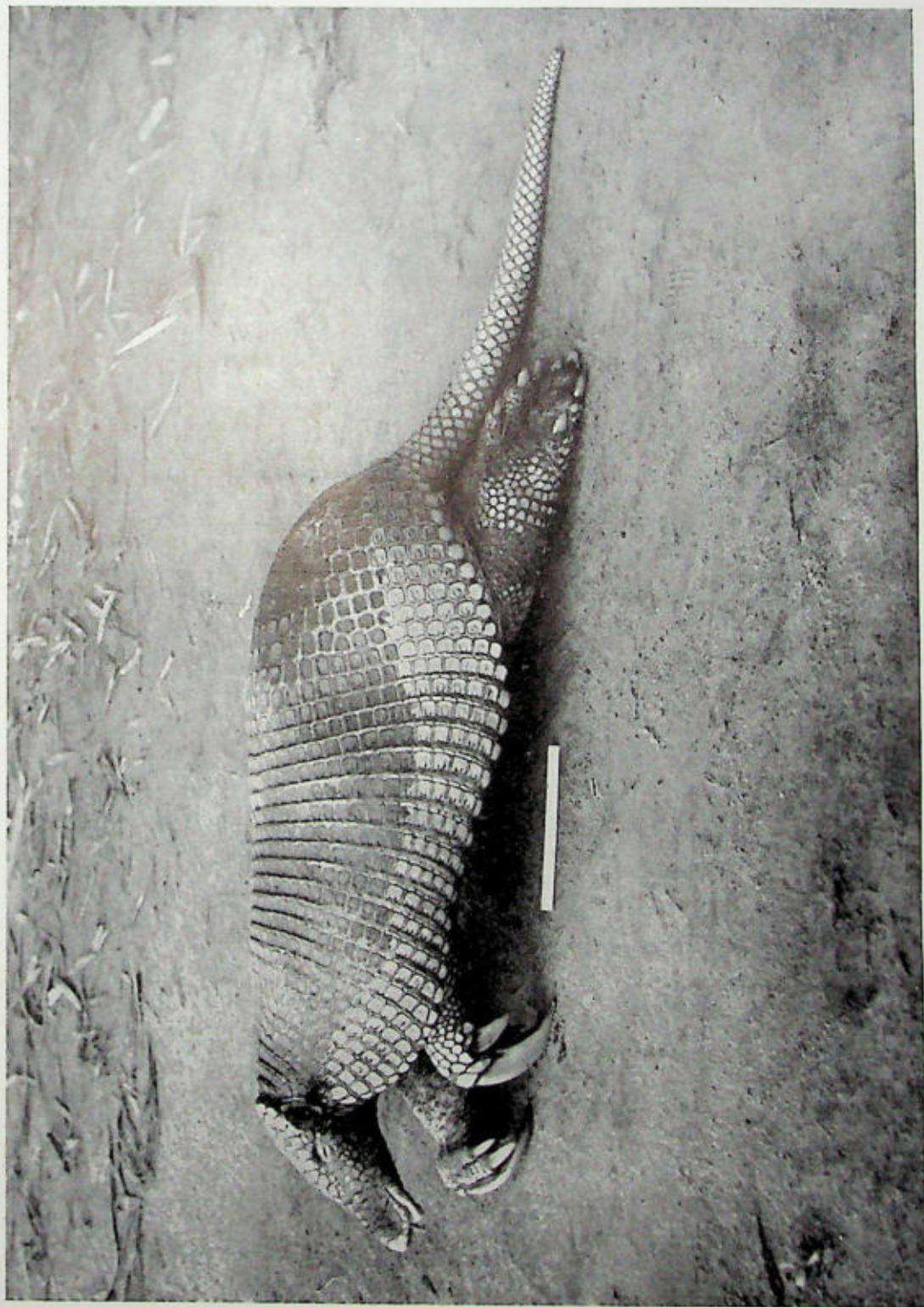
Whenever I have suggested to my Indian hunters the capture of a living *Mowoorimah*, they have smiled as at a good joke. One with a keen sense of humor answered, "Me catch two tiger live praps, but no Mowoorimah."

My second encounter gave me a more concrete belief in the truth of this remark, and enormously increased my respect for this living, high-powered, armored, animal tank. I had found a hole which, from its size, I was sure must have been made by a Giant Armadillo, and this was proved by the imprints of great claws at the entrance. I got my hunter and asked him how we could dig out the inmate. He got down and sniffed, announced that the animal was at home, and said he would go and plan a way. He did not return. I sat down and tried

to work it out. I knew the creature could dig as fast as we could, and that nothing except a solid timbered cage would hold it. It was almost dusk, and I was about to rise and go back to camp, when I heard a scuffling and a tail appeared in the hole, a tail which for sheer size might well have been that of a Glyptodon. I was wholly unprepared for this apparition, for I knew that usually these creatures come out only on the darkest of moonless nights. The tail came above the level of the ground, then the hind legs of the giant appeared, and the edge of the shell. Finally a mass of earth and bits of rock began to fly through the air, debris which the animal was dragging up.

At such a time a human being does not reason. I wanted a live Giant Armadillo for the Zoological Park more than anything in the world, and here it was. So I reached out and took it, or tried to. I have never tried to cling to the tail of a full-grown crocodile, nor attempted to stay with my hands the revolutions of a wind-mill. Once, however, Dr. Hornaday and I were dragged by a lassoed bear up a steep bank as by a steel winch. I was reminded of that occasion. What I expected the beast to do did not occur to me, and my only salvation was his own surprise. Instead of clawing and digging down out of sight, as any small armadillo would have done, this creature came out only the faster, and turning with the agility of a cat, made a side swipe at me and left at full speed. His reach was short, hence I am alive and able to write, but the effect was that of the swing of a scythe close to my eyes. When I realized that it was over, I measured the hole and found it a newly dug one, only eight feet deep, with a sharp bend. This explained why the armadillo sought escape in flight. On one of the other occasions I wounded one but could not track it.

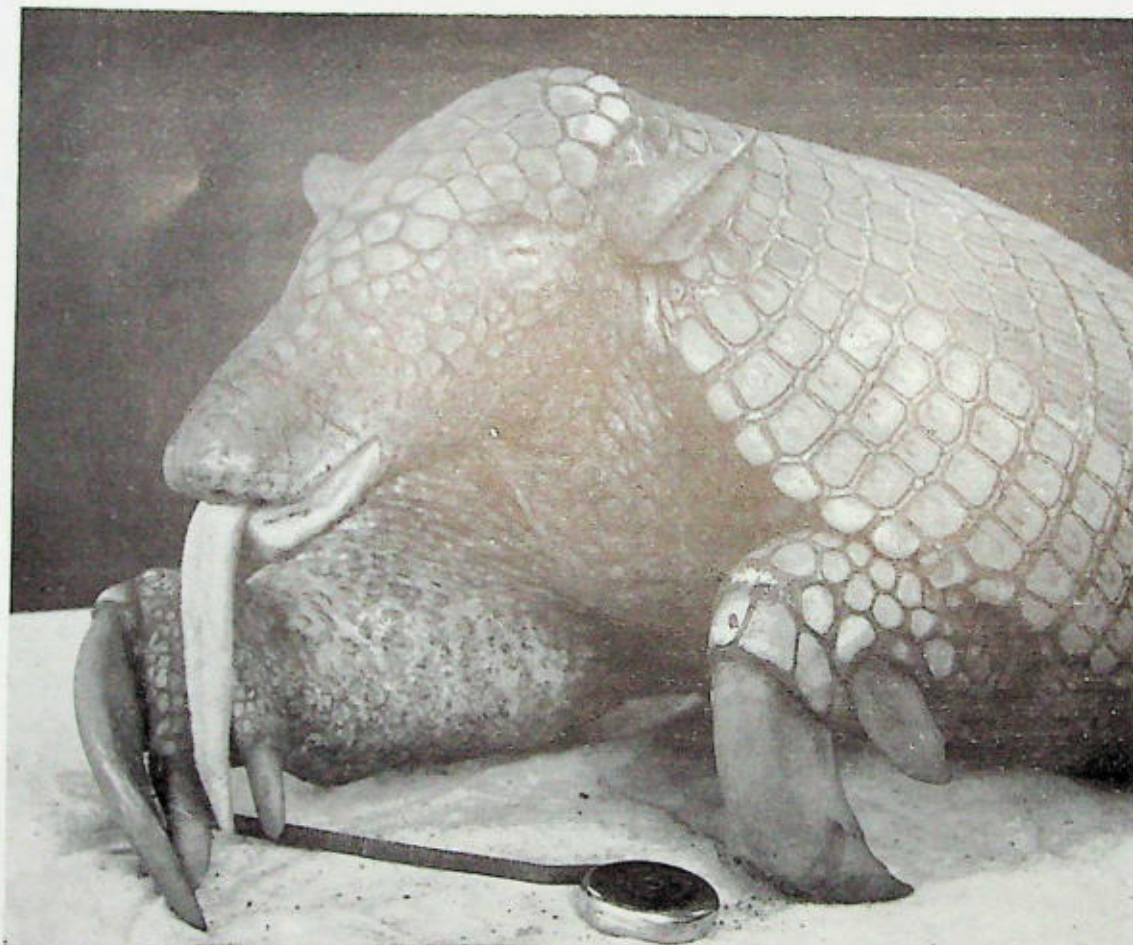
*Tropical Research Station Contribution Number 119.
¹American Natural History—Hornaday—p. 156.



GIANT ARMADILLO

Giant Armadillo (*Priodontes*) weighing seventy pounds, shot at the Tropical Research Station of the Zoological Society.
The white rule is six and one half inches long.

Photograph by John Tee-Van.



HEAD OF GIANT ARMADILLO

Note the long tongue, tremendously powerful middle claws, and very small fifth claw; the great muscles of the forearm, and the mosaic of plates with curious central designs.

Photograph by John Tee-Van.

The armadillo we have secured, although not full grown, measures over four and a half feet in length. The huge middle front claws are just short of five inches and are developed at the expense of the others, which are greatly reduced. Among the mass of data which I gathered from a study of the animal, a few points are of popular interest. Although classed as an Edentate, or toothless one, yet this individual had sixty-eight teeth, a number exceeded, I believe among mammals only by certain whales. His generic name *Priodontes*, or "saw-toothed," is infinitely more appropriate. The tongue extended for five inches beyond the lips, and was covered with an infinite number of minute teeth, each a semi-circle of horn split into three to seven points. The most conservative estimate gave two hundred and fifty thousand to the entire tongue. With an unlimited supply of glut-

nous saliva supplied by two enormous cervical glands, the apparatus for feeding was complete. With its enormously strong claws it tears apart ants' nests, or digs into decayed logs, and laps up the exposed insects. Our armadillo had fed on numerous beetle grubs and hundreds of termites or white ants, and to assimilate this food a digestive system was provided more than thirty-seven feet long.

The mighty carapace is a mass of square plates set, mosaic-like, in about thirty-six rows, of which eleven are movable, permitting extreme flexibility. These plates are of bone with a sheathing of horn, and about as large as one's thumb nail. They remind me of my old ivory netsukes, and in the centre of each is a half-effaced, sculptured symbol, of such variety that one can distinguish faces, figures, letters and strange designs. If this animal were a common

one, it must inevitably have been the centre of many superstitions.

Now that the Giant Armadillo is no longer a mystery, and we have photographed and dissected it, the next thing is to capture one alive. And although out of such fuel as grubs and worms and ants it develops claws like scythes, backed with a full horsepower of force, there is somewhere the armadillo and somehow the method, and this last survivor of the age of mammoth anteaters will, sooner or later, be on exhibition in our Zoological Park.

THE DANCE OF THE BUTTERFLIES*

By JOHN TEE-VAN

Assistant, Tropical Research Station

EMOTIONS are constantly being expressed, both by mankind and by animals, in the rhythmic motions which we call dancing. Usually associated with dancing is a place especially adapted for it,—a cleared space as a dance floor, or an open, sandy beach where sandpipers and plovers tip and teeter. Many different types of dancing grounds have been evolved by animals, ranging from the simple clear spaces upon the western plains where prairie-chickens dance and drum their challenges to rivals, to the elaborate arenas of the argus pheasants with escape trails and carefully tended floors, or the highly decorated playgrounds of the bower birds, richly furnished with feathers and stones and flowers of bright colors.

Far out on the Puruní Trail at Kartabo, I found one of the dancing grounds of the Ithomiid butterflies,—a small, circular amphitheatre, barely two feet in diameter, in the midst of tall underbrush and surrounded by high trees. The twigs of the bushes surrounding the circle came down very low, some of them almost reaching the ground, and forming irregular perches upon which the butterflies were able to sit as they awaited their opportunity of descending to the arena.

These butterflies are common about the Station, and their bizarre patterns of black, yellow and brown are one of the most familiar sights to be seen within the jungle. Some species of the group have strange sleeping habits, great numbers of them gathering upon the branches of a single bush, in response to some butterfly law which will not allow them to stay out alone at night.¹ Finding them with one strange habit, their possession of a dancing ground is not to be found unreasonable.

*Tropical Research Station Contribution, Number 120.
¹Jungle Peace—Beebe—p. 205.

There was nothing to distinguish this chosen portion of the forest which they were using as a dancing ground; no apparent physical reason as to why it should have been selected. The same type of vegetation grew within its borders as grew everywhere else within the forest. Lianas dropped their graceful lengths from the high branches of the jungle trees in the same manner as they did elsewhere; the floor of this favored spot was composed of the ever present black mold beneath a heavy coat of dead leaves.

Yet this tiny portion of the forest was different. For some strange reason it was able to attract these beautifully colored and soft-winged butterflies. To this spot from all the glades of the forest they flew. The paler colored ones flitted in as ghosts might come to a gathering, softly and silently,—drifting in as of wisps of smoke floating in still air, while the brilliant ones came to the group almost afire as the brilliant tips of sunlight scintillated on their colorful wings. All flew slowly, with the gentle waving flight so typical of their group, weaving their way in and out of dark corners, between twigs and around leaves, with their long, narrow wings unsoiled by contact with anything which might damage them. They rarely ascended to the level of one's eyes, preferring the more lowly parts of the jungle to the higher and more brilliantly illuminated portions. Often as five or six approached they would join together in a small, flying circle, about three feet in diameter, changing their position all the time, weaving in and out among themselves, making figure eights and almost impossible geometrical figures. After a short while the circle would fall apart as its component parts took their places about the arena.

A brilliant yellow, brown and black species (*Ceratinia mutilla*) was the most conspicuous and most common type, followed closely by a semi-transparent cousin with the same type of coloration (*Napeogenes cyrianassa adulta*). Fewer in numbers and more difficult to observe was a pale purplish-blue species (*Leucothyris aegle*), which almost disappeared against the dull colors of the jungle floor.

On the twigs and branches near the ground about the dancing ground the butterflies grouped themselves, brought to this spot by some factor utterly unknown. Possibly the lure was the odor disseminated by a female, not yet emerged from the cocoon, an odor far too frail to be grasped by the organs of man, but acting upon these male butterflies, for so they proved to be, as some giant magnet drawing to itself all the particles of iron within the field it in-



ITHOMIID BUTTERFLY NEAR DANCING GROUND

Photograph by John Tee-Van.

fluences. But careful search failed to reveal anything which might give the faintest clue to the cause of the gathering, although the ground for many yards around was sifted and the twigs and branches searched for many feet.

Near the center of the arena a single butterfly would take its stand. Its wings waved slowly up and down two or three times, accompanied by a rapid raising and lowering of the antennae, each antenna often acting independently, and in unusual positions. At the same time the insect hopped sideways in such a manner that the hind feet were used as pivots, and changing its position from an eighth to a sixth of the distance around a circle from the position it originally occupied. The butterfly never left the one spot, but circled on one tiny point, standing high on the tips of its legs, and with abdomen raised almost straight into the air, wholly unlike the usual horizontal position occupied by this portion of their body. This performance in all its details was repeated over and over, the insect at times making a complete circle, at other times flying up to a twig before it had completed the entire round.

Sometimes the next performer would be ready, or the stage deserted for a few minutes. Then another would slowly drift down from the twigs surrounding the dancing ground, and the dance go on, to be continued by others after the performer had finished.

The fifty or sixty individuals of this apparently friendly gathering were not entirely congenial. Many times a flying butterfly trying to alight near another was rebuffed by a waving of wings and antennae coupled with a short jump, plainly indicating to the intruder that his company was not desired.

Hour after hour the dance continued, one individual after another impelled by some strange butterfly instinct. Late in the afternoon their numbers gradually lessened. A few leaves on the topmost branches of a nearby tree rustled with the first breath of an approaching breeze. Two minutes later a clap of thunder announced the arrival of a great electric storm, and with the first cool breath, every insect had disappeared, leaving the mystery of the dance as completely hidden as it was in the beginning.



JUNGLE TRAIL BACK OF KARTABO RESEARCH STATION
Photograph by John Tee-Van.

ONE HOUR OF JUNGLE LIFE*

By WILLIAM BEENE

THE dearth of life and the silence in the tropical jungle is emphasized and reiterated in book after book of travel, and as long as the observer is actually travelling, he will indeed see little more than the few frightened creatures which rush from his path. When he is content to cease from being a traveller, and become a stander, or sitter or squatter, the wealth of tropical life begins to be apparent. Even the patient digger or grubber will reap a rich harvest, as when once I searched and found a thousand living beings in a square yard of jungle floor.¹

Movement, not conspicuous clothing or human form, is the disturbing factor which drives a host of creatures into hiding just before the eyes can detect them, and makes a walk through a primeval forest often a disappointing experience. This can be mitigated by slow movements and intensive observation, and the following is the record of a mile walk west from the Tropical Research Station at Kartabo, back along the Puruni Trail, from 7:30 to 8:30 in the morning of March 26 of the present year. There was no wind; the first fifteen minutes were cloudy, while the sun shown brightly the remainder of the time.

I went slowly, making notes as I walked, and covered the mile in forty-five minutes. The last quarter of an hour I spent motionless in one spot near a deep gully. Writing as rapidly as possible, with only an occasional glance at my notebook, I recorded every hint of living organism seen or heard, five hundred and thirty-six in all, and made a brief written or mental note about each observation. To this list I have added an occasional identification term to clarify my brief written word. It forms, I think, a satisfactory answer to statements of the paucity of jungle life. Our ecological work at the Station will ultimately show, as never before, the enormous population of a quarter of a square mile of tropical rain forest.

LIST OF ORGANISMS OBSERVED IN FORTY-FIVE MINUTES
ALONG A MILE OF TROPICAL JUNGLE TRAIL

BRAIN-FEVER COTINGA (*Attila*); heard the note of this beautiful bird as I left the Laboratory clearing at 7:30 A.M.
KISKADEE TYRANT FLYCATCHER (*Pitangus*) seen and heard.
CHESTNUT-BREADED SEED-EATER (*Sporophila*) in full song.
SPINE-TAILED SWIFTS (*Chaetura*), three flying over.
SMALL RED BEETLE.

*Tropical Research Station, Contribution Number 121.

¹Zoological Society Bulletin, Vol. XIX, No. 1 and Zoologica II, No. 4, 1916, p. 107.

GIANT BLACK ORIOLES (*Ostinops*) three seen and heard, one giving courtship performance.
CICADA heard south.
DUSKY NIGHTHAWK (*Caprimulgus*) flying up from trail; a true jungle bird, often perching on high limbs of trees.
RED-BACKED CACIQUES (*Cacicus*), two flying toward their nesting trees up the Mazatuni.
GREEN TROGON (*Trogon striplatus*) heard giving its breeding note.
BLACK CUCKOO (*Crotophaga*) heard, wheeep! wheeep!
SMALL GREEN CATERPILLAR.
GREEN, LONG-LEGGED FLY (*Dolichopodidae*) walking swiftly about on leaf.
SMALL, BLACK, ICHNEUMON-FLY searching for spiders.
GREEN TREE SNAKE (*Oxybelis*) moving slowly through branches.
LARGE, BROWN CRICKET (*Eucrotophaga*) chirping with its vibrating wings.
GREEN MEMBRACIDS, eight of these attended by ants on a weed stem.
SMALL BROWN ANTS, three running on ground.
GREEN DWARF WOODPECKER (*Picumnus undulatus*) hammering at an insect's cocoon in a rolled-up leaf.
SMALL BROWN ROBBER FLY (*Asilidae*) eating prey on leaf.
BLACKISH BIRDS, two, unidentified, flying through jungle.
SILVER-BEAKED TANAGERS (*Ramphocelus*) two in tree tops.
YELLOW-LINED GRASSHOPPER, a clearing species, rather out of place in the forest.
WAX-COVERED COCCIIDS, a group attended by ants.
LARGE BLUE HUNTING WASP (*Pompilid*) half flying, half walking over leaves.
ANTBIRDS (*Formicariidae*), three, unidentified, in dense foliage.
SMALL METALLIC FLY (*Pelucella*) on leaf.
LAND CRAB (*Cardisoma*) scuttling into underbrush.
METALLIC FLIES, three more.
GIANT GREEN GRASSHOPPER (*Acrididae*) crawling up tree trunk.
JUNGLE PIGEONS (*Leptoptila rufaxilla*), two males calling loudly from neighboring trees.
RED ANTS, four on guard with jaws raised, on leaf.
SMALL BROWN CRICKET.
RUFIOUS HERMIT HUMMINGBIRD (*Phaethornis ruber*) flying across trail.
SMALL BROWN WEEVIL.
WHITE-SPOTTED MEMBRACIDS, three in a row along stem.
CATERPILLAR of black papilio butterfly (*Papilio*).
CICADA calling, different species from other heard seven minutes before.
GUIANA MOTMOTS (*Momotus momota*), three perching in betty tree, swinging their tails from side to side.
SMALL BROWN GRASSHOPPERS, two on leaves.
LARGE GREEN KATYDID on under side of leaf.
SMALL WHITE-SPOTTED BEETLE (*Chrysomelidae*) on leaf.
TURQUOISE-WINGED WEEVIL.
GREEN-AND-BLACK CHALCID WASP, very small, searching under leaves.
BLACK-FACED FROGS (*Leptodactylus mystacinus*) two in a small pit.
GREEN GROUND LIZARD (*Ameiva*), large male in pit.
CAYENNE HERMIT HUMMINGBIRD (*Phaethornis superciliosus*) squaking among some flowers in a tree-top.
ROBBER FLIES (*Asilidae*) two large, hairy individuals, mating.
OBLIQUE-STRIPED JUNGLE LIZARD (*Anolis*) scurrying over leaves.
MEDIUM METALLIC BEE (*Euglossa*) hovering close to ground.
CARRION FLIES, twenty-four, of five species, around dead frog.
LAND MINNOWS (*Rivulus stagnatus*) two of these land-traveling fish in a pit dug for trapping frogs.
WOOD ROACH (*Blattidae*) small brown roach on dead leaf.
SULPHUR-AND-WHITE-BREADED TOUCAN (*Ramphastos vitellinus*), calling to the north.
SMALL BROWN CATERPILLARS grouped together on leaf.
WOODPECKER, unidentified, hammering to the south.
SMALL GNATS, a large cloud hovering overhead.
QUADRILLE BIRD (*Leucoclepis musica*) gave its wonderful call close to the trail three times, wholly different each time. Did not see it.
GREEN STICK GRASSHOPPER (*Trysalid*) resting in center of leaf.
GIANT BLACK SOLITARY ANT (*Dinoponera*) walking up tree.
RUFIOUS HERMIT HUMMINGBIRD flying about my face.
YELLOW-WINGED DEER FLY (*Tabanidae*) alighting on my hand.
COMMON ITHOMID BUTTERFLY (*Melipotis*) fluttering slowly along.
CRACKLING MANAKINS (*Manacus manacus*), a pair flying across trail.
SMALL ARMY ANTS, a file passing rapidly over leaves and ground.
BIRD-WINGED MORPHO BUTTERFLY (*Morpho menelaus*) zig-zagging rapidly past me up the trail.
ROBBER FLY with a small wasp in its jaws.
HUMP-BACKED FLIES (*Hylemyzidae*) resting on leaves.
BROWN ANT on leaf.
GREEN SPIDER under leaf.
ICHNEUMON-FLY with white antennae flying slowly.
SMALL WHITE-SPOTTED CATERPILLAR on leaf.

- GIANT SOLITARY ANTS, three on stem.
 LARGE BROWN SPIDER in web.
 ICHNEUMON-FLY with yellow, black-spotted wings.
 GIANT LINEATED WOODPECKER (*Coccyphus lineatus*) flying over in the direction of the bird which had been hammering.
 RED HOWLING MONKEYS (*Alouatta*) heard to the southward.
 JUNGLE PIGEONS heard in a new direction.
 GREEN SPIDER devouring green fly.
 SMALL BROWN ANTS, six on one leaf.
 LARGE CHESTNUT BEE (*Xylocopa*) half buried in a yellow allamanda blossom.
 MINUTE GNAT flying close to my eye.
 SPOT-WINGED ANTREKPER (*Sceleria leucostigma*) two in vine near trail.
 CARRION FLIES AND ANTS on bird dropping.
 SMALL GREEN CATERPILLAR looping along edge of leaf.
 YELLOW-HEADED VULTURE (*Cathartes arabitanga*) swooping low, close over the trees.
 BROWN COCCIDS, many on a branch, attended by ants.
 SMALL GREEN BUPRESTID BEETLE.
 RED-THROATED CARACARA (*Ibycter americanus*) calling with loud raucous screams upon discovering me.
 CINEREOUS ANTBIRD (*Thamnomanus glaucus*) calling just out of sight in the jungle, also annoyed by my presence.
 QUADRILLE BIRD, a second individual appearing for a moment.
 ITHOMIID BUTTERFLIES, two alighting on leaves.
 GREEN WOOD ROACH (*Panchloridae*) on green leaf.
 BROWN SILK COCOON with chrysalis moving about inside.
 SPIDERS, two fighting on small web.
 LARGE ANTBIRD, unidentified, flying swiftly across trail.
 CALLISTES, CHLOROPHANES AND BRIGHT COLORED TANAGERS, eight in tall trees.
 LARGE RED ANT on ground.
 SMALL BLACK AND WHITE BUTTERFLY (*Erycinid*) under leaf.
 SMALL BLACK FLIES, three waving their wings and whirling about on leaf.
 LONG-HORNED GRASSHOPPER mimicking daddy-long-legs (capture!).
 BLACK CHALCID WASP attacking pink caterpillar.
 GUIANA WOOD NYMPH HUMMINGBIRD (*Thalurania*) following me for some distance.
 SHORT-TAILED SWIFT (*Chaetura*) flying over.
 MINUTE GNATS, three on a small flower.
 AZTECA ANTS around suspended nest.
 METALLIC JUMPING SPIDER with fly on leaf.
 TERMITES OF WHITE ANTS making tunnel near their nest on tree.
 BLACK-FRONTED ANTBIRD (*Myrmodera ferruginea*) giving its teacher-teacher call near the trail.
 WHITE-HEADED TAYRA (*Tayra barbara*) one of these giant weasels rushing down out of a tree and off through the underbrush with a great riot of noise.
 MINUTE, RED-SPOTTED SPIDER hanging from strand of silk.
 HUMP-BACKED FLIES (*Hylomyzidae*), two on leaf mating.
 MOTTLIED SPIDER ON HUGE WEB (*Argiope*), with two blossoms, but no living prey entangled.
 GREEN-WINGED MACAWS (*Ara chloroptera*), calling to the north, and later appearing, flying high overhead.
 BROWN LOOP WORM with front part of body sticking out from stem like a dead twig.
 GREY JUMPING SPIDERS (*Attidae*) motionless on plant.
 RED ANT on ground.
 HUMP-BACKED FLY.
 TINY WHITE MOTH flying close to ground.
 LARGE GREY ROBBER FLY resting on twig.
 LARGE SPECIES HUMP-BACKED FLIES, three on one leaf.
 TURQUOISE-BACKED WEEVIL under leaf.
 MEALY AMAZON PARROTS (*Amazona farinosa*) two flying from tree with loud screams.
 PYGMY ANTBIRD (*Myrmotherula pygmaea*) heard.
 WOODPECKER hammering loudly ahead.
 SMALL REDDISH MOTH on leaf.
 SMALL HUMP-BACKED FLY on leaf.
 OLIVE-BACKED OVENBIRD (*Automolus infuscatus*) two feeding on small tree.
 WOODPECKERS, two small ones, too high for identification.
 WHITE-BREADED ANTWRN (*Rhamphocelus albiventeris*) one seen and others heard; this one hanging upside down picking at a leaf.
 SPOT-WINGED ANTBIRD seen near trail.
 ANTBIRDS, two, unidentified, with the Spot-wing.
 SMALL PARROTS, probably *Urochroa*, flying overhead.
 RED HOWLING MONKEYS, a second band heard far to the west.
 GREEN MANTIS gesticulating on leaf.
 BROWN ROBBER FLY with unidentified prey.
 BROWN, YELLOW-LINED GRASSHOPPER, a tree-top species, on leaf.
 MACAWS heard (probably the same birds).
 MEMBRACIDS shaped like small nuts, eight attended by four ants.
 COCCIDS attended by minute black ants.
 MEMBRACID with pillar-shaped thorax (collected).
 SMALL HUMP-BACKED FLY.
 HIGH-ARCHED MEMBRACID on same plant, attended by ant.
- PURPLE-BREADED COTINGA (*Cotinga cotinga*) heard in distance.
 SMALL INCH-WORM on my sleeve.
 SMALL BROWN WOOD-ROACHES, two running along trail.
 CROWD OF TERMITES rushing out of their nest accidentally broken open.
 METALLIC CARRION FLY on leaf.
 LACE-WINGED FLY (*Chrysopidae*) resting under leaf.
 METALLIC COPPERY SCARAB BEETLE resting on leaf.
 DANCING-WING FLIES (*Trypetidae*), gyrating on a leaf.
 DUMB-BELL-SHAPED, LONG-LEGGED FLIES flying and on leaf, one elaborately courting the other.
 SMALL METALLIC GREEN FLY (*Volucella*) on flower.
 MAGGOTS (*Diptera*) thirty or more around a bit of carrion.
 SMALL BLACK AND WHITE BUTTERFLIES (*Pierids*, although an exact copy of *Heliconids*-genus *Dismorphia*).
 SMALL BROWN DRAGONFLY on tip of leaf.
 SMALL BIRDS, two in tree, not identified.
 YELLOW-BELLIED CALLISTE TANAGERS (*Tangara mexicana*) three in tree.
 LARGE HUMP-BACKED FLY.
 YELLOW-WINGED DEER FLY buzzing about my face.
 GREEN SPIDER on green leaf.
 SMALL METALLIC FLY.
 SMALL BROWN GRASSHOPPER.
 HAIRY BLACK ROBBER FLY.
 TERMITES, small colony of these with snapping jaws.
 MISCID FLY on leaf.
 DARK SADDLE MEMBRACIDS with four ant attendants.
 GOLDEN METALLIC BEE.
 FOUR BLACK TRIGONID BEES.
 TWO ITHOMIID BUTTERFLIES.
 WHITE FLOWER-LIKE SPIDER.
 TWO VOLUCELLA FLIES.
 SLENDER BLACK ANT.
 DOLICHOPODID FLY.
 All on three small blossoms.
 SULPHUR-AND-WHITE-BREADED TOUCANS, a pair calling.
 GUIANA MOTMOTS calling in their muffled tones ahead.
 SMALL COPPER BEETLE dropping to the earth at a touch.
 MINUTE WHITE MOTH.
 BROWN, LONG-LEGGED CTENID SPIDER.
 WHITE-ANTENNAED, BRACONID WASP.
 SMALL BROWN ANTS, three carrying a bit of food.
 WHITE-CROWNED MANAKIN (*Pipra leucocilla*), a male flew past.
 YELLOW AND BLACK CERCOPIID BUG (*Tomasia ruber*).
 MINUTE METALLIC FLY.
 BROWN AND RED CATERPILLAR.
 RED-RIMMED BLACK HEMIPTERON on leaf.
 GIANT-BLUE TARANTULA-KILLING WASP.
 THREE WHITE CROWNED MANAKINS, two males and a female.
 DUSKY PARROTS (*Pionus fuscus*), three calling from tree overhead.
 WOODPECKERS hammering, one west, a second south.
 WHITE-THROATED THRUSH (*Turdus phaeopygus*), parent and nestling hardly able to fly, pursued them but could not capture the young one.
 LARGE RHINOCEROS BEETLE flying past.
 MACAWS heard, perhaps the same pair seen earlier.
 BLACK-THROATED TROGON (*Trogonurus curucui*) heard and seen.
 YELLOW-THROATED CARACARA (*Ibycter ater*), flying out of low tree screaming loudly.
 YELLOW-HEADED VULTURES, two soaring past.
 SMALL SWIFT, unidentified.
 SMALL GOLD-FRONTED HUMMINGBIRD unidentified.
 LARGE JUNGLE DAMSEL-FLY (*Mecistopaster*) fluttering slowly over the trail.
 SMALL HUMP-BACKED FLIES, two on leaves.
 METALLIC JUMPING SPIDER with small insect.
 SADDLE MEMBRACIDS, eight adults and young, attended by three ants.
 FURRY BLACK CATERPILLAR eating leaf.
 SMALL ROBBER FLIES, two mating.
 TINY RED CATERPILLAR under rolled leaf.
 WALKING STICK INSECT (*Phasmod*) hanging by four legs from a leaf, the front pair stretched out along the antennae.
 AGOUTI (*Dasyprocta aguti flavescens*) rushing away from a wild plum tree, grunting loudly.
 SMALL WHITE PIERID BUTTERFLY on flower.
 RED HOWLING MONKEYS heard, probably the same as the last band.
 CLOUD OF GNATS in mid air.
 WHITE-FRONTED ANTBIRDS (*Pithys albifrons*) three chirping close to trail, all seen.
 ANTBIRD, another species seen only for a moment.
 ARMY ANTS (*Eciton burckellii*), a small fan of these ants, accounting for the presence of the antbirds.
 THREE WOOD-ROACHES scurried out from among dead leaves.
 TWO DADDY-LONG-LEGS hiding among the same leaves.
 LARGE BROWN MILLPEDE (*Polydesmid*) crawling on ground.
 SMALL FLIES, six hovering over a dead spider.
 TWO MORE WOOD ROACHES.
 HARLEQUIN JUNGLE CRICKET (*Rhipipteryx*) flew ahead of me.



BLUE-EYED COCKATOO (*Kakatoe ophthalmica*)

The specimen of this rare species brought to us in July, 1922, by Mr. Ellis S. Joseph, is the first to be included in our collection. It is closely related to the Great White and the Red-crested Cockatoos and comes from the island of New Britain, in the Bismarck Archipelago.

Photograph by Elwin R. Sanborn.

WHITE-FRONTED ANTHRID, a fourth individual.
 WEDGE-BILLED WOODPECKER (*Glyphorhynchus cuneatus*)
 creeping up trunk of tree.
 YELLOW CHALCID WASP resting on leaf.
 ANTHRID, flock of about a dozen in tall tree, unidentified.
 AMEIVA LIZARD, rushing into hole as I approached.
 LONG-LEGGED DOLICHOPODID FLY on leaf.
 GIANT METALLIC BLUE BEE flying past.
 TRYXALID GRASSHOPPER motionless on leaf.
 AZTECA ANTS in nest suspended over trail.

Reached Gully at 8:15 and observed the following Organisms within Fifteen Minutes:

RED-FRONTED WOODPECKER (*Tripsurus rubrifrons*) seen and heard hammering almost overhead.
 OLIVE-BACKED OVENBIRD (*Automolus*) seen picking up food from bottom of gully.
 AMAZON PARROTS calling, not seen.
 MOUSE-COLORED BUSHBIRD (*Hypolophus murinus*) calling.
 SMALL ICHNEUMON FLY alighting on my hand.
 TWO MUSCID FLIES hovering over flower.
 MINUTE GREY MOTH flying near by.
 BROWN CRICKET calling a few feet away.
 PALM TANAGERS (*Thraupis palmarum*) heard and seen in tree.
 GUIANA SQUIRREL (*Guerlinguetus aestuans*) scolding me a minute or more from the center of a bush across the gully.
 RED HOWLING MONKEYS making a great uproar to the north, probably a new band.
 TWO SMALL FLIES in mid air.
 MINUTE GNAT flying about my eyes.
 MACAWS again, probably the same pair.
 REDDISH ROBBIE FLY resting on leaf.
 RING-TAILED MONKEYS (*Cebus apella apella*) swinging by within fifty feet, passing close to the ground.
 LARGE ANT with the tip of the abdomen jet black.
 TRYPETID DANCING-WING FLY.
 LONG-TAILED HUMMINGBIRD, probably *Phaethornis*, flying swiftly.
 MINUTE YELLOW ANTS, twenty in small flower.
 DEER FLY buzzing close to my face.
 SMALL YELLOW CATERPILLAR under nearest leaf.
 SMALL ITOMIID BUTTERFLY flying slowly past.
 VARIEGATED TINAMOU (*Crypturus variegatus*) calling to the south.
 PAPILIC BUTTERFLY alighting near by and walking over leaf.
 8:30 A. M.

SUMMARY OF ORGANISMS OBSERVED

Within an hour's time I made two hundred and forty-six observations and recorded five hundred and thirty-six living creatures. This included all five phyla of vertebrates, of which one hundred and twenty-eight individuals were birds. The details of this summary are as follows:

	Observations	Individuals
Mammals	8	12
Birds	71	128
Reptiles	4	4
Amphibians	1	2
Fishes	1	2
Insects:		
Lepidoptera, Imagos	13	16
Lepidoptera, Caterpillars.	11	11
Hymenoptera	39	95+
Diptera	47	139+
Orthoptera	20	25
Hemiptera	13	43
Coleoptera	9	9
Odonata	2	2
Isoptera	3	30+
Spiders	11	13
Phalangida	1	3
Millipedes	1	1
Crabs	1	1
	246	536

RESEARCH STATION NOTES

At the present moment, there are in the compound of the Research Station eight living Hoatzins, just brought from Berbice by Gilbert Broking, a member of the Station staff. They are awaiting the earliest possible moment for shipping to the Zoological Park.

The live stock at present in cages or on chains about the bungalow under the charge of Miss Rose, includes a sloth, a great anteater seven feet long, a twelve-foot boa constrictor, a ring-tailed monkey, squirrel monkey, iguanas, turtles, opossums, tanagers, jungle rats, electric eels, land crabs, crocodile, Devonian catfish, burrowing legless lizards, and numerous lesser forms such as frogs, lizards, fish and large insects.

* * *

As a sequel to the article in the May BULLETIN concerning Little Tobago and the birds of paradise established there, news has come of its purchase for ten thousand dollars by Mr. A. Luban of Newark, New Jersey. It is reported that he is attempting to trap and cage some of the birds, with the idea of breeding them in Florida for commercial purposes.

ITEMS OF INTEREST

Birds

By L. S. CRANDALL

New Penguins.—Of all the strange birds in the world, none makes a stronger appeal to the popular imagination than the penguin. Its grotesquely human appearance, its upright attitude on land and its dignified walk, instantly arouse a flood of comparisons. No bird is less bird-like than the penguin and it is not strange that tired parents often are heard to assure their off-spring that the occupants of the penguins' pool are young seals.

Just before the war, five specimens of the black-footed penguin (*Spheniscus demersus*), of South America, came to the Zoological Park. Seldom have we been so fortunate as with these birds. Accepting the then vacant walrus pool as their native land, they divided themselves into pairs and settled down to housekeeping. Many eggs were laid, several young were hatched and one was fully reared. Gradually, however, the flock dwindled, and in June, 1920, after six years of yeoman service, the last of the penguins succumbed to an attack of ptomaine poisoning.

No shipments of penguins reached America between 1914 and 1922, in spite of our efforts to secure them. In 1920, the Zoological Society

BLACK-NECKED SWAN (*Cygnus melanocoryphus*)

This is the only true swan found in South America. Its sharply contrasted coloration and graceful bearing place it among the most beautiful of this group. The black-necked swan is a delicate bird in captivity, though it breeds freely in some European collections.

Photograph by Elwin R. Sanborn.

of London presented us with a bird from its collection, but unfortunately it died at sea. In May, 1922, a pair was offered to us by a London dealer and on June 4th, arrived here in perfect condition, under the solicitous care of a horse-foreman. We were told that while the birds must be fed by hand, they did so readily and that we need have no fears. We soon learned, however, that as with most newly imported penguins, "feeding by hand" meant grasping the bird's neck firmly with the left and urging a large herring down its gullet with the right. This is no pleasant task, for no bird's bill can inflict a more painful wound than the razor-edged mandibles of a penguin. After two or three days of this heroic treatment, we found the birds showing more interest in their food, and soon they were seizing herring from their keeper's hand and bolting it in regulation fashion.

Birds of Paradise.—On November 13, 1910, three male greater birds of paradise arrived at the Zoological Park, and one of our fondest dreams was realized. We had always hoped that at some time, far distant in the future, we might have a bird of paradise, for the pleasure and edification of our visitors. To have three of these magnificent creatures at one time was an unexpected boon and our joy in them was

great. Since that day, now nearly twelve years ago, birds of paradise have become a regular and accepted part of our collection. Head Keeper Stacey and his assistants have mastered the details of their requirements and we now find them hardly more difficult subjects than the nearly-related crows and jays. That these splendid birds, shy inhabitants of wild and little known East Indian islands, can be exhibited in open cages and caused to live out their natural span of life, happy and contented, before the eyes of many thousands of visitors, is one of the marvels of modern aviculture. During the past ten years, we have had ten species of birds of paradise and six are living in the collection at present. These are Prince Rudolph's blue bird of paradise, the lesser, the six-plumed, Count Raggi's, the magnificent rifle-bird and the green manucode. Our beautiful male Count Raggi's bird of paradise will have passed the five-year mark with us in July and though he must be of advanced age, he gives no evidence of approaching senility. Our blue bird of paradise, probably the first adult male of his species to be exhibited alive, displayed constantly during the past winter, continuing into May. He is now engaged in a thorough and bedraggling molt and is being carefully nursed through this dangerous period in the life of every male bird of paradise.

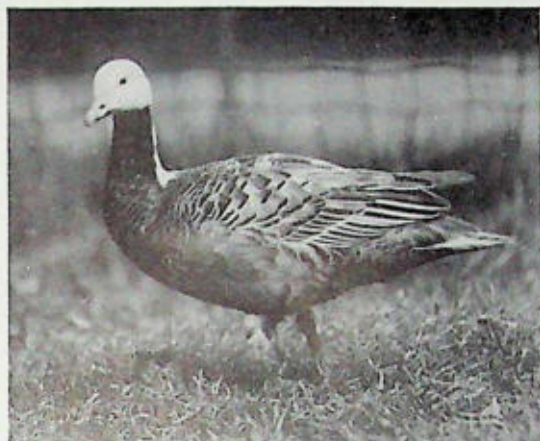


INDIAN BLACK-BACKED GOOSE
(*Sarcidornis melanotos*)

This bird is commonly known as "comb duck," because of the fleshy comb which ornaments the head of the male. This comb becomes greatly enlarged during the breeding season, and shrinks when that period has passed.

Photograph by Elwin R. Sanborn

The Zoological Park is rich in rare and beautiful birds, and it is difficult to select outstanding individuals for special notice but visitors should make a point of seeing the splendid male argus pheasant, at the Pheasants' Aviary. This bird was purchased in 1918 and if he continues to thrive until next October, he will have com-

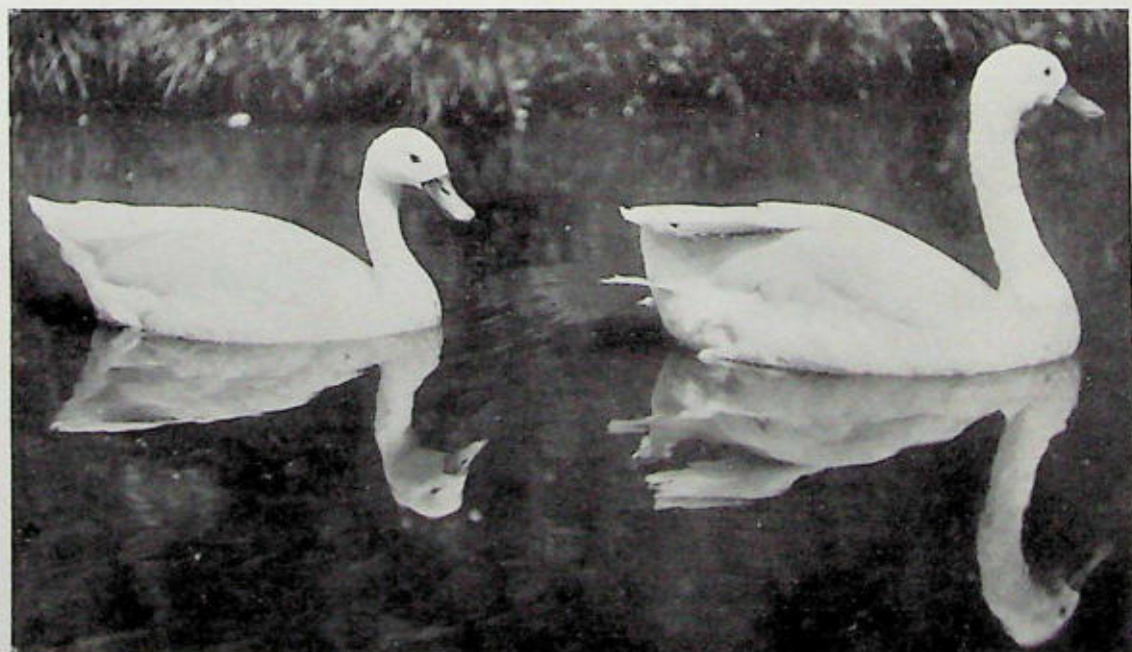


EMPEROR GOOSE (*Philaete canagica*)

This is the rarest of North American geese. It breeds in Alaska and winters in the Aleutians, sometimes coming down to British Columbia and even to California. This specimen, the first to be included in our collection, came to us by way of Holland.

Photograph by Elwin R. Sanborn

pleted a period of four years in the Zoological Park. When first offered to us, he had just been landed after a voyage from India via the Cape of Good Hope, and this fact, coupled with a reputation for delicacy in captivity, occasioned some hesitation before we finally decided to make the purchase.



COSCOROBA GOOSE (*Coscoroba coscoroba*)

Strongly resembling the swans, this bird is strangely anomalous in character, and is variously known as swan, goose and even duck. It is usually very delicate in captivity but this pair is remarkably robust.

Photograph by Elwin R. Sanborn.



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POCKET OF FYKE	LOBSTER POTS
SAND SHARK AND PASSENGER	SHEEPSHEAD MINNOWS
DOG FISH WITH SHARK-SUCKER	

JEW FISH Photograph by Elwin R. Sanborn Cover

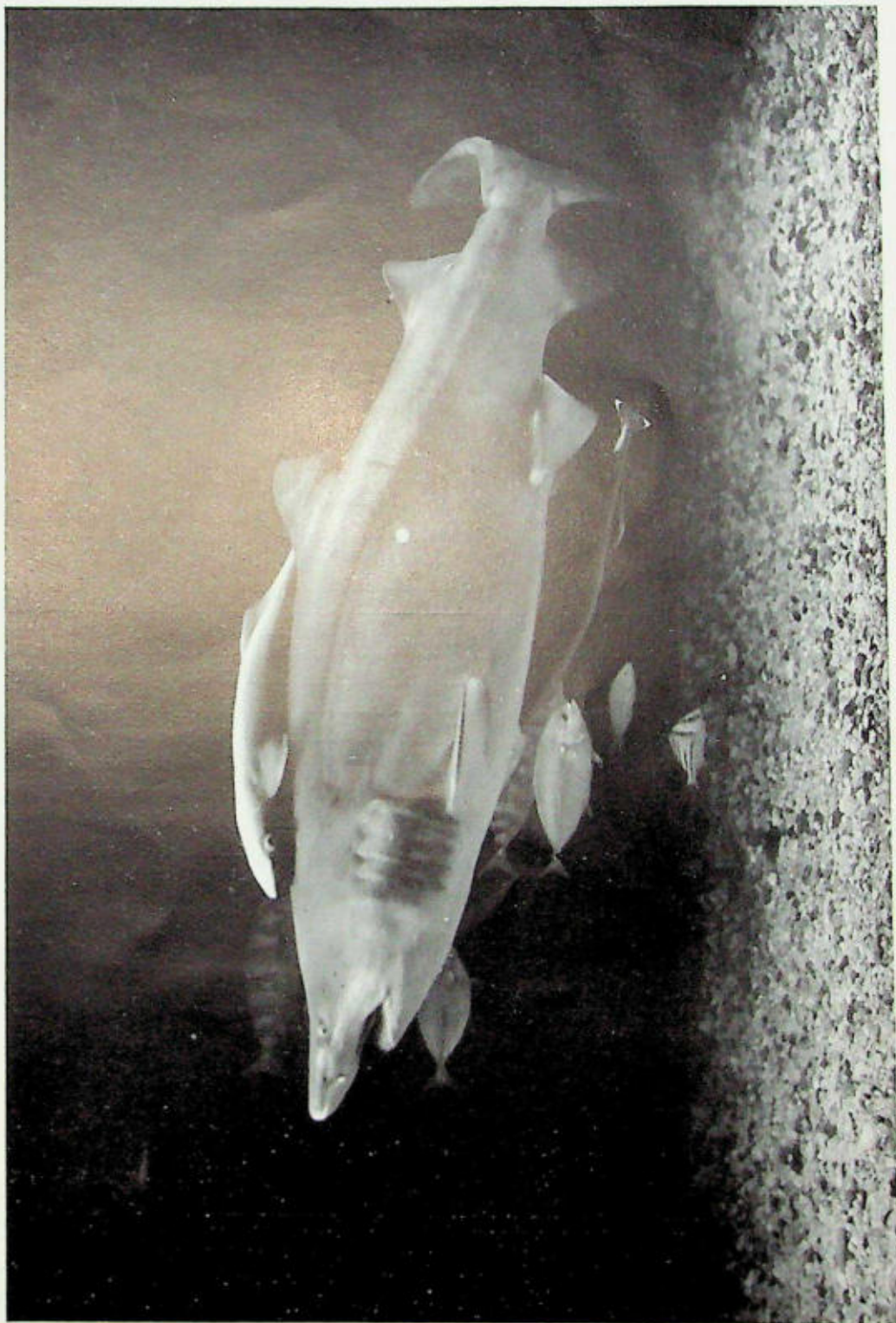
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SAND SHARK CARRYING TWO SHARK-SUCKERS

An unusual picture of this interesting exhibit. The one on top was obliged to turn over to make a contact with its disc.
Photograph by Elwin R. Sanborn

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A PRIVATE BIRD SANCTUARY

THERE is a group of small islands in Lake Champlain known as the Four Brothers, which marks the most southerly breeding place of the herring gull (*Larus argentatus*). The existence of this outpost is due to the fact that Mr. Edward Hatch, Jr., of New York, has afforded the gulls complete protection for he has maintained a guard on the islands from the beginning to the end of each nesting season.

The Four Brothers Islands lie about two miles off Willsboro Point, New York. Their total area is about a dozen acres. While the islands are well wooded, there are open spaces about the rocky shores where the gulls find plenty of room for their nests.

The presence of gulls on Lake Champlain during the summer months is due entirely to the full protection so long afforded them on these islands.

The writer accompanied Mr. Madison Grant, Chairman of the Zoological Society, on a visit to the Four Brothers on August 24. While crossing the lake by steamer from Burlington,

Vermont, to Willsboro, it was charming to see the long breakwater at Burlington, white with the forms of gulls. At the Four Brothers there were many gulls on the beaches although the nesting season was over. Eggs are laid, usually three to a nest, during the month of May, and are twenty-six days in hatching. One of the duties of the guardian is to make a census of the nests. The number of young gulls reared at the Four Brothers each summer is between five hundred and one thousand, a substantial contribution to the bird life of our shores.

The herring gull is the most abundant of the gulls wintering about Long Island, and around New York Bay. Gulls are useful scavengers and are among the species protected by law. Being large, conspicuous, attractive in flight, and, where unmolested, confiding, they have an esthetic value not to be overlooked.

The method employed by Mr. Hatch in securing protection for the birds each summer, is to advertise for a man willing to live alone on the islands, without work, aside from protecting



ONE OF THE FOUR BROTHERS ISLANDS
As viewed from another of the group.



A NESTING SITE

A rocky headland on one of the islands favored by the gulls for nesting.

Photograph by C. H. Townsend

the gulls, and without compensation. Food and shelter are furnished. No warden is allowed to serve a second time. Mr. Hatch's object in advertising is to secure the exceptional man who, for some reason known to himself, wants the job regardless of compensation. In this way he secures the kind of service he desires. The applicant may be seeking rest, retirement, or opportunity for study. It is no uncommon thing for him to receive a thousand or more applications.

C. H. T.

THE HARDY ROCK BASS

AMONG the native fresh-water fishes living in the Aquarium, there are few that adapt themselves more readily to the conditions of captivity than the rock bass (*Ambloplites rupestris*). In a tank now containing fifteen specimens mostly of large size, there have been no losses for three years.

The natural range of this fish includes the Mississippi valley, the Great Lakes and Lake Champlain drainages, but it has been introduced through fish cultural operations into many states east of the Alleghanies.

The adaptability of the rock bass to pond cultivation will ultimately extend its distribution. The methods of the expert angler are

not at all necessary for its capture. Great numbers are taken by amateur fishers wherever it abounds and during the greater part of the year.

In its feeding habits the rock bass is about as omnivorous as any member of the bass-sunfish family to which it belongs. Crayfishes and other fresh-water crustaceans, aquatic insects and their larvae, snails and such fishes as its rather large mouth will admit, all contribute to its natural food supply. If we include the grasshoppers, crickets, grubs, earthworms and other terrestrial baits used in catching it, the food list might be considerably extended. Fish culturists have found that it cannibalizes to some extent on its own young.

In addition to the baits already mentioned, the trolling spoon and other artificial lures are used successfully, but it has little of the fighting qualities of the black basses, soon yielding to the pull of the line.

The rock bass is a thick-bodied, meaty fish, and a couple of fair sized ones will fill the pan. There are specimens in the Aquarium a foot long that have nearly trebled in size since their arrival ten years ago. It is known, however, to grow somewhat larger.

At spawning time late in May, the rock bass



BROODING HERRING GULL

Between 500 and 1000 gulls are reared each year.



A ROCKY HEADLAND

The gulls frequent these treeless areas during the breeding season.

Photograph by C. H. Townsend



ROCK BASS AT THE AQUARIUM

Photograph by Elwin R. Sanborn

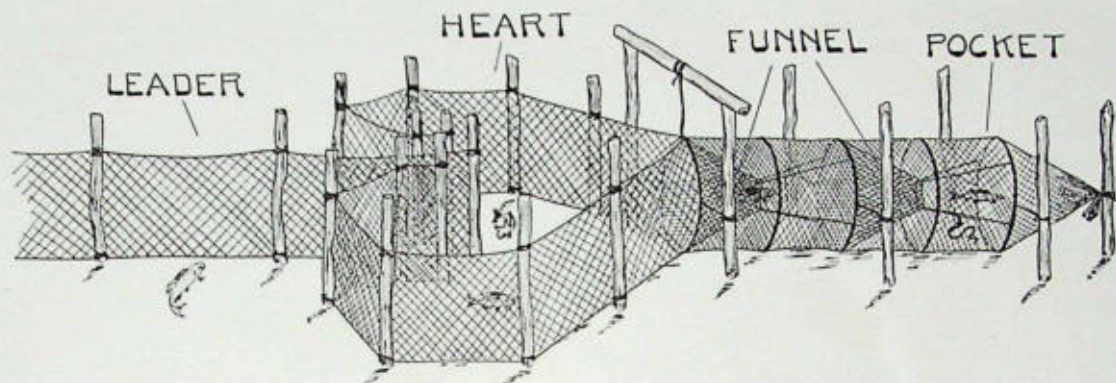
makes its nest in shallow water along shore, like basses and sunfishes generally. The fishes are sociable at this time and nests are often found in groups close together. C. H. T.

RECENT ACTIVITIES OF THE WELL-BOAT SEAHORSE

By C. M. BREDER, JR.

THE first trip this year, was taken for the purpose of distribution, rather than for that of collection; that is the initial voyage was made to Palisades Interstate Park, with a cargo of fry and fingerlings to be planted in its waters. The shipment included over 3,000 rainbow trout, 7,000 lake trout and 2,000 chinook salmon. The first and second mentioned species seem to have a fair chance of survival and it is to be hoped that they or their progeny will afford objectives for anglers in the future. The chinook salmon planting was, however, more in the nature of an experiment as these Pacific Coast fish are extremely difficult to establish in eastern waters. This assortment of some 12,000 young fishes was carried on deck in tubs under experimental conditions. Instead of the usual method of aerating the

water by means of a tin dipper, oxygen under pressure was supplied from such tanks as are used in connection with surgical work. A rubber hose connected these containers with liberators made of soft carbon tubes which were immersed in the tanks holding the fish. As this form of carbon is a porous substance these tubes allowed the compressed oxygen to escape only in very minute bubbles which, of course, made their solubility much greater owing to the large amount of surface they exposed to the water, in the aggregate. Patent rights are held on this device by the inventor who requested that we try his apparatus and so far as we could judge from this trial it was quite successful, the fish arriving in what appeared to be excellent condition although, naturally, it was impossible to study the behavior of the released fish to note if any after effect ensued. A control of 350 chinook salmon was also carried in which the aeration was affected by the usual dipper method and as these fish likewise sustained no losses, no great advantage could be seen. However, a saving in labor and necessary attention was noteworthy. On the return trip there were brought back some indigenous fishes from the park under similar conditions with nearly the



A TYPICAL FYKE NET

From a drawing by C. M. Breder, Jr.

same degree of success, except that a number of small shiners (*Abramis crysoleucas*) suffered even from as small a flow as the valve would allow. The symptoms shown by these fishes were chiefly a congestion of the gills and in some cases even of the fins at their bases which seems plainly to be due to an over stimulation caused by the excessive oxygen. This was remedied by simply shutting off the flow for short periods alternating with shorter ones during which the gas was allowed to pass through the water in small quantities. The subsequent behavior of the fish was noted and there appeared to be no ill after effects noticeable in the survivors. Where large shipments are to be made over long distances this method no doubt would prove to be of considerable value and convenience, and should be infinitely superior to the customary dipping.

The collecting in Sandy Hook Bay was impeded in the early part of the summer by a great preponderance of menhaden which are taken there for their oil. They unfortunately seemed to exclude everything else from the bay. In the middle of the summer all species fell off in numbers, as they usually do in these waters, but on their autumnal return a large variety of interesting forms appeared, together with few food fishes, which while satisfactory for the Aquarium's purposes certainly did not please the fisherfolk. The following species have been brought into the Aquarium on the *Seahorse* and been placed on exhibition. This is an increase of three over last year.

Species

Smooth Dogfish	Bluefish
Hammerhead Shark	Rudderfish
Spined Dogfish	Goggle-eyed Scad
Common Skate	Jackfish
Barndoor Skate	Yellow Mackerel
Clear-Nosed Skate	Threadfish

Big Skate	Moonfish
Sting Ray	Lookdown
Cow-nosed Ray	Pompano
Menhaden	Blackfish
Eel	Common File Fish
Common Killifish	Orange File Fish
Bass Killifish	Smooth Puffer
Sheepshead Minnow	Puffer
Two-spined Stickleback	Burr Fish
Four-spined Stickleback	Eighteen-spined Sculpin
Pipefish	Common Sea Robin
Spearing	Striped Sea Robin
Mullett	Shark Sucker
Striped Bass	Toadfish
Sea Bass	Ling
Porgy	Spotted Codling
Pinfish	Tomcod
Weakfish	Fluke
Silver Perch	Flounder
Spot	Sun Flounder
Croaker	Angler
	Kingfish

A method of secondary importance in collecting is the visiting of the fyke nets at times when they are being emptied of their contents. These nets operate on the same general principle as do the larger pound nets which are of primary import but owing to their size and design may be operated with ease by one man. The nets are set close to shore and in such a depth that when the tide is at its lowest ebb most of the apparatus is above the water line. It is at this stage of the tide that the captured fishes are removed, the operator moving about in a small skiff over about two feet of water. At high tide the nets are nearly if not quite submerged and it is then that most of the fishes are entrapped.

The basis upon which this type of gear operates is one of universal application in the capturing of various sorts of animals. That is, a series of funnel-shaped openings are so presented to the prospective captive that it may enter with great ease but on once gaining



SAND SHARK WITH PASSENGER AND OUTRIDERS

The sucker attached to the shark is not always a passenger; he often swims beneath or alongside, at least in captivity.

Photograph by Elwin R. Sanborn



FISHERMAN AT THE FYKE NET

The operator moves about in a small skiff.
 Photograph by C. M. Breder, Jr.

entrance finds it very difficult to withdraw. This principle has been applied for a great length of time and while refined and modified in various manners is still essentially the same as its use intended for the capturing of mammals, birds or fishes. The funnels of which there are usually two or more are placed with the large opening outward. The animals readily pass through this and are then usually unable to recognize the small opening through which they passed as an exit, when facing in the opposite direction. The use of this principle is well exemplified by common rat traps, fly traps, and sparrow traps. Either bait or some natural instinct of the animal sought, may be used to entice the creatures through the funnels. In the case of the fyke no bait whatever is used, the trap's operation being based solely on certain instincts of fishes. Referring to the diagram a vertical wall of net is seen to extend from one end of the trap. This is called the leader and reaches out for a considerable length in a shorewardly direction. Its function is to direct fishes passing by parallel to the shore into the trap proper. On being confronted with this block to their passage they in-

stinctively turn seaward, in order to pass around it. This leads them into the wings forming the so-called heart. From there they pass on into the tube of netting supported by hoops and finally through the two funnels inside of this until they reach the last receptacle or pocket in which they remain until removed by the fisherman. There is no positive obstruction to the fishes exit except their own stupidity which appears to be entirely sufficient, although doubtless a certain small percentage do eventually work their way out. However, after once passing through the three funnel-like gates their chances of escape are small.

It is from these nets, of which there are six in the bay, that many of the interesting smaller fishes are taken which pass through the larger meshes of the greater sized pound nets. The fykes of Sandy Hook Bay are usually set about the first of September and kept in operation until the ice prevents their successful manipulation. Striped bass are the fish most desired by the owner, but many other species of good market value are taken, included in which are, weakfish, fluke, eels, blue fish, mullet, not to



THE POCKET OF THE FYKE NET

When the hoop section of the fyke is collapsed, the fish are removed from outermost pocket.

Photograph by C. M. Breder, Jr.



SAND SHARK WITH PASSENGER AND OUTRIDERS

The sucker attached to the shark is not always a passenger; he often swims beneath or alongside, at least in captivity.

Photograph by Elwin R. Sanborn

mention a goodly number of blue crabs which manage to find their way into the pocket.

We are able to record with considerable satisfaction that many of the choice specimens collected in the two previous years are still on exhibition and in excellent health.

The large tripletail (*Lobotes surinamensis*) still graces the tank occupied chiefly by weakfish and on account of its ravenous appetite, has grown to be quite fat and sleek. Its first associates were a number of rudders, but not being endowed with their great speed or a pugnacious nature it fared poorly only being able to pick up such scraps as these active swimmers overlooked, which were few indeed. On being placed with the relatively more retiring weakfish, however, it soon recuperated and now is in the pink of condition. This incident is mentioned chiefly to serve as an illustration of the innumerable details which must be constantly kept in mind by the employees of such an institution harboring so many piscatorial types of varied disposition and habit.

The large sand shark (*Carcharias taurus*) and the attending retinue of shark-suckers and rudders still retains its eminence among the many exhibits. The only difficulty with this group is that occasionally a rudder will become careless in his habits and swim too near to the ready mouth of the shark and so find his doom. This condition apparently is brought about, not by any lack of intelligence on the part of the rudder, but on the contrary may be accounted for on the score of its good development. In the state of nature the rudder has learned to follow sharks in order to pick up crumbs from their orgies. This they attempt to continue in confinement for some time, but after a mild degree of domestication has taken place they manage to forget their normal habit and in its place discover that their food is dropped to them through the surface by some benevolent biped. From then on their troubles begin as they wander aimlessly about, coming to the surface whenever anyone approaches the rear of the tank, in the hope of being fed.

So with many of the other exhibits of local fishes little yarns might be spun, the moonfish, the school of young pompanos, the sea turtles, the spots, croakers, puffers, and burrfish all holding their own and adding bit by bit to our knowledge of fish life.

Likewise on the bay, incidents constantly occur of interest to the student of fishes. For example while riding at anchor in early June on a smooth sea at Sandy Hook, a school of small fishes led by a larger fish swam up and

hovered alongside the hull. One fell swoop of a fine meshed dip net entrapped nearly all of them and it was then seen that they were two-spined sticklebacks (*Gasterosteus bispinosus*), the small ones not being more than a month or two old while the large one on dissection proved to be an adult female which showed evidence of having recently spawned. There is nothing to prove that this was her brood but since in other species of this group parental care is shown, at least in the male, one could not help forming a comparison connecting this fish with a hen and her chicks. Although this is a common species near New York these were the first we had seen in this bay.

While wandering along a small creek near this same spot in search of fiddler crabs, the little fellows that run about on shore wildly waving an absurd claw, large enough for any ordinary crab five times their size, the feeding of a "one armed" blue crab struck the attention as he industriously gleaned the meat from the shell of a black mussel which he may or may not have opened himself. No word but flock could fit the group of killies which hovered over and about him trying to snap up little bits he might lose and no doubt constantly obtaining appetisers in the form of gustatory pleasures from the juices of the fresh meat that wafted toward them as he rended the flabby tissues with his butchering apparatus. When the killies became too enthusiastic and closed in too close about him for comfort in their struggle for a livelihood a ludicrous wave of his single "arm" sent them scurrying off to some more respectful distance. The scene was accentuated by a nearby school of current stemming silversides (*Menidia menidia notata*) which disdained so meanly a begging from a miserable invertebrate, preferring no doubt to save their appetites for some small relative of the crab himself which would be sure to come in on the next rise of tide.

These killies of which there are two species (*Fundulus majalis*) and (*F. heteroclitus*) common in the bay spawn chiefly in June and in proportion to their size deposit extremely large eggs. This fact has facilitated a study of the development of these ecologically important fishes. When another year affords the opportunity for a further study the making of some interesting observations is anticipated. Thus not only does the *Seahorse* provide exhibition specimens from local waters, but enables those connected with the work to make field observations on the side as well. Between May 2 and October 23, after which date the boat was hauled out, nineteen trips were made: One to Long Island,

ZOOLOGICAL SOCIETY BULLETIN

Departments:

Mammals	Aquarium
W. T. HORNADAY.	C. H. TOWNSEND.
Birds	Reptiles
LEE S. CRANDALL.	RAYMOND L. DITMARS.
WILLIAM BREER, <i>Honorary Curator, Birds</i>	

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VOL. XXV NOVEMBER, 1922 No. 6

two to Palisades Park, and the remainder to Sandy Hook Bay.

A total of 2,886 specimens of fishes was collected, consisting of 55 species. In addition great numbers of invertebrates of many varieties were collected both for exhibition and as food for other specimens. Several sea turtles large and small were added to the collection as well.

DR. ALFRED GOLDSBOROUGH MAYOR

In the death of Dr. Alfred Goldsborough Mayor, director of the marine biological laboratory at Tortugas, Florida, the New York Zoological Society lost a valued member, and the important work of the laboratory he was largely instrumental in founding, suffered a serious interruption.

Dr. Mayor was something more than an accomplished investigator; he was in fact a personality whose influence drew to his projects the assistance of other earnest workers in zoology. The success which followed the establishment of the Tortugas Laboratory by the Carnegie Institution was due to his leadership, and the important volumes which have emanated from it constitute a monument to his efforts. Although suffering from a long-continued illness, death found him still at work.

The present writer's acquaintance with Mayor began on a voyage of the U. S. S. *Albatross* in the tropical Pacific in 1899, and continued until his death. Association with him developed the conviction that he had an unusually lucid mind. His conception of scientific theories was so clear that it became a pleasure for his companions to listen to his expositions, which however came only in the ordinary course of

conversation and were presented in his characteristically modest and half humorous manner. He had a remarkably retentive memory. We used to say that Mayor apparently never had to learn anything twice.

Mayor was not only a natural investigator, but an artist and draughtsman of great ability, as everyone familiar with his published works realizes. He was his own illustrator with pencil and brush. His capacity for continuing his personal studies of marine life while constantly assisting those of others and managing the business details of his institution, was recognized and appreciated by all persons in any way associated with him. His versatility was notable. A thorough knowledge of navigation and seamanship enabled him to render excellent service during the war, when he gave instruction in navigation and prepared an excellent manual for the use of naval recruits.

Between seasons at the laboratory he made several voyages to the Pacific visiting Samoa and Torres Straits, where his investigations added much knowledge respecting the growth of coral reefs.

In the November, 1919, number of the BULLETIN will be found an article by Dr. Mayor on the growth rate of corals, illustrated by a remarkable photograph.

In 1905 Dr. Mayor, then director of the Museum of the Brooklyn Institute, presented to the Zoological Society, for the benefit of the New York Aquarium the manuscript and illustrations of a work entitled "Sea-Shore Life," a manual of the invertebrates of the New York coast.

The usefulness of this book, the first of a series of books and pamphlets relating to the living exhibits of the Aquarium, was soon demonstrated by a demand which has continued to the present time. It may be well to note here that certain typographical and other errors in this work are attributable to the fact that it was hurried into print during his absence, affording him no opportunity to see the proofs.

Dr. Mayor died on June 24th at the age of 54. He was a graduate of Stevens Institute. After service at Clark University and the University of Kansas he went to the Museum of Comparative Zoology at Harvard. Several years association with Alexander Agassiz, in laboratory work and during long sea voyages, served to direct his studies almost exclusively to marine forms of life.

He wrote the most intimate account we have of the work of Agassiz, whom he affectionately



ALFRED GOLDSBOROUGH MAYOR

One of the last photographs of Dr. Mayor, showing him at work on a Samoan coral reef.

called his master in science. Notwithstanding his scientific achievements his friends will remember him best for his attractive personality.

C. H. T.

MEMBERSHIP OF THE SOCIETY

The following persons were elected members of the Society, October 11th, 1922, by the Executive Committee:

	<i>Life</i>
Miss Zelina T. Clark	Henry Fairfield Osborn, Jr.
	<i>Annual</i>
Mrs. George D. Ali	Mrs. Grinnell Martin
Joseph A. Blake	Charles O. Miller, Jr.
A. Huidekoper Bond	Charles W. Parsons
Ernest T. Carter	S. C. Pirie
Mrs. Alfred Chapin	Hon. Henry Brewer Quinby
Mrs. W. Murray Crane	Ernest Richardson
Dr. John Otho Downey	Ralph Abel Smith
Miss Lillian Endicott	Robert G. Stone
Victor J. Evans	Dr. Walter Timme
V. Forbin	Robert R. Titus
Miss Ann C. Fraser	Dr. Maurice V. Tyrode
Miss Jane G. Fraser	Mrs. Samuel Oakley Van
Miss Sarah Fraser	der Poel
Pompeo M. Maresi	Watson Webb

GENERAL ENDOWMENT ACCOUNT

The Society received \$2000 in October from the estate of Chas. E. Rhineland. This makes a total of \$4000 thus far from this legacy.

THE SHIPWORM OR PILEWORM*

By PROF. SIDNEY I. KOHNHAUSER

LATELY the shipworm or pileworm, the most important being teredo, has come into prominence through the severe destruction of marine structures in San Francisco harbor where an epidemic has caused many millions of dollars worth of damage in the past few years. Many thinking persons have wondered whether these strange organisms might increase in New York harbor and threaten the waterfront of this great port. With this in view the Committee on Marine Piling Investigations of the National Research Council undertook a study of the borers in wooden structures about New York. The writer was concerned largely with the field work of this study. We attempted to find out the different species at work here, their abundance, their distribution,

* During the summer Prof. Kohnhauser was engaged by the New York Committee on Marine Piling Investigations to make studies of the Shipworm in local waters. While carrying on this work he made several trips on the Aquarium collecting boat *Sea-horse* and has kindly prepared this article for the BULLETIN.



PORCUPINE FISH AND HOGFISH

The porcupine is the first of its species received at the Aquarium.
It is nearly twenty inches in length.

Photograph by Elwin R. Sanborn

their breeding season and the conditions under which they live.

Very few persons are acquainted with the appearance of real shipworms because these animals live in wood most of their lives. To study them one must carefully carve open their burrows with chisels, and extract them without injuring their delicate translucent bodies. Shipworms are not worms at all but are mollusca, related to clams. They are highly specialized for boring into wood and thus outwardly resemble a clam very little although in their essential structure they are quite similar. The shipworms burrow into wood for protection. Their homes are lined with a pearly layer secreted by the mantle which also produces the boring apparatus consisting of two small shells corresponding to the shells of a clam or oyster but in this case enclosing very little of the soft body of the animal. A clam can close up in its shell, a teredo can not. He merely uses it to drill, depending on the wood in which he lives for an impregnable covering.

These shells are pivoted on knobs above and below and rock back and forth. On their outer surfaces they have rows of minute teeth which chip off the wood. The rocking motion is produced by two muscles, a smaller one in front called the anterior adductor muscle and a larger one behind called the posterior adductor muscle. The contraction of the latter causes the shells to gape more in front and this motion chips off the wood at the blind end of the burrow. The wooden chips are swallowed to get them out of the way and generally pass clear through the digestive tract of the teredo. Perhaps some sugar-like nutriment is got from the wood but that is still unsettled. At any rate wood is not the principal food of the shipworm which exists and grows on microscopical plants and animals of the sea water. The shell is added to as the animal grows by the secretion of a fold of the mantle at its posterior border.

In a clam there is a plow-shaped foot for burrowing into the mud or sand. Teredo also has a foot but it is modified into an adhesive disc and is located at the blind end of the burrow between the shells and serves to hold these shells tightly to the wood during the boring process. Above the foot is a small mouth for the reception of food and wood chips.

Most of the soft body of the shipworm which may be a foot long in teredo and three feet long in bankia, the feather-tailed shipworm, is covered with a delicate mantle. Inside this mantle are the vital organs of the animal.

There are organs of digestion, gills for respiration, organs of circulation, a nervous system and reproductive organs. The mantle secretes three different parts, the boring shells, the lining of the burrow, and a pair of pallets which will be described later on.

The only communication the burrow has with the outside world, the sea water, is through a little hole not over a sixteenth of an inch in diameter. When the shipworm is not disturbed there are two tubes thrust out of this hole into the water. These are called siphons, incurrent and excurrent. Into the former water flows whereas from the latter it is discharged. These siphons communicate with the mantle cavity and the currents of water are produced by its cells which have hair-like lashes that beat toward the mouth or in the reverse direction. The water flowing into the mantle cavity brings food and oxygen to the animal whereas the excurrent water carries off all the waste materials including the wood chips.

At the base of the siphons on each side of the teredo is a pallet. This is a shovel-shaped body made up of lime. The blade of the shovel is directed toward the small opening at the surface of the wood. When the shipworm is disturbed the siphons are pulled into the burrow and the pallets are thrust into the opening to the exterior to keep out the intruder. In teredo these pallets are simple structures but in bankia they are made up of many pieces and resemble feathers. From these pallets bankia gets its common name, the feather-tailed shipworm.

To understand how teredo gets into new wood and increases in numbers we must consider how it reproduces. Minute eggs are produced by millions after the animal is only a few months old. Sperm cells escaping through the excurrent siphon by the billions are set free into the sea water by male individuals. The gills of teredo act as breed pouches and in these the eggs are shed and here come in contact with a constant flow of water. This incurrent water contains many teredo sperm cells and fertilization takes place. The fertilized eggs develop into little free swimming larvae which move by means of a circlet of ciliated cells. These pass from the gill pouches into the sea with the excurrent water and develop into minute clam-like organisms with two little shells, a long movable foot and a sticky thread for holding on. In bankia there are no breed pouches and eggs and sperm are set free into the sea where the entire development of the larva takes place.



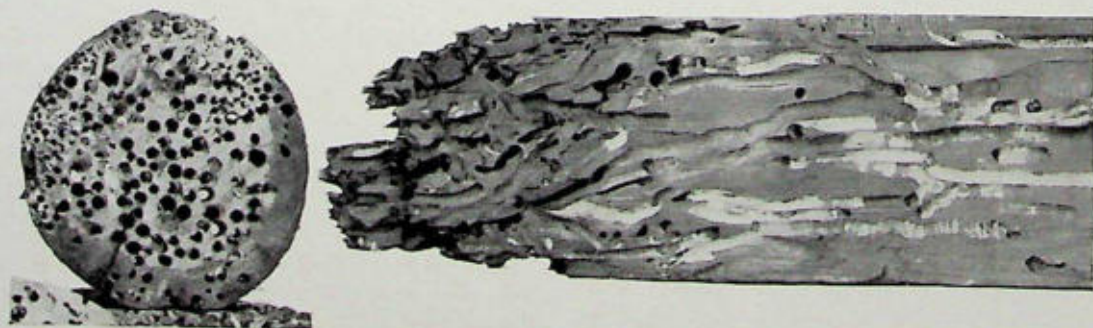
UNTREATED PINE PILE—BOCA GRANDE, FLORIDA
Work of *Linnoria*. The pile was two years in service.

The clam-like larva now seeks a wooden structure in which to bore. Perhaps it is attracted to wood by soluble substances of the wood dissolved in the sea water. When it alights on a wooden surface the sticky thread holds fast, the shells gradually transform into the boring apparatus, and the burrow is started, at first transverse to the grain of the wood but ordinarily turning if possible and running in either direction with the grain of the wood. As the burrow is excavated it is lined with pearl, the teredo elongates, develops pallets and grows at a tremendous rate. When it began to bore, it was probably not over 1-100th of an inch long. In a month it can be over two inches long, and may be ready to produce young. The spot where the larva attaches remains as the point of contact of the adult teredo with the outer world. A teredo does not change its home, neither does it burrow into its neighbors' homes although at times space in a pile or board is at a premium.

When one thinks of a single teredo producing several batches of millions of larvae in

a single season and even living over the winter to reproduce a second season, one wonders why these animals are not omnipresent. But teredo like other animals requires its own particular conditions in which it can live and reproduce. Even different kinds of shipworms have different demands; teredo likes brackish water but *bankia* prefers it much saltier. Undoubtedly conditions about large cities like New York where sewage and chemical wastes are cast into the sea have caused teredo to be less destructive than it ordinarily would be. But even now close to Manhattan Island teredoes are tirelessly burrowing into piles at such places as Staten Island, Bayonne, the Narrows, Coney Island, Sandy Hook, Long Island Sound, Jamaica Bay and Great South Bay. If favorable conditions for them should prevail, those places could furnish the larvae to extend the deadly work.

Old burrows of shipworms which extend from the mud line to about low tide level are often used as homes by marine worms and little crabs. These organisms most of them segmented worms



DOUGLAS FIR AND SOUTHERN PINE PILES

Left: Douglas fir from Seattle Harbor showing destruction in four years. Right: Southern pine from Biloxi, Miss., section taken between medium and low tides, after three years service.

with bristles do no harm but merely dwell in the deserted excavations. But there is a little crustacean which does make burrows and does a lot of damage. It is called limnoria. It is only an eighth of an inch in length and seldom burrows more than a quarter of an inch into the wood. They work in such tremendous numbers and so close to each other that the pile chips off and may soon be eaten into an hourglass shape at the mud line. These minute isopods work, however, clear up to the high water level and decrease the diameter of the pile under-water very effectively. Limnoria is

especially abundant in Sheepshead Bay, Bay Ridge, Sandy Hook, Atlantic Highlands, Staten Island and Long Island Sound.

At present many engineers, chemists, and biologists are striving to attain methods of protection against borers. Improvements in methods of creosoting, impregnation of wood with metallic salts, and various types of concrete protection are being investigated and reported upon. By concerted action one can feel certain that some advances will be made to make the works of man more permanent even in teredo infested waters.



THE BARRACUDA (*Sphyraena barracuda*)
From a specimen about five feet long.

THE BARRACUDA

By L. L. MOWBRAY

THE barracudas form a single genus, *Sphyraena*, of eighteen or twenty species. All are marine, although some enter rivers as far as the extent of brackish water. They are found in all tropical and subtropical seas. Occasionally a straggler wanders north as far as the coast of Massachusetts, but this is beyond its natural habitat. Its form closely resembles that of the pikes, and in size it exceeds the muscullunge. Examples of eight feet have been recorded, and the writer has seen a specimen taken over seven feet long. The fish is sluggish in its habits, swimming slowly or moving with the current, at times lying in the shade of a pinnacle of a coral reef, under some overhanging Gorgonia or under a floating log, or buoy. In southern Florida and the Bahamas they are abundant at the entrance of small creeks, taking advantage of the shade of the mangrove trees. Sometimes they are met far out at sea. In the Bahamas and Florida straits the largest are taken between the edge of the Gulf Stream and the coral reefs. Barracuda taken in deep waters are known to the fishermen as bluebacks. Those from shallow water among the Keys are light in color and are at times found in less than twelve inches of water. The barracuda is without question the most aggressive and voracious of marine fishes.

Carnivorous in its habits, it lies in wait for its prey, at which it strikes at sight. One can hardly

grasp the situation when the barracuda strikes. One sees a lazy fish hardly moving, vanish with such rapidity that the eye can only discern a streak of blue passing through the water. It is in this way that the barracuda has received its bad name. While it is extremely voracious, it is at the same time most wary, and the object at which it strikes has to be moving.

Many times I have had the barracuda approach within eight to twenty feet of the boat, and sometimes to within one or two feet of the sculling oar. Throw a dead fish to the barracuda, even with no line attached, and he will never take it; but throw a live fish within twenty or thirty feet of a barracuda, and you get results. A flash and the fish is swallowed.

I once had a barracuda strike at the oar that I was sculling with, with such force that the blade of the oar was broken in two. It is in this way that it attacks human beings. It is not that it desires human flesh, but it strikes at the nearest moving object, an arm or leg, hand or foot, inflicting a terrible wound. If the barracuda has made a mistake in the strike, the attack is not repeated. In all of the many records of the attack of the barracuda on human beings, there is no record of the rush being repeated. A young woman recently attacked by a barracuda in Florida waters, bled to death. The case attracted widespread attention. The attack was made as the young swimmer approached a buoy, in the shadow of which a barracuda was lurking and which may long have been its hunting ground. From such places



JAWS OF A BARRACUDA

The photograph gives an idea of the formidable dentition of this remarkable fish.

Photo by Dr. E. W. Gudger

the barracuda dashes at unsuspecting fishes that pass near. It strikes at moving objects, often without discrimination and from the fact that the swimming girl was not attacked a second time, there can be no doubt that a barracuda was responsible for her fatal injuries.

When the barracuda seizes, it shakes its head and, with its double-edged teeth, it inflicts a terrible wound. Only a year ago I was catching large barracuda on the edge of the Gulf Stream off the Florida Keys. Seven were caught in about two hours' run. In placing the third or fourth fish in the live well, two males happened to have been taken, and in a few moments their backs and bellies had gashes large enough to place one's hand in. The large barracuda do not travel in schools; usually one or two, sometimes five or six. Very rarely more are seen together, except when they are attacking a large school of small fish, and then sometimes one can see hundreds, dashing into the compact mass of small fish. When mullet are swimming, barracuda are seen in the greatest numbers. As a game fish the barracuda is a good fighter and can be readily taken by trolling at a speed of six miles an hour. A small fish, or a piece of fish cut eight or ten inches long by one or two inches wide, makes an excellent bait. A strip of white canvas is readily taken. A silver trolling spoon is used in trolling for the barracuda.

The flesh is sweet and firm and greatly esteemed among the fishermen. Cases of poisoning have been known from the eating of barracuda, which was no doubt decomposed.

THE LOBSTER FISHERY IN NEW YORK BAY

By S. A. CALLISEN

THE Lower Bay of New York and the region just outside of Sandy Hook offer all the requisites for a profitable pursuit of the lobster fishing industry. Over large areas, the bottom is level and fairly hard, composed of sand or gravel with a few, scattered ledges of rock. There are also patches of mud to which the lobsters can retreat in cold weather for partial hibernation, forming an ideal habitat. The depth of water over the fishing grounds ranges from three to fifteen fathoms, so that even the maximum depth does not entail too strenuous labor in the lifting of lobster pots. The shores of the Lower Bay are indented by numerous small streams and lesser bays—such as Gravesend Bay, the Shrewsbury River and Compton Creek—which afford ample protection for the fishermen's boats. The extensive pound net and menhaden fisheries of the Lower Bay furnish almost limitless quantities of bait, procurable at low cost and minimum effort, while the proximity of New York City offers an easily accessible market with a steady demand. The chief difficulties with which the lobster industry has to contend, seem to lie in the keen competition among the individual fishermen and the fluctuation in numbers of the lobsters present on the fishing grounds.

This fluctuation has given the industry a very uncertain character, and made the accumulation of accurate data difficult. Many men engage in lobstering spasmodically, setting out their gear only when fair sized catches are being made. Some are only transitory visitors, working in the region for a while and then moving on, while others again try clamming or gill netting whenever these appear to be more profitable. Quite a number of men on the other hand carry on lobstering steadily despite the many hardships and discouragements incumbent upon the work, and seem capable of making a living by this means even becoming at times fairly prosperous. During the last year (1921) the industry was distributed about the Bay approximately as follows:—Gravesend Bay, seven boats, Princess Bay, three; Keyport, ten; Belford, seven; Atlantic Highlands, six; Highlands, twenty; Seabright, ten; making a total of sixty-three boats and one hundred twenty-six men more or less actively engaged during the greater part of the season.

The gear used in lobstering is fairly simple. A trap constructed of lath and coarse netting is employed by all the lobstermen. These



LOBSTER BOATS AT A POUND NET
The lobstermen are getting menhaden for bait.

traps—"pots" as they are called—are semi-cylindrical in shape, three to four feet in length, one and a half to one and three quarter feet in width and height. The bottom is constructed of several narrow flat boards—pine, spruce or hemlock—with about half an inch space between each. To this is fastened three semi-circular upright frames, one at each end and one in the middle. Across these frames ordinary building laths are nailed lengthwise about an inch apart. Three or four slats near the bottom are cleated together instead of being nailed to the frames, so as to form a removable section the entire length of the pot, to facilitate baiting and handling.

One end of the pot is also slatted while the other remains open. Into this open end is inserted a coarse meshed net funnel extending inward about a quarter the length of the pot. Its larger diameter is that of the pot, its mouth being about six inches across. One side, shorter than the other, goes in towards the top of the pot, so that the lobster has to crawl up an inclined plane to enter the trap. By means of cords, one running to the top of the pot, and two to the center frame, the

mouth of the funnel is pulled upwards towards the slatted end and held open. To the center frame is fastened a second net funnel similar in size and design. The mouth of this funnel is also pulled towards the slatted end but only by means of two cords, in such a way as to partially close it. Two bricks are fastened to the bottom of the pot inside under the center frame in order to sink it. The whole pot is then tarred to preserve it from the ravages of ship worms (*Teredo*) and fouling by sea weeds.

About mid-season they must be taken ashore to be dried, and whenever they become very foul they are scrubbed while still in use

with a wire brush. These pots are made by the fishermen themselves and are valued at about five dollars apiece. Each man owns from two hundred to four hundred pots, and as they must be replaced every two or three years, this constitutes one of the largest items of expense. The pots, set in strings of forty or more, are fastened ten to fifty fathoms apart to a line or trawl of half inch rope by means of bridle and line eight feet long. When set out the line is anchored to the bottom and marked by a buoy. This buoy is usually a long stick



LOBSTER POTS; SANDY HOOK BAY
The gear used in lobstering is simple; a trap constructed of lath and netting, with buoy flags to mark their position.

Photograph by S. A. Callisen

with some cork fastened to its center, a brick attached to its submerged end and a distinctive flag to the other.

Due to the fact that many of the men during a part of the season at least, set their pots well out of sight of land, it has been necessary to develop a sturdy, seaworthy boat, speedy, roomy and reliable. These boats known as Seabright skiffs or dories, have become famous the length of the coast. They are open, clinker built with a comparatively high bow and square stern. The engine is set amidships, boxed in, and a removable canvas hood, covering the bow is used to keep out some of the spray. The dimensions of the boats are about as follows:—Length, twenty to thirty feet; beam, five to six and a half; depth (from gunwale to keel) four to four and a half; draught, one to one and a half. A great variety of engines is in use, Palmer, Peerless, Frisbie and Ford Marine, with from five to fifteen horse power being the commonest types.

In general these engines run about six miles to a gallon of gasoline and have a cruising radius of from sixty to one hundred miles. Many of these boats are locally built, often by their owners who are naturally very proud of them. In order not to waste time running to their sets—sometimes twelve miles or more from the home port—speed has become a prime requisite in so far, of course, as it does not detract from seaworthiness. All these boats seem to be able to make ten knots, some even as high as twenty knots an hour. When travelling at full speed the bow rises and so much water is thrown to each side, that in a choppy sea one has an impression of whizzing along between solid walls of water. Some of these boats are equipped with a well for transporting lobsters which can be closed by a valve and pumped dry. On the gunwale of each boat, near the bow is fastened a large wooden pulley, the use of which will be explained later. A grapnel with a length of rope, a wire brush to clean the pots, a small compass, a jug of drinking water, a bilge pump, broom, boat-hook, and perhaps a barrel for bait completes the boat equipment. Such a boat as just described is valued at from five to fifteen hundred dollars, depending on condition, make and power of engine, etc.

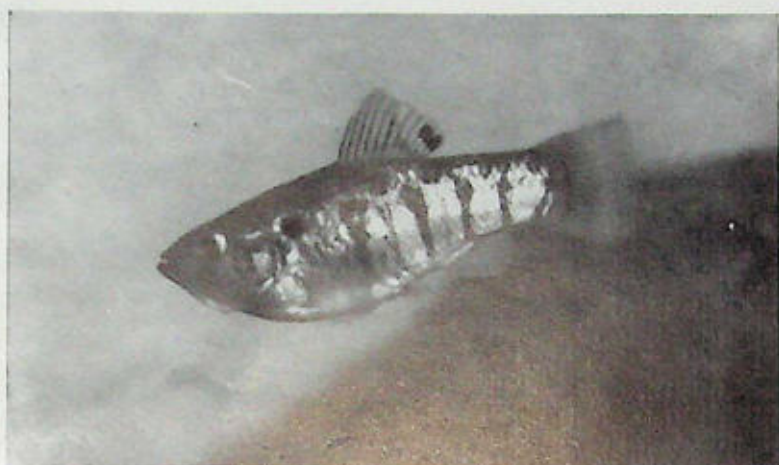
From May to August the lobsters seem to be fairly plentiful inside the bay making the work for the time being much lighter, as the depth averages little more than six fathoms, and bad weather is not so much to be feared. Later in the season the lobsters move off shore and the more industrious fishermen follow them out.

The lobstermen run out from—say Highlands, N. J.—about five o'clock in the morning to the pound nets near Sandy Hook for bait. It is a case of first come, first served, and it is a common sight to see five or six boats waiting patiently for the pound net men to put in an appearance. Some take only enough bait for a single set, others living farther away or desiring to save time on subsequent mornings take quite a load at once, which they salt down. Six bushels of menhaden at twenty-five cents a bushel are needed for two hundred pots. They then head for their fishing grounds, guiding themselves in an almost uncanny fashion to the exact location of their pots by means of ranges while working inshore.

When they move out to sea in autumn out of sight of land, they place entire reliance upon their compass and an accurate knowledge of the boat's speed, together with the drift of the currents. Even so it is no mean feat of seamanship to find a handkerchief fluttering five feet or so above the water, on a foggy morning, five or ten miles off shore amid an endless succession of ground swells. Passing steamers and storms frequently break the buoys adrift. It is then necessary to use the grapple, and by cruising in circles above the general location of the pots endeavor to pick them up. This is of course, not always successful, and many pots are annually lost in this way.

As soon as the pots have been reached the main line is hauled on board and passed over the pulley previously mentioned. The boat is then pulled along with the rope passing over the pulley thus raising the pots from the bottom with the minimum effort. As the pots come along side they are raised to the gunwale, the four cleated slats are removed, and such lobsters as have been foolish enough to be trapped are dumped into the bottom of the boat. The pot is rebaited with three menhaden, which because of their oily nature make an excellent lure. If the pots are very foul with sea weed or other marine growth, they are cleaned, the removable slats are slipped into place again and then they are dumped overboard where their weight, as they sink, helps to raise the others. When one set of forty pots or more has been attended to, the boat moves on to the next until all of the two or three hundred pots have been lifted. The boats then run back to their respective ports and dispose of their catch to local dealers, or take them to Fulton Market direct.

As this is quite a trip from the Lower Bay, the usual procedure is to keep the lobsters in a live-car until a sufficient number have been



THE SHEEPSHEAD MINNOW

An interesting little native salt water fish.

Photograph by Dr. E. Bade

caught to warrant the expense. Lobsters cannot be kept long on ice after death like fish, and the live-cars are absolutely essential if the lobsters are to be kept for any length of time in a marketable condition. These crates are built of narrow boards or heavy laths. They are rectangular in shape, about four by two by two feet with a hinged cover on top. They are weighted with brick so as to sink them to the bottom, and are farther secured by several small anchors attached to them by fairly long lines. These live-cars are located in the more sheltered parts of the bay, and their position marked by certain ranges on shore known only to their owners. When desiring to raise one of them, the fisherman runs his boat to the approximate location of the car, then slows down and using his grapple engages one of the anchor lines by means of which he hauls it to the surface.

As in all other forms of fishing, the average catch is a difficult thing to ascertain. Seven to fifteen hundred pounds for a single haul of two hundred pots, while being considered very good, is by no means uncommon. To be sure, much of the time no such hauls are made. Twenty thousand pounds per boat working one hundred full days, is perhaps nearest the true amount. By "full days" are meant those days on which a majority of the pots can be attended to, the work not being unduly interrupted by squalls, lack of bait, etc. The lobsters seem to move slowly from the sandy areas in shore in summer, to the muddy areas and deeper water off shore as the temperature of the water falls in autumn. When shedding, the lobster being defenseless, has to lie hidden and quiescent until his shell

hardens again. The law prohibits the taking of lobsters under ten and one-half inches in length, measured from one extremity of the body to the other and excluding the claws. These "shorts" as they are called, form a considerable percentage of the catch and destroy as much bait as those of a legal size, but as they must be thrown overboard, they are far from forming an asset. As nearly as can be ascertained, the total catch for the Lower Bay during 1921, amounted to 1,250,000 pounds, bringing the lobstermen \$287,560.00.

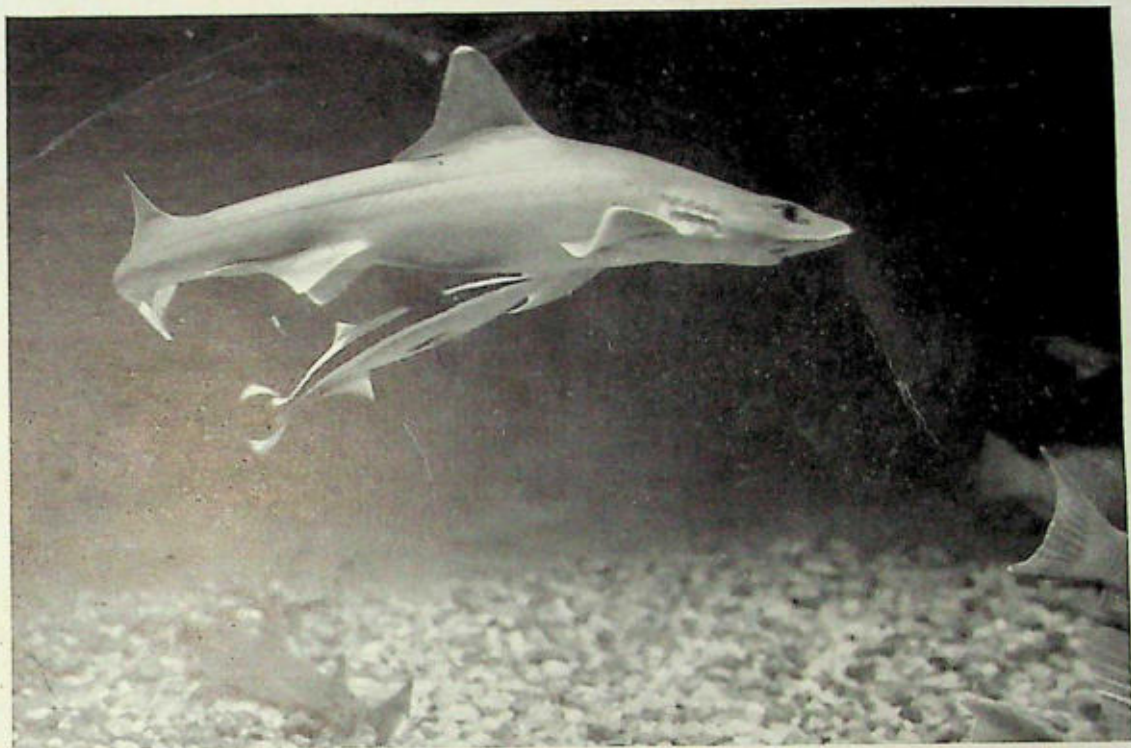
As many of the men are foreigners and seem rather unwilling to give exact figures, the following is offered as an approximate expense per boat for a season of one hundred working days:

Bait	\$150.00
Gasoline and Oil	150.00
Marketing	260.00
Depreciation and Loss....	1,000.00
Interest on Investment....	120.00
	\$1,680.00

The average catch per boat per season is 20,000 pounds, worth \$5,000 to the fisherman, in other words a profit of \$3,200 to be divided between two men. At present it would not pay a man to start lobstering, the competition already being too keen, but as the more inefficient men drop out, together with those who were attracted by the war prices offered for their catch, those remaining will again make a good living by their industry.

ITEMS OF INTEREST

The Sheepshead Minnow.—The sheepshead minnow (*Cyprinodon variegatus*), also called sheepshead lebias, is familiar to many as a brackish water species and one of the most charming of small native fishes, averaging about two inches in length. Though not so abundant as the killifish, it is found in company with the latter, from November to March, in creeks and marsh lands as far north as Cape Cod, and readily adapts itself to conditions in the salt water balanced aquarium. There is even an occasional rumor of its thriving in fresh-water aquaria.



SHARK-SUCKER ATTACHED TO A DOGFISH

Photograph by Elwin R. Sanborn

Some aquarists complain that it is a bully, but we have found it not unfriendly toward the killifish, with which it has been kept in our laboratory.

In the breeding season the male assumes a ravishing combination of colors: ultra-marine blue over the back and sides, with dull orange below, a black half-ring round the eye, and black touches on the edges of the fins; these colors being but temporary embellishments to the natural beautiful markings of silver and black.

I. M., M.

A Notable Exhibit. — The association of shark, shark-sucker and pilot fish described in the January number of this BULLETIN, continues to be a fascinating sight at the Aquarium.

Professor Bateson of Cambridge University, a distinguished scientist, who saw it last year, pronounced it unique as an aquarium feature. He thought it altogether remarkable that these three species, always living together in the wild state, could be seen in the heart of a great city, behaving just as they do in the wide oceans. When this strange display of sea life was established, the director had no great faith in its permanency, but the wholly unrelated numbers

in the anciently appointed partnership proceeded at once to act as they had always acted. While captivity has modified the behavior of the pilots to some extent, the shark-suckers continue true to form. After more than a year of captivity the participants in the performance show no sign of dropping out.

Mr. Sanborn has recently made some remarkably good photographs of these fishes, which are reproduced in this number of the BULLETIN. Since the shark, shark-sucker and pilot fish group was established, a successful union of shark-sucker with the small dog shark (*Mustelus canis*) has been brought about. When the former attached itself to the dog shark, the latter struggled for hours in the attempt to dislodge it, but finally accepted the inevitable. After several months of this intimate association, both species remain in good condition.

In midsummer a six-inch shark-sucker, the smallest ever brought to the Aquarium, was successfully located with another dog shark.

Dislodging the shark-sucker seems to be impossible. The air disc with which it clings takes too firm a hold.

C. H. T.

