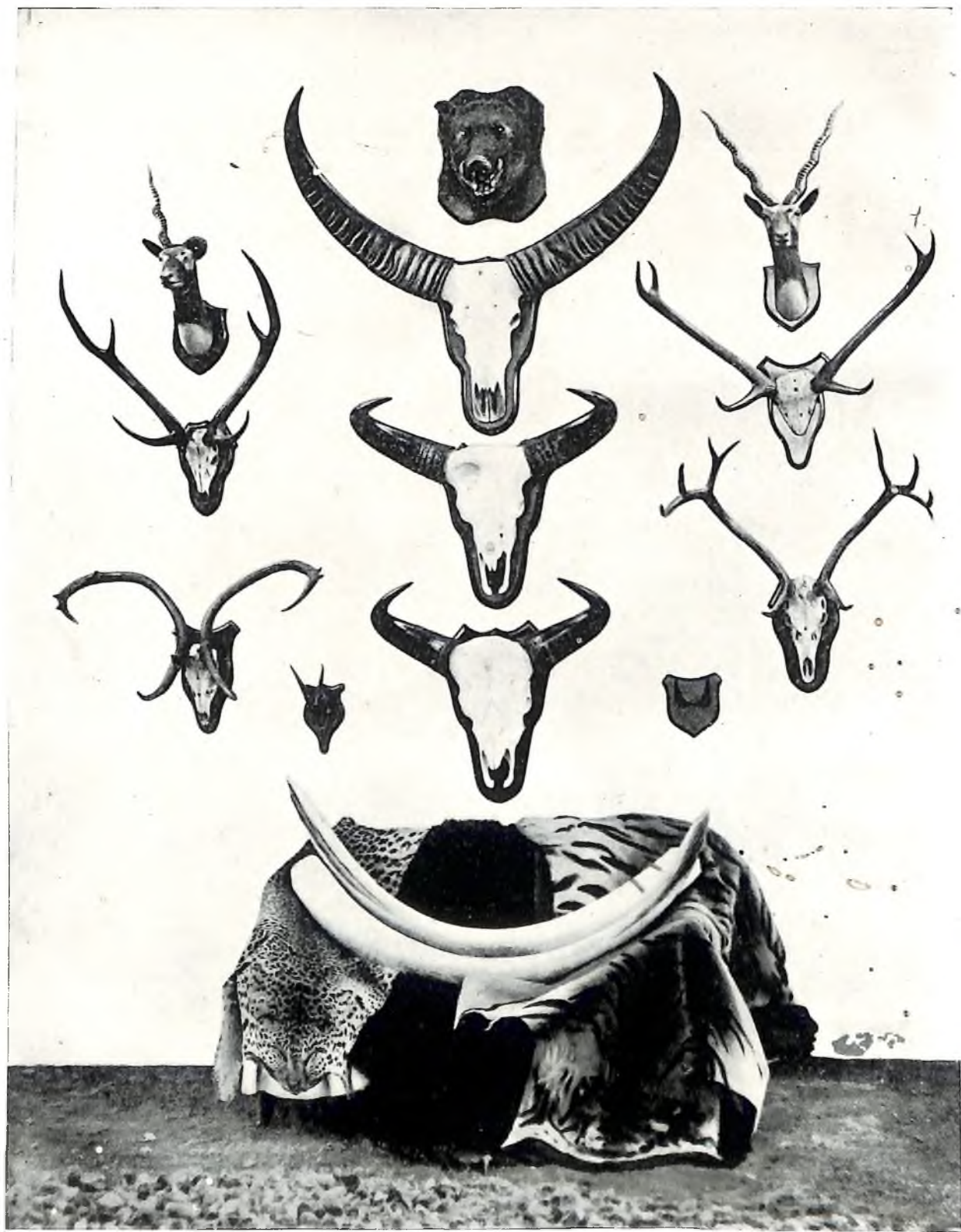




SOME SIGNPOSTS TO SHIKAR



Not the least of the attractions of India and Burma.

[Frontispiece.]

SOME SIGNPOSTS TO SHIKAR

BY



R. D. T. ALEXANDER, D.S.O., O.B.E., T.D.

AND

A. MARTIN-LEAKE, V.C., V.D.

WITH ILLUSTRATIONS

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Dedicated
TO
ALL KEEN SHIKARIS
AND
OUR FRIENDS OF THE JUNGLE TRACTS

639

PREFACE

MANY excellent books have been written on the subject of shikar in general, the habits of the wild animals in various parts of India, and on the Sporting Rifle. With the exception of lightly touching on these, we desire, as far as possible, to refrain from trespassing on the ground already covered by others.

This book which we have, with some trepidation, ventured to write, will not depict any exciting incidents in the realm of shikar, its main object being to give exact illustrations of the footprints of such wild animals of the plains of India and Burma of which we have had personal experience. We have only been tempted to write the book at all with the object of assisting the novice in the intelligent study of those signs of the jungle, a knowledge of which will avoid him being dependent entirely on a tracker who may be good, bad or indifferent, or blundering aimlessly along through the domain of the animal he is pursuing, blindly trusting to luck.

By a careful study of the photographs and other matter it is hoped that the novice will, in a short time, be in a position to distinguish the footprints of one animal from another, to tell within a fairly close approximation the time at which an animal passed a certain point and, in short, to make his visit to the jungle not just an outing but a valuable training and an education.

So much for the objects in writing the book, but we believe that in any book dealing with shikar, and especially one purporting to be of assistance to the novice at the game, some information (and possibly advice) is also expected on the allied subjects of sites for camps, equipment, and methods of keeping fit in the jungle, a list of stores and an insight into the mysteries of a kitchen in the jungle, weapons, points of importance in the pursuit of game, the preservation of trophies and a short description of the habits of the animals whose footprints are illustrated. On each of these subjects we have endeavoured to give some information which, we hope, will prove useful. For the benefit of those of our readers who desire to start a library on the interesting subject of shikar, we have given in Appendix A a short but by no means exhaustive list of books which, in our opinion, will form a useful basis to work on. The reading of the books mentioned in this list, in addition to many others, has afforded us both pleasure and instruction, and we desire gratefully to acknowledge the help which we have received from others in the confirmation of our own experience in the jungle.

We are glad to have this opportunity of expressing our thanks to Mrs. A. H. Bishop, for permission to reproduce her sketches of buffalo and bison, which were made specially for us from photographs of animals which had been shot and with only a description of the surroundings to guide the artist, and to Mrs. J. T. Down, for her sketch illustrating "A Kitchen in Camp." We also wish to acknowledge the assistance which we have received from the Superintendent and other officials of the Calcutta Zoo in procuring a number of the photographs which are embodied in this book, and to

PREFACE

ix

Mr. B. N. Ganguly, who gave us much help with the photography. The photographs of all the footprints were taken truly vertically and in all, except two, cases to full scale or exact size. The methods adopted involved not only great patience but very considerable skill in the art of photography and the results obtained are very largely due to Mr. Ganguly's expert work.

Last but by no means least we wish to record our thanks to Mr. A. F. Gibbs for his assistance in connection with the game birds of India, mentioned in Chapter IV, of which subject he has made a life study and is an undoubted authority.

THE AUTHORS.

Calcutta, April, 1932.

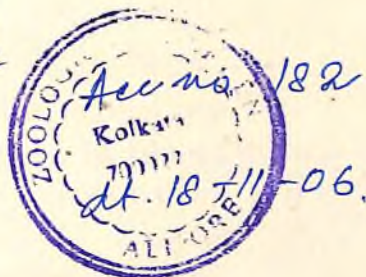
CONTENTS

	PAGE.
PREFACE	vii—ix
CHAPTER I.	
CAMP SITES—EQUIPMENT—METHODS OF KEEPING FIT IN THE JUNGLE, ETC.	1—9
CHAPTER II.	
INSIDE THE COOKHOUSE	10—20
CHAPTER III.	
THE SPORTING RIFLE OF TO-DAY	21—46
CHAPTER IV.	
A FEW THINGS WORTH KNOWING	47—68
CHAPTER V.	
THE PRESERVATION OF TROPHIES	69—74
CHAPTER VI.	
FOOTPRINTS AND OTHER TRAILS OF SOME OF THE WILD ANIMALS OF THE PLAINS OF INDIA AND BURMA	75—116
APPENDIX A.	
LIST OF BOOKS ON SPORT AND WEAPONS RECOMMENDED AS A NUCLEUS FOR A LIBRARY IN INDIA	118—119
APPENDIX B.	
SOME CALCULATIONS ON BALLISTICS	120—127

ILLUSTRATIONS

NOT THE LEAST OF THE ATTRACTIONS OF INDIA AND BURMA	<i>Frontispiece</i>
A KITCHEN IN CAMP	<i>Facing Page 2</i>
SOME MASTERPIECES OF THE GUNMAKER'S CRAFT	21
EXAMPLES OF SPORTING BULLETS	37
<i>Photos of animals and their footprints.</i>	
BARASINGHA (OR SWAMP DEER)	96
BARKING DEER (OR KAKUR)	100
BEAR (SLOTH)	105
BLACKBUCK	89
BOAR	106
BUFFALO	81, 82
CAT (JUNGLE)	104
CHITAL	95
CHINKARA	91
CHAURSINGHA (OR FOUR-HORNED ANTELOPE)	92
DOG (WILD)	110
ELEPHANT	77, 78
FOX	112
GAUR OR BISON	84
GAYAL (OR MITHUN)	86
HOG DEER	99
HYÆNA	113
LEOPARD (HUNTING)	109
NILGAI	88
OTTER	114
PANTHER	103
PORCUPINE	115
RATEL	116
RHINOCEROS	80
SAMBHUR	93
THAMIN	98
TIGER	101
TSINE	87
WOLF	111

639
ALE



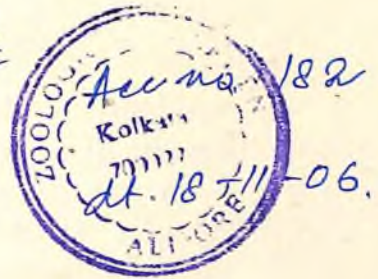
CHAPTER I.

CAMP SITES—EQUIPMENT—METHODS OF KEEPING FIT IN THE JUNGLE, ETC.

ALL books have to make a start and we have deliberated as to whether this one, which purports to contain advice to the young shikari, should commence with the subject of rifles, a description of the wild animals he hopes to pursue, or his equipment for the jungle trip. By a system of elimination, not unknown to the ancients, the decision has been arrived at that the book will start with the chapter on camp sites, equipment, and methods of keeping fit in the jungle. This weighty decision having been come to, we shall without more ado get down to the subjects in hand.

In Government Forests, camping sites are settled by Government and the young shikari will be told where he may camp. By arrangement with the Forest Department he may perhaps be able to obtain the use of a forest bungalow. If, however, he is shooting in an Indian State or Zemindary, he will probably have to choose his own encampment and he should be careful how he goes about this. Generally speaking, beautiful sites are the most dangerous. Grassy glades at the foot of hills, with clear streams of seepage water, are invariably dangerous on account of the fever-carrying

639
ALE



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mosquitoes, which breed abundantly in such localities. It is unwise at any time to carry out the custom of the country of camping too near tanks or rivers on account of the mosquito danger. If allowed, your servants will always try and select such a neighbourhood to save the trouble of carrying water any distance. It is worth while taking all precautions possible against the mosquito danger. Nets should always be taken for yourself and your servants; this is most important.

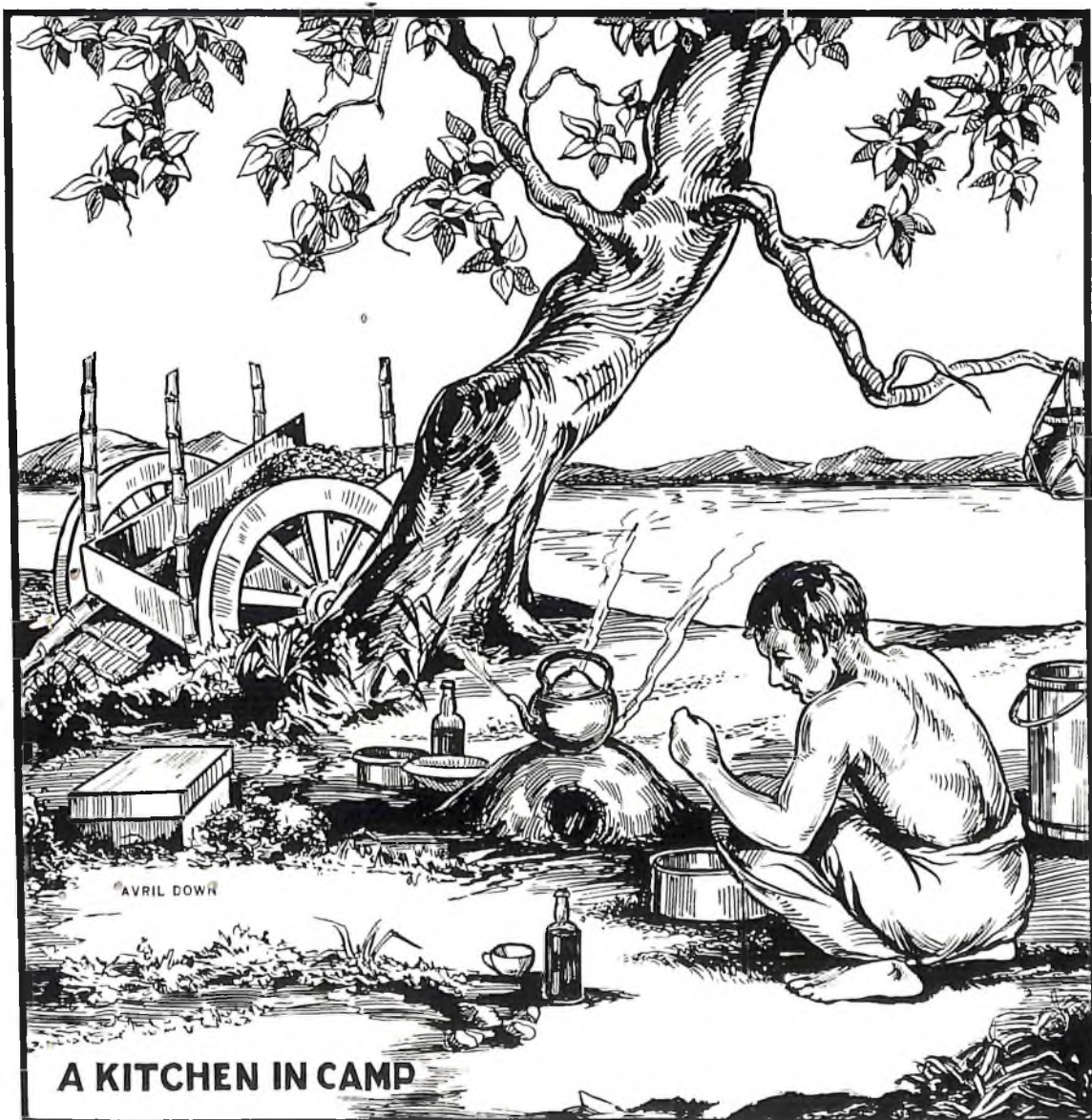
The best site to select for a camp is a place a fair distance from water and under good shade. Mango topes are, as a rule, unsuitable in that they are often infested with insect pests, and as they are frequently used as camping grounds by cartmen and cattle herders they are usually far from clean.

Any other trees which give good shade are preferable to the mango.

The ground selected for your camp should be cleared of leaves and grass for a good area around, as a protection against snakes, scorpions and also fire.

With regard to camp equipment, the first advice we have to offer is—make yourself and your servants as comfortable as circumstances permit. Even in war there is no object or merit in suffering more privation or discomfort than necessary. Why should it be necessary in shikar, where conditions are, as a rule, far easier?

Many a shikar trip which ought to have been highly successful has become a hopeless failure through sheer lack of thought and knowledge in taking a few very simple precautions and the unnecessary cutting down of essential transport. We are not for one moment advocating the expense involved in extensive transport arrangements. For example, in the hot weather in the Central Provinces it is not necessary to have heavy tents; you can be perfectly comfortable in



[Facing page 2.

shelters made from the branches of trees and grass, if a little ingenuity and intelligence in the construction of these be employed.

Your food and that for your servants must be good and sufficient, and a little extra expenditure in this direction often makes all the difference between success and failure.

In the cold weather be sure that both you and those working with you have warm clothing and blankets.

Take good lamps and a sufficient number of them, and do not forget the oil or petrol. Be sure that all water to be drunk by either yourself or your servants has been properly boiled and then kept cool in a clean earthenware *chattie* or in canvas *chagals*. For each member of the party take not less than two *chagals*, as well as a large size water bottle covered with thick felt.

◦ The following is a list of articles which will be found useful:

◦ *For each member of the party.*

One folding camp bed (do not sleep on the ground if it can be avoided).

Two folding camp chairs.

Two small camp tables.

One canvas bath.

One enamel iron wash basin with leather lid.

Two cakes Coal Tar soap.

One packet toilet paper.

Two empty kerosene oil tins for carrying and boiling bath water.

One electric torch.

Two Hurricane lamps.

One tin opener.

Enamelled iron crockery (1 Soup plate, 2 Dinner plates, 2 small plates).

Two table knives.
Two forks.
Two dessert spoons.
Two table spoons.
Two tea spoons.
One small teapot.
One sugar basin.
One milk jug.
Two china cups and saucers.
One egg cup.
Two tumblers.
Two wine glasses.
One Sportsman's knife with swivel.
One pocket compass.
One whistle.
100 yards of rope about $\frac{3}{8}$ inch diameter for tying *machans*,
etc. Stain this with permanganate before you start.
50 yards of rope for tying "Garahs."
One kukri.
One ball of twine.
One strong haversack.
Two canvas *chagals*.
One water bottle.
Cigarettes, tobacco, matches.
Writing materials.
Telegraph forms.
Stamps.
Fountain pen with bottle of ink in travelling case.
Two pencils.

Do not forget to take money in small change; the following is suggested for a 10-day trip:

Rs. 10 in one-anna pieces.
Rs. 30 in two-anna pieces.
Rs. 50 in four-anna pieces.
Rs. 100 in silver rupees.
Rs. 150 in Rs. 10 notes as a reserve.

EQUIPMENT

5

Each person must also take all necessary cleaning gear for his gun and rifles.

If a fisherman, also take necessary fishing tackle.

In addition, whether for one or more people, the following are required:

One set cooking pots.

Two kettles.

One portable oven.

One grid for chops.

One collapsible meat safe.

Two corkscrews. } These items often get lost.

Two tin openers. }

Two petrol or other good lamps.

One extra Hurricane lamp.

Two tins kerosene oil.

One tin petrol.

One map of the locality.

One rope ladder about 18 feet long.

One steel tape 50 feet.

Two balls of string.

One sailor's needle.

Four empty gunny bags.

250 wire nails about $3\frac{1}{2}$ inches long for pegging out skins.

150 wire nails of assorted lengths and sizes.

One hammer.

One mortising chisel.

One strong screw-driver.

One pair cutting pliers.

One pair pincers.

One small fine-tooth hand saw.

One coarse-tooth hand saw.

One axe.

One meat chopper.

One dozen candles.

300 Cardboard Wads, with any shot number or other mark, to be used as tokens when employing beaters.

SOME SIGNPOSTS TO SHIKAR

One lb. washing soda.
One tin knife polish.
One tin Keating's Powder.
Three dozen boxes matches.
One box Sunlight soap.
One piece Monkey Brand soap.
Two tins Arsenical soap.
One bar ordinary soap for washing clothes.
One small bottle Phenyle.
One small bottle Lysol (for ticks).
One tin Flit. }
One Flit gun. } For keeping away mosquitoes in camp.
One bottle (100) Formalin tablets, for preserving skins.
One bottle (100) Aspirin tabloids, 5 grains.
One bottle (25) Calomel tabloids, 3 grains.
One bottle (100) Cascara tabloids, 5 grains.
One bottle (100) Quinine tabloids, 5 grains.
One bottle (4 oz.) Carbolic Acid.
One bottle (6 oz.) Castor Oil.
8 oz. Epsom Salts.
4 oz. Potassium Permanganate.
One bottle (6 oz.) Tincture of Iodine.
One bottle Saloids of Corrosive Sublimate (Burroughs and Wellcome) for making 1 in 1,000 disinfectant, as per instructions in Chapter IV. This is a strong poison and must be kept under lock and key.
Six rolls bandages.
Three triangular bandages.
Four small packets surgical gauze.
Four small packets cotton wool.
One roll Lint.
One rubber tourniquet.
One surgical knife.
One glass syringe (2 oz. capacity).

Each member of the party will no doubt take a certain amount of literature to suit individual taste, but there are

five books which we advise either the single individual or party to take on the trip. These are:

Notes on Sporting Rifles, by Major Gerald Burrard, D.S.O.

Wild Animals in Central India, by A. A. Dunbar Brander, F.Z.S., F.R.G.S.

The Indian Field Shikar Book, by W. S. Burke.

Tiger and Other Game, by Col. A. E. Stewart.

The Preservation of Shikar Trophies, by Messrs. Van Ingen and Van Ingen, Mysore.

These five books will not weigh much and will add greatly to the joy of your trip.

List of bedding, clothing, etc., for each person of the party:

One sleeping bag.

Two blankets (brown or khaki).

One rug.

Two pairs of sheets.

Two pillow cases.

Two pillows.

One mosquito net.

Two bath towels.

Two face towels.

One waterproof valise.

Two shikar coats of Solaro cloth.

Two pairs khaki slacks.

Two pairs putties.

One pair riding breeches.

One pair Jodhpurs.

Two pairs slacks.

Four khaki shirts.

Two tennis shirts.

Six pairs socks.

Two pairs boots with either crepe rubber or Phillips' rubber soles.

One pair slippers.

One pair soft leather mosquito boots.

Six vests (as usually worn).

Two khaki or neutral colour sweaters.

One cushion with soft khaki cover.

It is of course of the utmost importance that one be thoroughly fit throughout the trip and in this connection it would be as well to observe the following simple rules.

Strenuously avoid hanging about camp in wet clothes.

Have a hot bath as soon as possible after you come in, and put on a set of dry clothing.

Do not start off in the early morning without first having a good square meal. You can never be certain when you will get your next and it is wise to have a good foundation to work on.

Be sure to take with you a full water bottle and some food. Biscuits, chocolate and a tin of sausages are easily carried in a haversack and will see you through even if you have to spend a night in the jungle away from camp. Insist that the men accompanying you take some food as well.

An occasional dose of 5 grains of quinine for all in camp does much to keep off fever and other ailments.

Remember that the change in the habits of yourself and your servants which life in the jungle necessarily involves, often goes hardly with the working of your "internal economy." Should such be the case a little Glauber or Epsom salts before one's early morning tea will soon put matters right. There is nothing new in this advice; it was regularly practised by the famous Colonel Peter Hawker before a big partridge shoot about 100 years ago as a means of "clearing the eyesight and steadying the nerves." The treatment in his case certainly had the desired effect, as he was reputed, with a double flint lock gun, to have killed 100 partridges with 100 shots—a performance which few to-day, with all our modern appliances and even with the assistance of Mr. Glauber's preparation, can equal.

Do not forget to take with you a supply of bandages, iodine, and potassium permanganate, and when after dangerous game take a small supply in your haversack. Even with the greatest care accidents do sometimes unfortunately occur and the immediate use of these simple antiseptics may save a man's life.

Some notes concerning the "first-aid" treatment of wounds, jungle maladies, etc., are given in Chapter IV, while a list of stores suggested for the trip will be found in Chapter II.

CHAPTER II.

INSIDE THE COOKHOUSE.

To many the food *bundobust* for a shikar trip is a great trial, but it cannot be ignored, so the subject must perforce be dealt with.

The value of obtaining fresh meat and fresh fish is naturally well understood, as quite apart from being far preferable to anything tinned, there is the satisfaction of eating the product of your own skill.

In the matter of stores to be taken on the trip, a great deal depends on the nature of the district to which you are going. In places where fish is procurable and there are fishermen by caste, you will find them only too willing to supply you, but as one may not be successful in obtaining fresh meat or fish, anyone proceeding on a shikar trip must be prepared to (if necessary) live largely on stores conveyed from his station of residence. A list of stores considered as sufficient fare for two for a period of from ten days to a fortnight is therefore given on page 12. This, with the help of chicken and eggs, which can, as a rule, be obtained in the jungle, and what one may shoot in the way of venison, peafowl, pigeon, etc., will see you through.

From our own experiences we give the following advice which we hope may be helpful.

Order groceries from your regular grocer, who on your return will smilingly take back all stores which have not been used on your trip.

Bread is certainly a great luxury in camp, but for making this it is necessary to have an oven and perhaps four moulds, three tins Polson's superfine kiln-dried flour (or any flour will do), and for the yeast, a tin of hops, brown sugar, potatoes. If, however, there are difficulties which make it necessary to reduce transport, suitable substitutes are (i) Cabin biscuits, (ii)*Ryvita biscuits, and (iii) Cream crackers. These could be supplemented with ordinary soda scones which any cook worthy the name should be capable of turning out at short notice, and for which the following is quite a good recipe:

Ingredients:

- 3 tablespoons (heaped up) flour (*maida*).
- 1 tablespoon (heaped up) Paisley flour.
- Yolk of one egg.
- Half a cup of milk.
- 1 dessertspoon butter.
- Salt and sugar to taste.

Mix the Paisley flour in a little of the ordinary flour (*maida*) and keep aside. Next beat up the yolk of the egg in the milk. Now mix the remaining ingredients in a bowl or saucepan, adding the milk and yolk of egg gradually, and last of all add the mixture of *maida* and Paisley flour which has been set aside, and lose no time in putting into a hot oven on a flat dish (the cover of a *dekchie* does very well), heaping a dessertspoonful at short distances to form small rolls.

Chapattis can also be eaten in place of bread, but it is not everyone who cares for them, and some might find them indigestible.

The following is a list of stores necessary for two people, for a trip of ten days to a fortnight in the jungle:

- 1 5-lb. tin Cabin biscuits (or equivalent in Ryvita biscuits or Cream crackers).
- 2 or 3 tins of Quaker Oats.
- 5 or 6 tins of fish.
- 5 or 6 tins of sardines.
- 5 or 6 half-pound tins of sausages.
- 2 lbs. of bacon.
- 8 small tins of butter.
- 2 jars or tins of marmalade.
- 4 jars or tins of jam.
- 1 tin Golden Syrup.
- 2 tins tea.
- 1 large bottle coffee essence.
- 1 tin cocoa.
- 24 small tins of milk ("Ideal" unsweetened is good).
- 1 tin milk in powdered form for puddings, sauces, etc.
- 1 bag sugar.
- 1 bottle Bovril.
- 1 medium sized hump. If your cook cannot spice hump, buy one in a tin, ready spiced, about 5 lbs.
- 1 tongue.
- Army Rations and Bully Beef (if your cook is inexperienced).
- 8 seers of potatoes.
- Vegetables, fresh and tinned (French beans, green peas, haricot, tomato, beans, and carrots of good tinned varieties).
- 6 tins of fruit in syrup.
- Dried fruit—1 lb. prunes, 1 lb. apricots, 1 lb. apple rings.
- Cereals for milk puddings. Milk can generally be obtained, but should be very carefully boiled. Milk in powdered form is strongly recommended unless you are sure of good fresh milk.

Cornflour, or Arrowroot, or Benger's or Horlick's, in case of illness, when ordinary diet cannot be eaten.

1 lb. fresh cheese.

1 tin of cheese.

1 tin of cheese biscuits.

1 bottle curry powder.

1 tin Paisley flour.

1 tin Borwick's baking powder.

6 small tins or jars of potted meat.

Raisins for puddings and cakes.

Salt, pepper, mustard, red pepper, vinegar, Worcester sauce, pickles, chutney.

1 tin of sweet biscuits.

Nut chocolate.

Spicing of Meat:

Ingredients necessary for spicing about 4 lbs. of meat.

1 lb. salt.

4 ozs. saltpetre.

4 ozs. *jagri*.

$\frac{1}{2}$ tea-cup vinegar; ginger, cloves, pepper, chillies and limes to taste.

Pound the ingredients and mix with the lime juice and vinegar. Place the meat in a shallow dish (a wash hand basin will do) and rub the mixed ingredients well into it. Make incisions here and there with the point of a sharp table knife or penknife, and fill the incisions with the ingredients. Then let the meat stand in its own juice from 2 to 5 days, and take care to see that it is rubbed and turned over, both morning and evening. Before boiling, wash off the ingredients; and before placing the meat in the saucepan or *dekchie* for boiling, bind tightly round with broad tape. The water in the saucepan should be just sufficient to cover the meat and should be put in cold. Boil till tender (4 to 5 hours), removing the scum as it rises to the surface.

When cooked, remove the tape, and sponge off any scum adhering to the meat.

Note.—Tongues to be pickled and cooked in exactly the same manner.

Drinks.—Kia-ora Lemon Squash, Kia-ora Orange Squash, a bottle of ginger beer essence, beer, vermouth, gin, whisky, brandy as desired.

Water.—Besides the water bottle, take two canvas *chagals*; while one contains cold water ready for use, the other can be cooling. All water should be most carefully boiled for both yourself and your servants. Boiled water should be used for cleaning teeth and also for gargles, should such be necessary. If it be impossible to boil water, protection can be obtained by chlorination, for which tablets are obtainable.

Cold Tea.—Use the same quantity as if making hot tea, but pour cold water on the tea leaves and allow to stand from 4 to 6 hours. Drink with lemon or lime juice.

Concerning the edible parts of big game, some of us no doubt look back, possibly with an excusable smacking of the lips, to various Home leaves before the war, when we partook of oysters, sole, and Porterhouse steak at Gow's in the Strand, a cut from the joint at Simpson's a little further along, dinner at the Carlton, and supper (preferably with a fair companion) at the Savoy. Wonderful as these feasts of Lucullus certainly were, can they for real enjoyment compare with a well cooked dinner in the jungle off the product of one's very own efforts? Can the finest turtle soup of a Guildhall banquet bear comparison with the soup made from the tail of a bison tracked from early morn throughout the heat of a mid May day in the Central Provinces and eventually brought to bag?

Certain meals in the jungle stand out like milestones in shikar trips, but of what avail in the way of food is the great

black bull of India unless one knows where to look for the delicacies and how to prepare them for the table? The marrow might be prepared fit for a king, or be inferior to the grease from an axle box, the difference being in the cooking. We candidly admit that on our jungle trips there are three things which we appreciate more than a little; these are—congenial companions, reliable rifles, and well cooked game. Perhaps in the course of our service we have had too intimate acquaintance with food out of tins to desire on holiday trips in the jungle the continuance of such association; and as we wish that others may benefit from our many unpalatable (and probably indigestible) meals, we propose in this chapter to give a little advice on the subject of the selection of the tit-bits of various game animals, and the cooking thereof, so that one will desire to eat the meat as well as the gravy. Mere man may know what to select and how to cook it, but we are somewhat sceptical if he is in reality competent to describe the process in all the detail so necessary for good results. We have therefore called to our aid certain lady friends in the persons of Mrs. W. J. Anthony, Mrs. A. Martin-Leake and Mrs. R. MacGregor-Innes, to assist in this matter, and we owe them our thanks for much help and useful advice.

We will now proceed with a description of the tastiest morsels of some of the edible animals of the jungle, and the methods of bringing them to the table.

Note.—(1) The *Saddle* includes that portion of the back of the animal lying between the hind quarters and the second last pair of ribs, and not separated from the backbone.

(2) The *Undercut* is the tender fleshy portion on the inner face of the saddle, lying in two parallel strips on either side of the Vertebra or backbone.

(3) The *Chops* constitute the fleshy portion adhering to the upper extremities of the ribs and the backbone. To secure these, cut down to the ribs with a sharp knife along the fleshy portions on either side of, and close to, the backbone and then cut through the rib joints with a sharp chopper along the line of incisions already made, retaining eventually only such length of the rib bones as are necessary to form the chop.

ELEPHANT.

Elephant flesh, when carefully cooked, makes an excellent stew—tender and of good flavour. It has been mistaken for good beef. The tongue and trunk are not recommended; they are as tough as some rubber tyres. Sanderson recommends the baking of the feet in a hole in the ground under a wood fire, but we have had no experience of this.

BUFFALO AND BISON.

Only undercut and tongue can be eaten, while the tail and shin bone can be used for soup. The tail also makes an excellent brown stew.

BARASINGHA AND CHITAL.

The saddle and chops are good eating. For roast saddle, slit open the fleshy parts and let in slices of bacon, and roast in the usual way. The tongue boiled, and the tail either stewed or made into soup, are both appetising. The shin bone also makes excellent soup.

SAMBHUR AND NILGAI.

Except the tongue and undercut, the flesh of these animals is coarse eating, but the tail and shins make quite good soup,

while the marrow bones would be hard to beat. The marrow or thigh bones are 12 to 18 inches long; these should be broken in two in the middle and the broken ends covered over with a thick layer of ordinary flour (*atta*) dough and bound firmly over with a piece of muslin or other cloth available, to prevent leakage of the marrow during the boiling operation. Boil for four to five hours and serve up hot, with salt and pepper to taste.

Barking deer, Blackbuck, Chinkara and Chaursingha are all good eating—legs, loin, saddle, undercuts, liver, etc.

The suet of Barking deer and Chaursingha is useful for cooking.

A "hot-pot" made of any part of the smaller animals and of small game is excellent, always stewing slowly. Turn out about every fourth day and start again. No vegetables should be put into the stew, as they would make it sour.

BEAR.

Some hungry people have eaten bear steak with relish, but our experience is that the undercut, chops and liver made into a pie with short pastry is the only possible dish.

FIG OR WILD BOAR.

In the cold weather the head and trotters make excellent brawn. Clean the head and trotters of all hair; from the latter remove the hoofs and put on to boil, using sufficient cold water to cover it. When sufficiently boiled to leave the bones easily, place in a hot pan and, while hot, remove all bones and such parts as are not required, *viz.*, the eyes, ears and snout, and cut up the meat into small pieces as quickly as possible to prevent the fat settling in it. Now add the necessary seasoning, such as salt, pepper, cayenne pepper, cloves and a few leaves of sage or

other scented herb if available, all pounded and mixed together previously. Stir briskly and place in a cake tin or mould, and press down, and keep pressed down all night with a heavy weight placed on top. Should a cake tin or mould not be available an ordinary aluminium *dekchie*, with the cover of the next smaller size *dekchie* placed over and weighted, will suit the purpose. The brawn will have cooled and set by the morning and should cut quite firm. The suet of the jungle pig can be used for cooking purposes, preferably mixed with *ghee* or Cocogem.

PORCUPINE.

This small animal is considered quite a delicacy and is certainly good eating; the flesh is white and tender and is a welcome addition to the larder.

SMALL GAME.

Stew, jug, grill or roast. Cold pies are always good. Any small game is useful for the hot pot.

SNIPE.

An excellent stew can be made of snipe and potato and onions. Never roast too brown—many people prefer them very lightly cooked. Serve on fried bread, with lemon and red pepper. Can also be eaten cold.

PEAFOWL

Is, as a rule, dry eating, but can be considerably improved by the addition of a little bacon. Always hang the bird for 2 to 3 days if possible and, when roasting, slit open the breast in places and let in slices of bacon. This will improve the flavour considerably.

Mulligatawny made from peafowl, and served up with boiled rice and sliced lemon, is perhaps one of the most palatable dishes the sportsman can indulge in on his shooting excursion; and as peafowl are always plentiful, he should see that his cook is not a novice in preparing this dish. The following is a good recipe:—

Ingredients to a pound of meat:

Turmeric (*haldi*)—about 1 inch length.

Dry chillies (*mircāi*)—2 or 3 in number.

Green ginger (*adrak*)—about 1 inch length.

Gram, either roasted or boiled and husked—2 or 3 tablespoons.

One small onion and salt to taste.

First boil the meat, adding sufficient water to cover it; when cooked, add the above ingredients, which should be finely ground, and boil all together for another 15 to 20 minutes. Now remove the meat and set aside, and strain the soup through a coarse strainer. Next heat $1\frac{1}{2}$ to 2 tablespoons *ghce* or Cocogem in a clean *dekchie*, having thrown in some slices of onion; and when red hot, add the strained soup and meat and allow to simmer till the soup thickens. To be served with boiled rice and sliced lemon. If cocoanut milk is added at the last simmering it will improve the richness and flavour considerably.

• *Roasting Venison*.—Wipe meat well with damp cloth and put into hot roasting tin or pan with plenty of fat or dripping. Place in hottest part of oven for first ten minutes, turning frequently and basting well. Remove to cooler part of oven and cook *slowly* till tender, allowing about twenty minutes to each pound of meat and twenty minutes over; baste frequently.

Gravy.—When ready, put meat on hot dish and keep hot. Pour off fat into a dish, leaving sediment in baking tin. Add to

sediment 1 tea cup hot water and some salt, and stir till it boils. Serve with meat. (Delicious gravy is obtained if the meat is well sprinkled with flour when half cooked.)

Piquante Sauce:

1½ oz. sultanas.

¼ oz. currants.

3 chopped onions.

Put in pan with a little butter, fat, or lucca oil, and fry till brown; add a little water or gravy. Make smooth paste of 2 teaspoonfuls cornflour and a little cold water, add to pan and stir till sauce thickens. Allow to simmer slowly. When ready, add a little grated nutmeg, if available, and the rind (not juice) of half a lime, which is to be taken out before serving. If too thick to pour, add more water or gravy. Serve hot.

If liked, add one wineglass Madeira or Sherry to sauce *just* before serving. Sauce must not be boiled after wine is added.

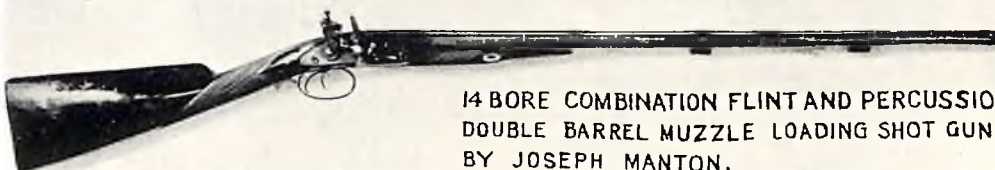
Additional Notes.—The smaller deer and antelope are naturally better eating, particularly barking deer and blackbuck. Any meat, of course, is suitable for curry.

To spice and salt meat, leave in the pickle for not less than two days.

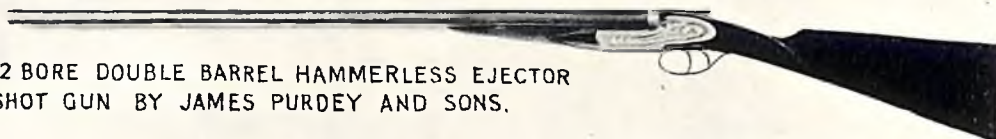
Cover meat with vinegar and hang for one or two days in the cold weather.

Any stores in tins, such as sardines and other fish, jams, butter and potted meat, etc., unless eaten at once, should, when opened, be removed from tin and kept in large mouthed glass jars, cups, or dishes in your Tundice on the train; in the jungle, stand in water in a *chattie*. Butter kept in this manner can be safely eaten on the fourth day. Care should be taken that all food in camp is kept out of reach of stray cats and dogs.

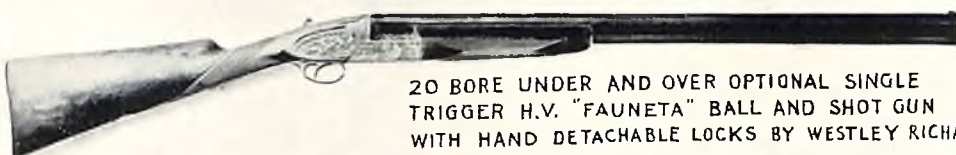
SOME MASTERPIECES OF THE GUNMAKERS CRAFT



14 BORE COMBINATION FLINT AND PERCUSSION
DOUBLE BARREL MUZZLE LOADING SHOT GUN
BY JOSEPH MANTON.



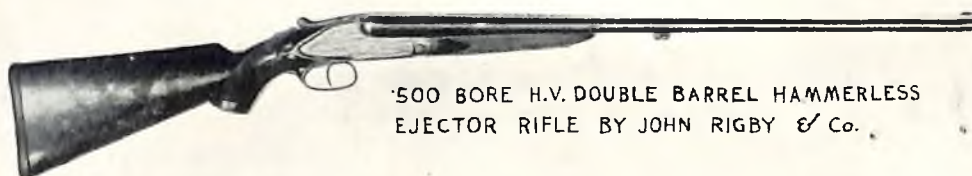
12 BORE DOUBLE BARREL HAMMERLESS EJECTOR
SHOT GUN BY JAMES PURDEY AND SONS.



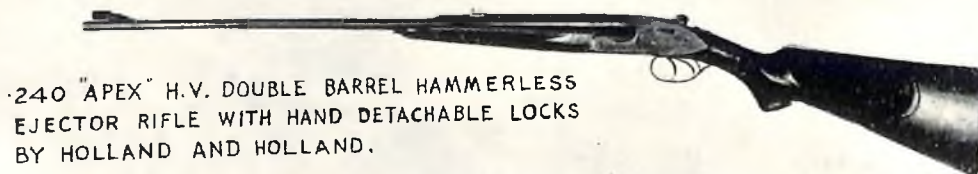
20 BORE UNDER AND OVER OPTIONAL SINGLE
TRIGGER H.V. "FAUNETA" BALL AND SHOT GUN
WITH HAND DETACHABLE LOCKS BY WESTLEY RICHARDS & Co.



.375 MAGNUM H.V. DOUBLE BARREL HAMMERLESS
EJECTOR RIFLE WITH HINGED FORESIGHT BY
WILLIAM EVANS.



.500 BORE H.V. DOUBLE BARREL HAMMERLESS
EJECTOR RIFLE BY JOHN RIGBY & Co.



.240 "APEX" H.V. DOUBLE BARREL HAMMERLESS
EJECTOR RIFLE WITH HAND DETACHABLE LOCKS
BY HOLLAND AND HOLLAND.



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CHAPTER III.

THE SPORTING RIFLE OF TO-DAY.

To those who take an interest in the sporting rifle, not merely as a lethal weapon but as a real friend on which some day their life may depend, we feel we cannot do better than advise a careful study of the second editions of those two most instructive and interesting books, namely:

- “Notes on Sporting Rifles,” by Major Gerald Burrard, D.S.O., late Royal Artillery, published by Messrs. Edward Arnold and Company, London, in 1925, and
- “The Sporting Rifle and its Projectiles,” by Captain James Forsyth, late Bengal Staff Corps, published by Messrs. Smith Elder and Company, 65 Cornhill, London, in 1867.

In these two books will be found a vast store of information written by experts past and present. Should the reader desire to study the flight of bullets, he would do well to read a little book entitled “Exterior Ballistics,” by Lieutenant-Colonel Sir Phillip W. Richardson, Bart., O.B.E., V.D., and Major C. W. Wirgman, T.D., both international Rifle Shots.

We have now told you what to read, but as we have more or less committed ourselves to giving some advice on the

subject of sporting rifles, it may be mentioned that after over 25 years' experience with big game of the plains of India and the use of rifles of many makes and bores, we are forced to the conclusion that, although an advance in combining the qualities of a race-horse with those of a Clydesdale has undoubtedly been made since Sir Samuel Baker's day, sportsmen are still some way distant from having available on the market a weapon equally suitable for blackbuck in open country and a charging bull buffalo weighing about a ton in heavy jungle. In other words, a perfect all-round rifle does not yet exist.

The nearest approach to an all-round rifle is perhaps either the .375 Magnum High Velocity, with a 300 grain bullet, or the .470 High Velocity, firing a bullet weighing 500 grains propelled by 75 grains of cordite. One of us had made for him by William Evans, of 63 Pall Mall, a double barrel hammerless ejector rifle of the latter bore which, with 26-inch barrels, weighed 10 lbs. 12½ ozs. This was a very accurate weapon and was capable of placing eight shots, fired right and left alternately, on to a square with 1½-inch sides at 100 yards, and the barrels were so adjusted that there was no crossing of the shots. With such a weapon one could deal with any game in India, but it was undoubtedly too heavy for small beasts or for use in the Hills, and was perhaps on the light side for buffalo and bison, unless one was fortunate enough to be able to pick the shot. But how often is this possible at moving animals in heavy jungle? Furthermore, 11 lbs. or thereabouts is just about as much as the average man can manage throughout a whole day in the hot weather, and something lighter, if not greatly deficient in power, would certainly be an advantage.

The possession of the most suitable battery for shooting in the plains of India is largely governed by financial considerations. If money be no object, then have all your weapons double barrel hammerless ejectors. There are many advantages in weapons of this type, the chief being that the second barrel can be fired very quickly without the metallic noise inevitable with any form of magazine rifle. The advantage of two barrels was recognised over 60 years ago by that great shikari, Captain James Forsyth, who stated that "two barrels are essential in the sporting rifle, whether for a right and left at deer, etc., or in order to have a second barrel ready to stop a charge elicited by the application of the first."

It must however be realised at the outset that the manufacture of an accurate double barrelled rifle requires the greatest skill and patience, and in consequence such weapons are expensive, costing anything between £90 and £140. As it may not be within the capacity of the sportsman to pay such prices we propose to give recommendations concerning the type of weapon to suit various financial conditions. Before doing so, there are two points which we feel we cannot too strongly stress: these are (1) avoid anything in the way of a sporting rifle which is not of the very best of its type, and (2) do not go in for a bore for which cartridges are not readily obtainable in the country in which you propose to shoot.

We shall first deal with the fortunate individual—alas, not often met with in India!—to whom money is no object. All his weapons should be double barrel hammerless ejectors, and his battery should consist of a 12 bore shot gun and one of the following combinations for rifles:

- (a) A .375 Magnum H. V. for general use (to be carried always by the sportsman himself), and a

.600 bore H. V. for use against buffalo, bison, tsine, gayal, elephant and rhino;

or

- (b) A .470 H. V. for general use, to be carried always by the sportsman himself, except when definitely after deer or antelope, for which a .318 or .350 Magnum will be found light, accurate and effective.

Many sportsmen of experience consider that the .600 H. V. is unnecessarily heavy and that the .470 is good enough for anything in India. This is entirely a matter of opinion, on which divergent views will always be held; but the fact should not be lost sight of that as a rule the sportsman will carry his lighter rifle himself, and will only take over the .600 when reasonably close to the heavy beasts he is after. If carried on a wide web sling, neither the .600 H. V. nor an 8 bore black powder Paradox or rifle is beyond the power of the average man to carry for three hours or so, and at the end of that time to use with celerity and efficiency.

With regard to the rifle to be carried always by the sportsman himself, or, in other words, to be his constant companion in the jungle, this must fulfil two essential conditions. It must not be too heavy for him to carry without fatigue, and to use quickly and accurately at the end of a long day in the hot weather; and secondly, for its weight it must possess the greatest possible power, and the size and weight of the bullet should be such as to have a reasonable chance of stopping a buffalo or other heavy beast should it have to be used in an emergency.

One of us has killed both bison and buffalo with a single shot from a .375 Magnum, and although we certainly do not recommend this bore for general use against such heavy beasts, we are of the opinion that the effect of this rifle on game appears

to be very little inferior—if at all—to that of the .470. Further considerations in favour of the .375 Magnum are that it is almost a pound lighter in weight than the .470, and, if long shots have to be taken, the accurate judging of distance is not so important as with the larger bore.

We repeat that those to whom money is no great matter should have all their weapons double barrel hammerless ejectors. The question of the rifle to be one's constant companion, whether the .375 Magnum or the .470, and the bore to be selected for one's second rifle, must be left to the individual himself; but in the matter of your capacity to deal with the weight of any particular rifle we would advise you not to forget that the apparent weight of a rifle at the end of a long day in the hot weather in India is a very different matter to what it is, after a good breakfast, in a gunmaker's shop in London.

For the sportsman who can afford only one double barrel hammerless ejector rifle, his choice must depend on the kind of animal most likely to be met with. If heavy beasts, such as bison, in addition to the usual game, are likely frequently to be encountered, we recommend the .470; but if the majority of game will be nothing heavier than tiger, then we think that the .375 Magnum with the 300 grain bullet will be found the most generally useful rifle for India.

For those who desire to possess two rifles and whose expenditure is limited to say £50 for this portion of their battery, we suggest a single barrel .375 Magnum, either falling block or magazine action, costing about £35, and a second-hand 8 bore Paradox or rifle firing 10 to 12 drams of black powder.

Lastly, for those who still desire to have two weapons but whose expenditure is limited to say £30, we advise a second-

hand double barrel .577 black powder rifle and a 9.5 mm. (.375) Mannlicher Schonauer, each costing about £15.

It may be mentioned that the .577 black powder rifle is one of the very best weapons for tiger, and with hard lead bullets many bison and buffalo have been bagged with it by famous shikaris of the past. Cartridges loaded with low pressure nitro powder and nickel base bullets can be used in this, as in other black powder rifles. There is a great advantage in cartridges so loaded, owing to the elimination of smoke; but it is not every rifle originally built for the use of black powder that will shoot well with low pressure Nitro—although we have had experience of two rifles which shot equally well with both.

With regard to the 9.5 mm. (.375) Mannlicher Schonauer, this is a light, handy, rotating magazine rifle, usually made on the "take down" principle; it is good enough for the heaviest deer, but it has nothing like the power of the .375 Magnum, neither has it the same flatness of trajectory.

What has been said above deals with rifles for use in the plains of India, and it is presumed that in all cases the shikari will possess in addition a double barrel 12 bore shot gun.

We have, unfortunately, had no experience of shooting in the hills, or in Kashmir; but, judging by the weight and vitality of many of the animals met with in these localities, and bearing in mind the long range at which shots have of necessity often to be taken, we would use the .375 Magnum with the 235 grain bullet if we went on a shikar trip to the hills.

Before purchasing a rifle, whether new or second-hand, try it yourself at a target, and also examine the bore with the greatest care and ensure that it is perfect. In connection with the trial of high velocity rifles in Great Britain and in India, our

experience is that high velocity rifles which shoot dead on the mark at 100 yards range in Great Britain shoot about $2\frac{1}{2}$ inches high in India. We are of the opinion that the sights should be adjusted to allow for this. You should also always try your rifle before going on a shikar trip, and satisfy yourself that everything is as it should be with the weapon on which so much will depend. If there be any defect, unless you happen to be an expert both in the knowledge of the construction of weapons and the handling of tools, do not attempt the repair yourself but send it straight off to the best gunmaker available; and see that the case containing the weapon is packed round with a good supply of shaving or other resilient material inside a strong wooden box. In India the wooden packing case should be wired and sealed before despatch.

NOTE ON THE CLEANING OF RIFLES.

It is most important that the shikari should do everything possible to ensure the accuracy of his rifle, and also to avoid any damage to the bore from the corrosive gases of nitro powders. We have found the following a satisfactory method of keeping rifles clean.

1. Before starting off into the jungle remove every sign of grease or oil from the bore by means of a piece of flannelette threaded through a *loop* screwed on to your cleaning rod. We do not recommend the use of a jag, either as part of the rod or to screw on separately, as in our opinion it is liable to damage the rifling near the muzzle. If grease and oil are not removed from the bore, high shots and dangerous pressures are liable to result.

2. Take with you to the jungle either in a pouch in your haversack or in a trap in the butt of your rifle, a good bristle brush pull-through with loop through which is threaded a piece of flannelette of the correct size to suit the bore, well covered with "B. S. A. Safety Paste," or other similar preparation, for neutralising the effect of nitro powder. When you are reasonably certain that you will not fire your rifle again, pull it through three or four times before returning to camp.

3. On returning to camp take off the barrels, hold them in one hand with a *jharon* and with the other pour through the bore about half a quart of *boiling* water. Thread a piece of slightly oily flannelette through the loop of your rod and scrub through the bore with this; then use several pieces of dry flannelette in the same manner until they come out clean after use. Then thread through the loop of your cleaning rod a piece of flannelette heavily covered with "B. S. A. Safety Paste," or other similar preparation, and pass this slowly through the bore several times, making sure that the chambers also receive their share. Push out the extractors, clean them thoroughly, and grease between them and the barrels with the same preparation used for the bore. Use a little light gun oil on the legs of the extractors. Thoroughly clean the slots in the action into which the lumps of the barrels engage, and oil the slots with fine gun oil.

4. The outside of the barrels, action, and all metal work should then be lightly oiled over. Do not allow ordinary gun oil or grease to get on to either the wood of the stock or the fore-end: it is liable to make the wood spongy. The woodwork should occasionally be polished with a little Maxwax or linseed oil, using an old silk handkerchief.

5. Should you find, after several applications through the bore of the dry flannelette mentioned in clause 3 above, that it

does not come out clean, you will probably discover that there is a slight metallic deposit on the rifling. This can be removed by first scrubbing with "Cunired," or other similar preparation, on a piece of flannelette, then with a brass wire brush and lastly with dry flannelette. We do not, however, advise the use of these abrasive preparations unless absolutely necessary.

6. The methods suggested above for the cleaning of rifles may also be applied to shot guns.

In connection with sporting rifles the following information may be of interest:

One ounce avoirdupois = $437\frac{1}{2}$ grains.

One dram = 27.33 grains.

16 ounces = 1 lb. = 7,000 grains.

Powder.—The standard black powder charge for a 12 bore shot gun is 3 drams (equal to 82 grains). The *volume* occupied by 3 drams (or 82 grains) of black powder is the same as that occupied by 33 grains of E. C., Empire, or Smokeless Diamond, or by 42 grains of Amberite or Schutze. The ordinary 3-dram measure can therefore be used for loading all the above powders, which are in consequence known as "Bulk" smokeless powders.

Bore.—The bore of large calibre black powder weapons is denoted by the number of *spherical* bullets of pure lead (of exactly the same diameter as the bore) as will weigh 1 lb. Thus, an 8 bore means that 8 *spherical* bullets for this weapon weigh 1 lb.—or, in other words, that the bullets for this weigh 2 ozs. (or 875 grains) each.

The bore of the modern high velocity rifle is expressed in decimals of an inch—thus, .600, .470, .369, etc.—as measured across the lands of the rifling.

The relative weights and diameters of spherical and conical bullets for some black powder rifles is given below:—

Bore (or number of spherical Bullets which weigh 1 lb.).	Diameter of Bullet in inches.	Weight of Bullets in grains.	
		Spherical.	Conical.
8	·835	875	1257
12	·729	583	750
16	·662	437½	550
20	·615	350	425 (Fauneta)

Striking Energy.—The blow which can be delivered by various weapons used for big game shooting is usually expressed in foot lbs. at the muzzle, or at some particular range, such as 100 yards.

For those who may be unacquainted with this method of expressing power, it may be explained that one foot lb. is the blow delivered by a weight of one lb. falling freely from a height of 1 foot. Similarly, 1,000 foot lbs. represents the blow delivered by a weight of 1 lb. falling 1,000 feet, or 5 lbs. falling 200 feet, or 10 lbs. falling 100 feet. Now, if a weight of 1 lb. is allowed to fall freely through a height of 1,000 feet, it will, owing to the effect of gravity, have attained a velocity, at the instant of impact, of nearly 254 feet per second. This result is derived from the formula:

$$V^2 = U^2 + 2g.s.,$$

where V =the final velocity in feet per second which we wish to find,
 U =the initial velocity (in this case zero, since the body starts from rest),
 s =the vertical distance travelled (in this case 1,000 feet), and
 g =the acceleration due to gravity (32.2 feet per second per second).

It will be seen therefore that the blow delivered at the instant of impact is dependent on the weight of the body and on the velocity at which it is moving when it strikes the object.

As in the case of sporting rifles we have to deal with the weight of the bullet and the velocity at any particular range, let us now work back to the example of a weight of 1 lb. falling freely through 1,000 feet which delivers a blow of 1,000 foot pounds, and set the question in this manner. What will be the striking energy of a projectile weighing 1 lb. whose striking velocity is 254 feet per second?

In this case let E = the striking energy in foot pounds which we desire to find,

V = the velocity at the instant of impact (254 feet per second),

W = the weight of the projectile in pounds, and

g = the acceleration due to gravity (32.2 feet per second per second).

Then the striking energy is found from the formula:

$$\begin{aligned} E &= \frac{W V^2}{2g} \\ &= \frac{1 \times 254 \times 254}{2 \times 32.2} = \frac{64,516}{64.4} \\ &= 1000 \text{ foot-pounds (approximately).} \end{aligned}$$

Let us now take a practical example:

Find the striking energy at the muzzle of a .375 Magnum High Velocity Rifle with a bullet weighing 300 grains and a muzzle velocity of 2,460 feet per second.

Now 300 grains = $\frac{300}{7,000}$ lbs., and, using the formula given above, we obtain

$$E = \frac{300}{7,000} \times \frac{2,460 \times 2,460}{2 \times 32.2} = 4,027 \text{ foot-pounds.}$$

The effect of rifle bullets on animals is difficult to understand because we cannot in practice get from a rifle bullet sufficient momentum (which is the *mass* of the bullet multiplied by its velocity) as can be developed by even a small animal in its stride, and it is the balancing of these two momenta which would bring the animal to a standstill physically.

For example, a blackbuck weighing 88 lbs. has a mass of $\frac{88}{32.2}$ lbs. If this buck be travelling at even as low a speed as 40 feet per second (or $27\frac{1}{4}$ miles per hour), it will have a momentum of $\frac{88}{32.2} \times 40 = \frac{3,520}{32.2} = 110$ pounds feet; whereas a bullet weighing 900 grains, fired from a .600 bore High Velocity Rifle with a velocity of 1,950 feet per second, has a momentum of $\frac{900}{7,000 \times 32.2} \times 1,950 = \frac{251}{32.2} = 8$ pounds feet only, at the muzzle.

The bullet will therefore fail physically to bring the blackbuck to a standstill. This problem may perhaps better be demonstrated in the following manner:

We know from Newton's Second Law of Motion that action and reaction are equal and opposite; therefore, the momentum of a bullet in a forward direction is exactly equalled by the momentum of the rifle in the opposite direction, or as transmitted to the shoulder of the man who fires it.

It will be admitted that if a blackbuck weighing 88 lbs. travelling at 40 feet per second (or $27\frac{1}{4}$ miles per hour) were to hit a man standing in the position used in firing a rifle, on the shoulder, that man would be knocked completely over; whereas the recoil from a .600 bore H. V. Rifle will not do so.

This example is a practical proof that the momentum of a blackbuck weighing 88 lbs. and travelling at 40 feet per second is greater than that of a bullet weighing 900 grains at the muzzle of a .600 bore H. V. Rifle; and so it will be seen that the blackbuck cannot be stopped even by such a powerful weapon by virtue of the momentum of its projectile alone.

This theory can further be demonstrated by means of a resilient India-rubber model having the mass of a blackbuck and propelled on wheels at a speed of 40 feet per second. If this model be hit fair and square by a bullet from a .600 bore H. V. Rifle the bullet will have little effect in arresting the forward movement of the model.

It is, however, known from experience that even a light rifle will bring down a blackbuck "head on" at full gallop. This brings us to a point where it is desirable to explain in a certain amount of detail the different characteristics of the momentum and energy of a moving body. As both momentum and energy depend only upon the weight of the bullet and its velocity, it may prove somewhat confusing for the reader to grasp the inherent differences between these two properties of a projectile. Without going into mathematics, the best way of explaining this is by means of an example. From this example it will be shown that although a number of different bullets of different weights and velocities may have the same stopping effect, the lighter of these bullets travelling at high speed will have the greater energy and therefore, within limits, greater destructive effect upon an animal.

Reverting to the imaginary example of the India-rubber blackbuck model advancing directly towards a rifle, the simplest case to consider is where conditions are such that the impact of the bullet will bring the animal to a dead halt while

the bullet imbeds itself in the rubber body. In order for this to come about, one condition—and one only—is required, namely, that the momentum of the model and that of the bullet must be the same.

Now suppose that instead of 40 feet per second the blackbuck model is advancing at 1 foot per second, and that its weight is, as before, 88 lbs.; then the momentum is

$$\frac{\text{Weight}}{32.2} \times \text{velocity} = \frac{88}{32.2} \times 1 = 2.73 \text{ pounds feet.}$$

It is quite easy to calculate the velocity of a number of bullets of different weights which will have a momentum of 2.73 pounds feet, and which will therefore stop the India-rubber model if fired directly at it. In tabulated form the result is as follows:—

<u>Weight of bullet</u>	<u>$\frac{W}{32.2}$</u>	<u>Momentum.</u>	<u>Velocity.</u>
·2 lb.	$\frac{.2}{32.2}$	2.73	440 feet per second.
·1 lb.	$\frac{0.1}{32.2}$	2.73	879 feet per second.
·05 lb.	$\frac{0.05}{32.2}$	2.73	1,758 feet per second.
·025 lb.	$\frac{0.025}{32.2}$	2.73	3,516 feet per second.

We can now see that these four bullets of different weights will exactly bring the moving model to a standstill.

The point now to be grasped is that although these bullets have the same momentum, or stopping power, with regard to

a moving model, their energy varies very greatly, as is shown below:—

Weight in lbs.	Velocity in feet per second.		Energy $\left(= \frac{W}{64.4} \times \text{Velocity}^2 \right)$
·2	440	193600	$0.2 \times \frac{193600}{64.4} = 601$ foot-pounds.
·1	879	772641	$0.1 \times \frac{772641}{64.4} = 1199.7$ foot-pounds.
·05	1758	3090564	$0.05 \times \frac{3090564}{64.4} = 2399.5$ foot-pounds.
·025	3516	12362256	$0.025 \times \frac{12362256}{64.4} = 4799$ foot-pounds.

From this table it will be seen that of the four bullets, all of which have the same momentum or theoretical stopping power, the lightest bullet, owing to its higher velocity, will have by far the greatest amount of energy; and, assuming that the resistance is the same in all four cases, this bullet will penetrate furthest into the rubber model. In the case of a live animal this energy will be available for the breaking of bones (provided that the bullet is heavy enough and large enough to do this), the destruction of tissue and the dealing of shock, but in order to impart shock to the full amount the bullet must of course remain in the animal. Should it go through and emerge with a velocity of, say, 1,000 feet per second, then an amount of energy of $\frac{.025 \times 1000^2}{64.4} = 388$ foot-pounds will not have taken effect on the animal.

In spite of what has been written above, the sportsman should not fall into the error of supposing that its striking energy is the only consideration in estimating the power of a rifle on game.

The other consideration is shock or impact, which is measured by the rate of change of momentum. It is obvious that a large bullet with a low velocity will be more quickly

brought to rest than a small bullet with a high velocity. Mathematically this is represented by the equation $t = \frac{Kv}{m}$, where t is the time taken for the bullet to come to rest and k is some constant dependant on the material into which the bullet is fired. Assuming now that we have two bullets, one of small mass m with a high velocity V , and the other of larger mass M and low velocity v , then

$$\left. \begin{array}{l} \text{Shock or Impact for} \\ \text{the large mass bullet} \end{array} \right\} = \frac{Mv}{t} = \frac{Mv}{\frac{kv}{M}} = \frac{M^2}{k}.$$

Similarly for the small mass bullet the shock or impact $= \frac{m}{k}$. It will thus be seen that the shock is proportional to the square of the mass of the bullet. The above clearly shows that whereas a fairly high velocity is necessary in order to enable sufficient energy to be generated, at the same time a bullet of fairly large mass is desirable in order to impart the necessary shock.

As a general working rule it may be stated that one must have a bullet of sufficient weight and size to smash the largest bone of the animal to be encountered and to destroy tissue over the greatest possible area, and the striking energy of the bullet at the moment of impact should be greater than that of the animal when moving at the speed at which the shot will usually be taken.

It is most important that the type of bullet be such as to remain in the body of the animal as a single mass, since, should it break up, each small portion will take longer to come to rest and so a proportion of the shock will be lost. The truth of this is illustrated by the following experiences.

A barasingha stag standing almost head on was hit in the chest at a range of 70 yards by a soft-nosed bullet weighing 500 grains fired from a .470 bore high velocity rifle; the bullet entered

FULL SIZE EXAMPLES OF SPORTING BULLETS
UNFIRED AND *AFTER EXTRACTION FROM ANIMALS.

.318 - 250 Grains
soft nose



Unfired

from Sambhur



.375 Magnum 300 Grains
solid



Unfired

from Bison



470 - 500 Grains
soft nose



Unfired

from Bear



20 bore Nitro Fauneta
425 Grains



Unfired

from Chetal stag



8 bore Paradox
1257 Grains
Steel point



Unfired

from Buffalo



the chest, smashing the breast bone, which stripped the nickel jacket of the bullet off the lead core and broke up the lead core into several pieces. These fragments of the bullet destroyed three-quarters of the heart, tore one lung and the liver to pieces in their path, and no part of the bullet came out of the animal—yet that barasingha went sixty yards before falling dead.

On the other hand a bull bison going all out, in the process of charging someone else, was hit behind the shoulder at close range with a solid Nobeloy bullet weighing 300 grains from a .375 Magnum H. V. Rifle, and was rolled over like a rabbit on the spot; in this case the bullet did not break up, but, having buckled its nose on a rib on the side of entry, was found embedded as one solid mass under the skin on the far side of the animal, as illustrated on the page opposite.

The above examples are not given with the idea of in any way decrying the .470, which is an excellent rifle, but with the object of illustrating the great importance of the bullet remaining as a single mass in the animal.

It might here be pointed out, however, that in addition to being considerably lighter in weight than the .470, the .375 Magnum appears to have some extraordinarily paralysing effect in addition to disruption of tissue, due to the high velocity combined with the reasonably heavy weight and fairly large diameter of its bullet. Be that as it may, we cannot too strongly impress on our readers that the larger and heavier the bullet the better for dealing a knock-out blow to an animal. In the case of the .375 Magnum we therefore advise that only the 300 grain bullet be used for shooting game in the plains of India; and for big beasts like bison far heavier weapons, such as a .600 H. V. or an 8 bore Paradox or rifle, should, as a rule, be employed.

The following are the velocities and striking energies of the various rifles previously mentioned in this chapter, as calculated by Major Burrard in his book "Notes on Sporting Rifles" and as obtained by us in the case of the 9.5 mm. Mannlicher Schonauer:—

Rifle.	Charge of powder.	Weight of conical bullet in grains.	Velocity in feet per second.		Striking energy in foot lbs.	
			At the muzzle.	At 100 yards.	At the muzzle.	At 100 yards.
8 Bore ..	10 drams black.	1257	1500	1198	6290	4010
.577 ..	6 Do.	650	1650	1340	3930	2600
.600 H. V. ..	110 grains cordite.	900	1950	1690	7610	5720
.470 H. V. ..	75 Do.	500	2125	1910	5030	4060
.375 Magnum*	57 grains M.D.T.	300	2460	2260	4040	3410
.375 Magnum..	57 Do.	270	2600	2380	4060	3400
.375 Magnum..	Do.	235	2850	2560	4250	3420
9.5 mm (.375) Mannlicher Schonauer ..	43 grains smokeless.	270	2150	1943	2769	2261
.350 Magnum..	62 grains	225	2600	2360	3380	2790
.318 ..	50 Do.	250	2340	2150	3050	2580

* NOTE.—.375 is the diameter of an unfired bullet from this rifle; the true bore or diameter across the lands of the rifling in this weapon is .369 inches.

In the table the velocity and striking energy both at the muzzle and at 100 yards for a small proportion of the vast number of sporting rifles on the market to-day have been given.

We have shown how, given the velocity at any point (for example, the muzzle) and the weight of the bullet, the striking energy may be obtained. This is a simple matter in so far as striking energy at the muzzle is concerned, but in order to obtain the striking energy at any particular range other than at the muzzle it is first necessary to obtain the velocity at that particular range, and this depends on the following factors:

- (a) The velocity of propulsion, *i.e.*, muzzle velocity.
- (b) The shape of the bullet.
- (c) The weight of the bullet.
- (d) The diameter of the bullet.

It is obvious that the striking velocity is some factor of the muzzle velocity, and the air resistance which causes the diminution of velocity as the bullet proceeds along its path is a factor of the combined shape, weight and diameter of the bullet.

Those interested in rifles owe an enormous debt of gratitude to Colonel Lord Cottesloe, C.B., V.D., T.D., Chairman of the National Rifle Association, Lieut.-Col. H. Mellish, C.B., V.D., Mr. F. W. Jones, O.B.E., Lieut.-Col. Sir Phillip W. Richardson, Bart., O.B.E., V.D., Major C. W. Wirgman, T.D., and several others for the time and energy which they have given to the study of this interesting and somewhat complicated problem.

To follow the theory on which these gentlemen worked involves the knowledge of a good deal of mathematics, and as this may be tedious to some of our readers we give it in Appendix B for those who desire to wade rather more deeply into the subject. As we are however fairly certain that nearly every shikari would like to have some ready means of obtaining the striking velocity of his rifle at any particular range, we

include in this chapter a pair of sliding scales which will give this direct, without any calculation whatever.

In connection with the making of these scales we wish cordially to acknowledge the great assistance we have received from Captain R. Strick, late R.E., whose exceptional mathematical knowledge was made full use of during the Great European War of 1914-18, much to the discomfiture of our opponents both on sea and land.

The sliding scales referred to above are two in number and are labelled A and B. Scale A, which we will call the fixed scale, you will note is a permanent part of the book. Scale B, which we will call the sliding scale, has been provided in duplicate. One of these is perforated and can be torn out for use in conjunction with Scale A. The other is fixed in the book as a reserve should the first one be lost.

The method of operation will be clear from the accompanying diagram which shows that the striking velocity of a bullet with ballistic co-efficient $C = .24$ and with muzzle velocity of 2,500 feet per second on a range of 250 yards is 1,943 feet per second.

It will be seen that the edge of Scale B is laid along the diagonal line of value $C = .24$, and that the scale has been shifted lengthwise until the mark representing velocity 2,500 feet per second coincides with the range line of 250 yards.

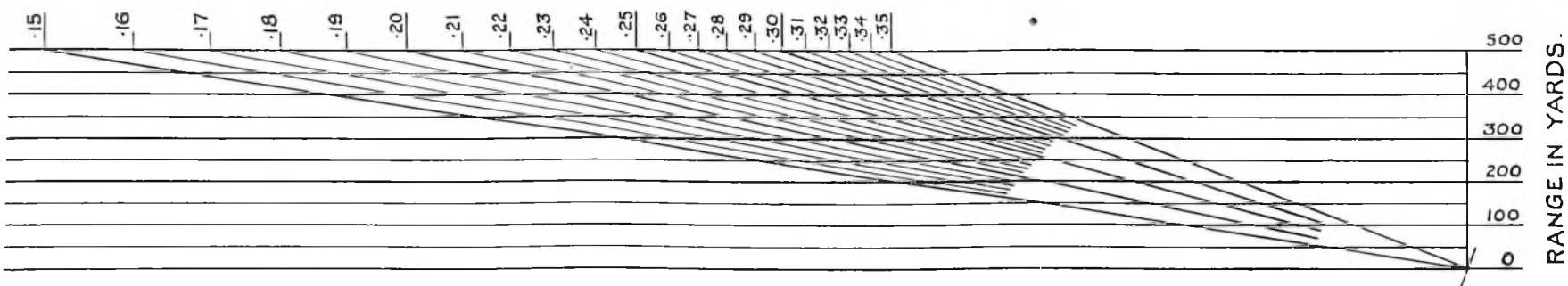
The striking velocity is read on Scale B opposite the zero point of range on Scale A, which point is also the focus of all the diagonal lines.

The value of C , the ballistic co-efficient, is obtained from the formula

$$C = \frac{W}{nd^2},$$

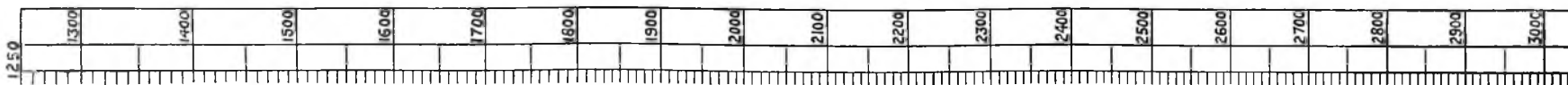
when W = the weight of the bullet in pounds,
 n = the shape co-efficient,
 d = the diameter in inches of the *unfired* bullet.

BALLISTIC COEFFICIENTS "C"

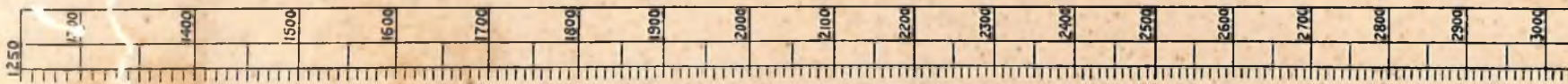


SCALE A RANGES & BALLISTIC COEFFICIENTS

SCALE B VELOCITIES IN FEET PER SECOND



SCALE B VELOCITIES IN FEET PER SECOND



It will be seen from Appendix B that the shape co-efficient (n) is equal to unity when the air resistance on the projected area of a bullet of one inch diameter travelling at 1,300 feet per second is 5 lbs.

At the end of Appendix B are also given the ballistic and shape co-efficients of bullets for a few sporting rifles in general use to-day.

A BRIEF NOTE CONCERNING SHOT GUNS.

We have previously explained in this chapter that the standard *black* powder charge for an ordinary 12 bore shot gun is 3 drams or 82 grains, and the *volume* of this black powder charge is the same as that occupied by 33 grains of E.C., Empire or Smokeless Diamond, or by 42 grains of Schutze or Amberite smokeless powders.

The following are the loads of shot gun cartridges in general use:

Bore.	Length of case. Inches.	33 GRAIN SMOKELESS POWDER.		42 GRAIN SMOKELESS POWDER.	
		Powder.	Shot.	Powder.	Shot.
		grs.	oz.	grs.	oz.
4	4	90	3	112	3 $\frac{1}{4}$
8	3 $\frac{3}{4}$	70	2 $\frac{1}{4}$	83	2 $\frac{1}{2}$
10	2 $\frac{7}{8}$	44	1 $\frac{1}{16}$	56	1
12	2 $\frac{1}{2}$	33	1 $\frac{1}{16}$	42	1 $\frac{1}{16}$
16	2 $\frac{1}{2}$	28	$\frac{7}{8}$	36	$\frac{7}{8}$
20	2 $\frac{1}{2}$	24	$\frac{3}{4}$	31	$\frac{3}{4}$
28	2 $\frac{1}{2}$	20	$\frac{9}{16}$	25	$\frac{9}{16}$
410	2 $\frac{1}{2}$	10 $\frac{1}{2}$	$\frac{3}{8}$	12 $\frac{1}{2}$	$\frac{3}{8}$

Number of Pellets of various sizes of shot in one ounce:

Size of Shot.	Number of Pellets in one oz.		Diameter.		
			Inches.		
L. G.	5		.388		
M. G.	7		.360		
S. G.	8		.332		
Special S. G.	11		.300		

Size of Shot.	Number of Pellets in one oz.	Diameter Ins.	Size of Shot.	Number of Pellets in one oz.	Diameter Ins.
SS G	15	.269	No. 3	140	.128 ^c
SSS G	20	.245	4	170	.120
SSSS G	25	.227	4½	200	.115
SSSSS G	30	.214	5	220	.110
AAA	35	.203	5½	240	.106
AA	40	.194	6	270	.102
A	50	.180	6½	300	.099
BBB	60	.170	7	340	.095
BB	70	.161	8	450	.087
B	80	.154	9	580	.080
No. 1	100	.143	10	850	.070
2	120	.135			

Percentage of the total pellets in the charge which should be in a 30-inch diameter circle at various ranges corresponding to different boring of Shot Gun barrels.

Range.	True Cylinder.	Improved Cylinder.	Half Choke.	Full Choke.
Yds.	Per cent.	Per cent.	Per cent.	Per cent.
30	60	72	83	95
35	49	61	71	82
40	40	50	60	70
45	33	42	50	60
50	26	33	40	48
55	21	27	32	39
60	17	22	26	32

Details regarding standard 12 bore Shot Cartridges loaded with $1\frac{1}{16}$ oz. Number 6 shot and 33 grains powder by Imperial Chemical Industries, Ltd.

Range in Yards.	Mean Velocity over range in feet per second.	Time to travel over range in seconds.	Striking Velocity in feet per second.	Allowance in feet to be made ahead of a bird travelling at 40 miles per hour or $58\frac{2}{3}$ feet per second.
20	1,070	·0560	883	3·3
30	969	·0928	752	5·5
35	925	·1135	691	6·7
40	880	·1163	634	8·0
50	796	·1882	528	11·1

Diameter of Circles in inches taking the whole charge of a Gun at various ranges.

Boring.		Range in yards.						
		10	15	20	25	30	35	40
True Cylinder ..	..	19	26	32	38	44	51	57
Improved Cylinder	..	15	20	26	32	38	44	51
Half Choke ..	..	12	16	20	26	32	38	46
Full Choke ..	..	9	12	16	21	26	32	40

Number of Pellets of No. 6 shot in a circle, 30 inches diameter, at various ranges from a standard 12 bore cartridge loaded with 33 grains powder and $1\frac{1}{16}$ oz. of shot (*i.e.*, 287 pellets).

Boring.		Range in yards.						
		30	35	40	45	50	55	60
True Cylinder ..	..	173	142	114	95	75	60	49
Improved Cylinder	..	208	175	145	120	95	77	62
Half Choke ..	..	241	206	176	146	116	94	76
Full Choke ..	..	275	237	202	172	138	111	91

Results of tests in England in April, 1926, by one of the Authors with a 12-bore Choke-bored Gun by James Purdey and Sons, and Cartridges specially loaded with Smokeless Diamond Powder and No. 6 chilled shot—30 inches diameter circle,

40 yards. Only two shots were fired from each barrel in each series. No rounds omitted from the count.

Series.	Powder Grains.	Shot oz.	No. of Pellets in Charge.	Average No. of Pellets in Circle.	% of Pellets in Circle to Number in Charge.	REMARKS.
A	33	1 $\frac{1}{8}$	304 304	R.223 L.230	73.3 75.6	Good even pattern. Noticeable recoil.
B	33	1 $\frac{1}{16}$	287 287	R.209 L.219	70.3 76.3	Good pattern. No undue recoil.
C	33	1	270 270	R.180 L.217	66.6 80.4	Fair distribution. Two blanks near edges.
D	33	$\frac{7}{8}$	236 236	R.192 L.189	81.3 80.1	Light recoil. Hard centre. Good distribution.
E	30	1	270 270	R.202 L.220	74.4 81.5	Light recoil. Hard centre. Light recoil.
F	30	$\frac{7}{8}$	236 236	R.191 L.192	80.9 81.3	Remainder of pattern fairly hard. Light recoil. Hard centre.
G	36	1	270 270	R.216 L.213	80.0 79.0	Weak outside. Hard good pattern.
H	36	$\frac{7}{8}$	236 236	R.197 L.194	83.5 82.2	High velocity. Fair recoil. Pattern and velocity excellent.
Westley Richards' Standard A.L.P. Cartridge	36	1	270 270	R.218 L.220	80.7 81.5	Little recoil. Good even pattern. High velocity. No undue recoil.

As a result of the above tests the owner had some of the choke removed by the makers from the right barrel of his gun so that with 33 grains of powder and $1\frac{1}{16}$ oz. of No. 6 shot it now gives a pattern of 190 pellets with the right barrel and 218 with the left in a 30-inch circle at 40 yards. With this boring the following loads have been found to give good results in India, and entirely to obviate gun headache even after firing a great number of shots on a hot day:

For snipe—30 grains smokeless Diamond and $1\frac{5}{16}$ oz. shot.

For duck—33 grains smokeless Diamond and $1\frac{5}{16}$ oz. shot.

For Great Britain, cartridges with standard loading are with this gun in every way satisfactory.

CHAPTER IV.

A FEW THINGS WORTH KNOWING.

WE think it might be helpful to give in as concise a form as possible a list of a few things which it is useful for a sportsman in India to know in connection with a shikar trip. We are also giving in this chapter some notes on the First Aid treatment of wounds and jungle maladies.

1. When tracking, if footprints be difficult to follow, look out for a stone which may be displaced, a broken twig or turned blade of grass, or a fallen leaf wet with dew which may have been turned over.
2. When sitting up over a "kill," if you notice a jackal or vulture suddenly make off, you can be fairly certain that the owner of the kill is near by.
3. Monkeys and certain birds, for example, the kingcrow, chatter when one of the Felidae, such as a tiger or panther, is near.
4. A tiger sometimes roars with the object of keeping jackals and other animals away from the "kill."
5. A crow suddenly flying up into a tree will often indicate the position of a "kill." Vultures circling round in the sky or sitting on trees are also a sure indication

of the position of the kill. If the vultures or crows are perched on the trees, it is a sure indication that the tiger is either on the kill or in the immediate vicinity.

6. A tiger, when travelling through the jungle, and not in pursuit of game, will always walk on a jungle path, road, fire-line or in the dry bed of a nullah. When tying up for tiger or panther, as far as possible, select a spot near the point where two paths, or a path and a nullah, or two nullahs, meet. Also be sure that a good tree, in which you can later on tie the *machan* if you intend to sit up, is within easy shooting distance of this point. If you are going to sit up, the " Garah " must be tied by the foreleg with a strong rope which the tiger cannot break. If, on the other hand, you wish to beat, then the rope should be such that the tiger can easily break it and drag the " kill."
7. All wild animals which are unwounded, with the possible exception of the boar, will usually move away from the sound of the human voice if they have a means of escape.
8. If any unusual sound be made in the jungle and an animal cannot see the cause, it will always move away from the sound which it cannot comprehend.
9. To tell the difference between the " kill " of a tiger and a panther, remember that a tiger *usually* seizes its prey with its teeth on the top of the neck, that the neck is always broken, and that the tiger starts eating the rump; whereas a panther seizes its prey under the throat and starts eating the stomach.

10. The time at which tiger and panther return to their "kill" is variable; if the locality be a quiet one, they may return as early as 4 p.m., but they usually come by 8-30. If they do not come by that time, they are unlikely to come before midnight, and will probably turn up just before dawn.
11. In constructing a *machan*, whether for a beat or for sitting up, tie it as high up in a tree as feasible, and be sure that it is thoroughly screened with leaves and branches on all sides and underneath as well. Be sure that you have a good background of some kind of jungle growth, and satisfy yourself that an animal will not be able to see your outline against the sky.
12. Keep absolutely quiet and still. If you have to move in your *machan*, then do so very slowly, as rapid movement attracts attention of both man and beast.
13. Do not dangle your legs over the side of a *machan*; sit on it cross-legged, or on a low stool or *morah*, with your legs and feet on the *machan*. A leg hanging down is very liable to attract attention. If you find that keeping your legs and feet on the *machan* is uncomfortable, there is no great harm in resting your feet in a fork of the tree, provided you do not move them.
14. Cover the *machan* with a light mattress or with thick rugs, and wear soft clothes and boots which will not make a noise if you have to move. Wear "slacks," or Jodhpurs. Riding breeches and putties may also be worn, but are less comfortable in a *machan*. Do not wear shorts when in a *machan*, as mosquitoes will worry you and probably cause movement.

15. Make yourself as comfortable as possible with cushions, etc., so that you will not feel the necessity of moving your position.
16. Take a waterbottle and haversack with some food, and also a pair of field glasses, but be sure that these are all placed on the *machan* within easy reach and are not tied dangling over the edge. Do not use a waterbottle with a screw stopper: it is noisy.
17. Always sit with your left shoulder facing the direction from which the animal is expected to come in a beat. When sitting up over a "kill," have your left shoulder towards the "kill." This arrangement will give you a comfortable field of fire of nearly 180 degrees. This compass should, if possible, include the line of the "drag," which is the usual line of approach of a tiger to its "kill."
18. *Beats*.—Although we do not propose to go into any minute details concerning the running of beats, there are a few points which are worth attention:
 - (a) If it be decided to have a beat in any particular locality, the "Garah" should be tied with a rope which can easily be broken by the tiger, so that the "kill" can be dragged.
 - (b) The "Garah" should be tied at a place close to which there is water and shade, and adjoining jungle suitable for the tiger to lie up in.
 - (c) The "Garah" should be given a good drink before being tied up and a good supply of cut grass should be placed within his reach.
 - (d) Go yourself to inspect the "Garah" the next morning, and if there has been a "kill" see that no disturbing noise is made.

- (e) Always take your rifle. You may find the tiger on the kill. If so, stand not on ceremony. Shoot him on the spot. You may not get another chance.
- (f) Decide on the probable patch of jungle where the tiger is lying up, and from your study of the country (which you should make before you tie the " Garah ") make up your mind as to the direction in which the tiger is most likely to go if disturbed, and arrange to drive him in this direction. In this respect there is no vast difference between driving pheasants at Home and tiger in India.
- (g) Tie the *machan* and place the stops as silently as possible.
- (h) Be sure that you have a good view from your *machan* of all possible points of escape for the tiger and be sure that these are within certain range.
- (i) Permit no talking amongst the beaters until the beat actually starts.
- (j) Do not forget that if possible the tiger, or panther if there be one in the beat, should be allowed to pass your *machan* before you fire. This will minimise the danger of a wounded animal being turned back on to the line of beaters.
- (k) Shoot to kill. If you cannot make certain of your shot, do not fire at all.
- (l) It is advisable to have three or four reliable men, who will not cough or speak or move, placed in

trees about 60 yards behind the line of *machans*, to see what happens to the tiger or panther after passing the line of *machans*.

19. If you are fortunate enough to get a chance of taking part in pig-sticking, which is without doubt the finest sport in India, never forget that no liberties can be taken with the old grey boar. He is the bravest animal in the world and it is nearly always a case of you or him. As a rule you will get an indication of when he intends to charge if you watch his tail. When the boar raises his tail he means business. Be ready for it.

It may be found useful to know some rules for determining:—

- (a) The age of the moon on any date.
- (b) The North Point without a compass.
- (c) The time of day without a watch.

The age of the moon on any date may be found as follows:

Give to each month the following constants—

January	..	..	0	July	..	..	4
February	..	..	2	August	..	..	6
March	..	..	0	September	..	..	7
April	..	..	2	October	..	..	8
May	..	..	2	November	..	..	9
June	..	..	4	December	..	..	10

From the current year subtract 1911, multiply the difference by 11 and divide by 30; this gives a whole number and something over. Consider the remainder only; this is the constant for the year.

For example—

$$\frac{(1931 - 1911) \times 11}{30} = \frac{220}{30} = 7 \text{ and } 10 \text{ over.}$$

10 is therefore the constant for the year 1931.

Now, if you wish to find the age of the moon on the 28th of June, 1931, take the date of the month on which you want to know the age of the moon, namely, 28th; add the constant for the month; add the constant for the year; and divide the total by 30. The *remainder* gives the age of the moon on the date required.

For example—

The date of the month	..	..	..	28
The constant for June	..	..	..	4
The constant for the year	..	..	..	10
Total	..	..	..	42

Divide by 30 = 1 and 12 over. The moon will therefore be 12 days old on the 28th of June, 1931. Check this with a calendar and you will find that it is correct, full moon being on the 30th of June, 1931.

To find the North Point without a Compass.

In Daylight—in the Northern Hemisphere.—Hold a thin piece of straight stick vertically between the first and second fingers of your left hand. Lay your watch face up on the palm of that hand and move it round until the shadow from the stick lies along the hour-hand. A line bisecting the angle between the hour-hand and twelve o'clock with the watch in this position points *South*. This line produced through the centre of the watch points North.

The above is true throughout the year for any place lying outside the Tropics in the Northern Hemisphere (*i.e.*, whose latitude is greater than 23°—27'—30" North).

It is also true for places in the Tropics in the Northern Hemisphere between the 22nd of September and the 22nd of March. In the remaining half year it is true only for varying periods depending on the latitude.

At Night.—The North Point can be determined (approximately) by the North Star, which in turn can be located by the two Pointers (A and B in sketches) of the constellation of the Great Bear or Plough, as it is sometimes called. When the Great Bear has not fully risen, the constellation of Cassiopeia will be of assistance in locating the North Star. This constellation can be distinguished by its similarity to two triangles, one approximately right angled and the other obtuse angled, meeting at a common point, the combination forming (roughly) the letter W.

On the opposite page three sketches are given, showing the positions of the constellations of the Great Bear and Cassiopeia at different times of the night during the early part of the month of February. From these sketches it will be seen that the constellations of the Great Bear and Cassiopeia rotate from right to left about the North Star, so that towards the morning the Pointers of the Great Bear will be on the left of the North Star and Cassiopeia will have appeared on the right of it.

To tell the approximate time without a watch.

In India the sun rises and sets at the times on the dates given below (sun time):—

21st March.—Rises 6.04; Sets 6.11.

21st June.—Rises 5.16; Sets 6.47.

21st September.—Rises 5.48; Sets 6.00.

21st December.—Rises 6.36; Sets 5.21.

Your rifle or a stick held at any fixed angle casts its shortest shadow at 12 noon, as the sun is then at its greatest altitude above the horizon.

If the sun rises at 6 a.m. and sets at 6 p.m., then your rifle or a stick resting on the ground and held vertically will throw a shadow equal to its own length at 9 a.m. and 3 p.m.

SHEWING THE NORTH STAR, THE
POINTERS A & B OF THE GREAT
BEAR JUST VISIBLE, AND THE
CONSTELLATION OF CASSIOPOEA.
(EARLY FEBRUARY)



+ NORTH
STAR

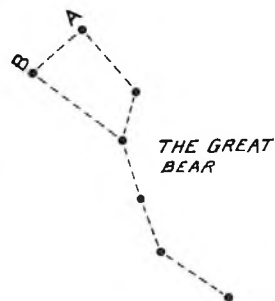


SKETCH I

SHEWING THE NORTH STAR, THE GREAT
BEAR FULLY RISEN, AND CASSIOPOEA.



+ NORTH
STAR

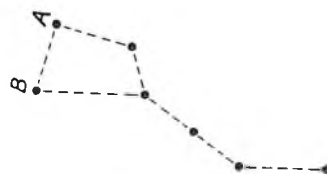


SKETCH II

SHEWING THE NORTH STAR, THE POINTERS
OF THE GREAT BEAR NEARLY VERTICAL,
AND CASSIOPOEA ABOUT TO SINK BELOW
THE NORTH STAR.



+ NORTH
STAR



SKETCH III

Average weight of animals of the Plains of India, with Dates of Close Seasons and Shedding and Fulness of Horn.

ANIMALS.	WEIGHT IN LBS.		†CLOSE SEASON.		Approximate date of Shedding horns.	Approximate date when animal is in full horn, (i.e., free of velvet).
	Male.	Female.	From	To		
*Barasingha (or Swamp Deer).	400	300	1st Apl.	14th Oct.	April	Nov.
Barking Deer (or Kakur) ..	45	30	1st Apl.	14th Oct.	May	Sep.
Bear (Sloth) ..	275	260	None		..	..
Bison (or Gaur)	1,950	1,750	1st May	31st Oct.	..	..
Blackbuck ..	88	75	15th June	15th Sep.	..	..
Boar ..	175	165	None		..	..
* Buffalo ..	2,200	2,200	Whole year		..	..
Cat (Jungle) ..	14	12	None		..	..
Chital ..	190	150	15th Sep.	31st Jan.	August	March
Chinkara ..	50	40	1st Apl.	30th Sep.	..	..
Chaurisingha (4-horned Antelope) ..	50	45	1st Apl.	14th Oct.	..	..
Dog (Wild) ..	40	35	None		..	..
* Elephant ..	9,000	8,000	Whole year unless prescribed		..	..
Fox ..	7	6	None		..	..
Gayaal (or Mithun) ..	1,700	1,500	1st June	31st Oct.	..	..
Hog Deer ..	100	90	1st Apl.	14th Oct.	April	Sep.
Hyæna ..	80	70	None		..	..
Leopard (Hunting) ..	120	100	None		..	..
Nilgai ..	600	480	None		..	..
Otter ..	21	19	None		..	..
Panther ..	150	130	None		..	..
Porcupine ..	35	30	None		..	..
Ratel ..	22	20	None		..	..
* Rhinoceros ..	..	..	Whole year		..	..
Sambhur ..	600	500	1st Apl.	14th Oct.	March	Dec.
Thamin ..	220	160	15th June	30th Nov.	July	Feb.
Tiger ..	470	350	None		..	..
Tsine ..	1,500	1,350	None		..	..
Wolf ..	45	40	None		..	..

* Note:—Close seasons for male Deer in full horn and for male Antelope and Bison are not laid down in the Game Regulations in many Provinces and States but the dates given above should be observed in the interests of Game Preservation. Game Laws of the area to be shot over should be consulted in each case.

† The shooting of Rhino, Elephant, Buffalo (and in some areas even Bison and Barasingha) require special permission which, if granted, entails a high special fee in addition to the License fee.

Average weight of some common Indian Game Birds of the Plains,
with Hindustani Names and Dates of Close Seasons.

English Names.	Hindustani Names.	Average Weight.	Winter Visitor or Resident.	Close Season.	
				From	To
(1) Bustard and Florican.					
Great Indian Bustard ..	Tookdar ..	M. 25 lbs. } F. 10 lbs. }	R.	1st Apl.	15th Sep.
Indian Houbara Bustard ..	Houbara ..	M. 5½ lbs. } F. 3½ lbs. }	W. V.	1st Apl.	15th Sep.
Bengal Florican ..	Charas ..	4½ lbs.	R.	15th Mar.	30th Sep.
Lesser Florican ..	Likh ..	1½ lbs.	R.	1st Apl.	15th Sep.
(2) Crane.					
Common Crane ..	Kulang ..	....	W. V.		None
Demoiselle Crane ..	Karkarra ..	....	W. V.		None
(3) Duck and Teal.					
Brahminy or Ruddy Sheldrake ..	Chuckwa ..	About 4 lbs.	W. V.		None
Comb Duck or Nukta ..	Nukta ..	M. 5¾ lbs.	R.	1st June	30th Nov.
Gadwall ..	Mila ..	2 lbs.	W. V.		None
Grey or Spot Bill Duck ..	Naddun ..	3½ lbs.	R.	1st June	30th Nov.
Mallard or Wild Duck ..	Nilsir ..	3 lbs.	W. V.		None
Pintail ..	San ..	2¾ lbs.	W. V.		None
Pochard ..	Lalsir ..	2½ lbs.	W. V.		None
P o c h a r d, Red Crested ..	L a l Chonch	2¾ lbs.	W. V.		None
Pochard, White Eyed ..	Karchiya ..	1½ lbs.	W. V.		None
Shoveller ..	Tokur Wallah	2 lbs.	W. V.		None
Tufted Duck ..	Ablak ..	2 lbs.	W. V.		None
Common Teal ..	Murghabi ..	15 oz.	W. V.		None
Cotton Teal ..	Gurgurra ..	10 oz.	R.	1st June	30th Nov.
Garganey, or Blue Wing ..	Chaitwa ..	1 lb.	W. V.		None
Whistling Teal (Large) ..	Silli ..	2 lbs.	R.	1st June	30th Nov.
Whistling Teal (Small) ..	Silli ..	1¼ lbs.	R.	1st June	30th Nov.
Widgeon ..	Chota Lal Sir	1¾ lbs.	W. V.		N o n e

English Names.	Hindustani Names.	Average Weight.	Winter Visitor or Resident.	Closed Season.	
				From	To
(4) Fowl.					
Jungle Fowl (Grey) ..	Jangli Moorghi ..	Over 2 lbs.	R.	1st Mar.	30th Sep.
Jungle Fowl (Red) ..	Ban Moorghi ..	2 lbs.	R.	1st Mar.	30th Sep.
Pea Fowl ..	Mor, Munjoor ..	M. 11 lbs.	R.	1st Apl.	30th Sep.
Spur Fowl (Painted)	Hoolka ..	10 oz.	R.	1st Mar.	30th Sep.
Spur Fowl (Red)	Chota Jungli Moorghi ..	14 oz.	R.	1st Mar.	30th Sep.
(5) Geese.					
Bar Head Goose	Chota Rajhans ..	7 lbs.	V.	None	
Grey Lag Goose ..	Sona Rajhans	9 lbs.	V.	None	
(6) Crouse (Sand).					
Black-bellied (Imp) Painted ..	Bhat Titur ..	20 oz.	W.V.	1st Apl.	15th Sep.
	Pahari Bhat Titur ..	7½ oz.	R.	1st Mar.	15th Sep.
Pintail, Large ..	Ka-at ..	12 oz.	W.V.	1st Apl.	15th Sep.
Pintail, Common ..	Bukht Titur ..	10 oz.	R.	1st Mar.	15th Sep.
Pintail, Spotted ..	Chittidar Bhat Titur ..	12 oz.	W.V.	1st Apl.	15th Sep.
(7) Partridge.					
Black Partridge ..	Kala Titur ..	16 oz.	R.	1st Apl.	15th Sep.
Chikor ..	Chukor ..	27 oz.	R.	1st Mar.	15th Sep.
Grey Partridge ..	Titur ..	12 oz.	R.	1st Apl.	15th Sep.
Painted Partridge	Kala Titur ..	13 oz.	R.	1st Apl.	15th Sep.
See See Partridge	See See ..	8 oz.	R.	1st Mar.	15th Sep.
Swamp Partridge	Kyah ..	18 oz.	R.	1st Apl.	15th Sep.
(8) Pigeon.					
Blue Rock ..	Jungli Kabutur ..	..	R.	1st Mar.	15th Sep.
Green Pigeon (Bengal) ..	Hurrial ..	..	R.	1st Mar.	15th Sep.
Green Pigeon (Southern) ..	Hurrial ..	..	R.	1st Mar.	15th Sep.
Green Pigeon (Kokla) ..	Kokla ..	..	R.	1st Mar.	15th Sep.
Wood Pigeon ..	Ban Kabutur	..	R.	1st Mar.	15th Sep.
Wood Pigeon Speckled ..	Chittri ..	..	R.	1st Mar.	15th Sep.

English Names.	Hindustani Names.	Average Weight.	Winter Visitor or Resident.	Close Season.	
				From	To
(9) Plover & Lap Wing					
Batan ..	Batan ..	..	R.	1st Mar.	15th Sep.
Golden Plover ..	Titiri, Batan ..	..	R.	1st Mar.	15th Sep.
Goggle Eyed or Thick Knee }	Barsiri ..	..	R.	1st Mar.	15th Sep.
Spur Wing ..	Titiri ..	..	R.	1st Mar.	15th Sep.
Red Wattled Lap Wing }	Titiri ..	..	R.	1st Mar.	15th Sep.
Yellow Wattled Lap Wing ..	Jitiri ..	..	R.	1st Mar.	15th Sep.
(10) Quail.					
Bush Quail (Blewitts) ..	Sirsi Lowa ..	2¼ oz.	R.	1st Mar.	15th Sep.
Bush Quail, Jungle ..	Lowa ..	3 oz.	R.	1st Mar.	15th Sep.
Bush Quail, Painted ..	Lowa ..	3 oz.	R.	1st Mar.	15th Sep.
Bustard Quail ..	Gulu ..	2½ oz.	R.	1st Mar.	15th Sep.
Button Quail, Large ..	Lowa ..	1½ oz.	R.	1st Mar.	15th Sep.
Button Quail, Small ..	Chota ..	1¼ oz.	R.	1st Mar.	15th Sep.
Grey Quail (Common) ..	Battair ..	4¼ oz.	W.V.	1st Mar.	15th Sep.
Rain Quail, Black-breasted ..	Battair ..	3 oz.	R. & W.V.	1st Mar.	15th Sep.
Rain Quail, Blue-breasted ..	Battair ..	2 oz.	R.	1st Mar.	15th Sep.
(11) Snipe.					
Common Fantail ..	Chaha ..	4¼ oz.	W.V.	1st Mar.	15th Sep.
Jack ..	Chaha ..	2½ oz.	W.V.	1st Mar.	15th Sep.
Painter ..	Chari ..	6½ oz.	R.	1st Mar.	15th Sep.
Pintail ..	Chaha ..	..	W.V.	1st Mar.	15th Sep.
Solitary ..	Chaha ..	7 oz.	W.V.	1st Mar.	15th Sep.
(12) Woodcock.					
Sim Titur ..	Sim Titur ..	11 oz.	W.V.	1st Mar.	15th Sep.

Note :—Close seasons vary in different Provinces and the Game Laws of each should be studied. Permission to shoot Bustard, Florican and Woodcock is difficult to obtain in places—and rightly so, as these birds are rare and require special protection.

PHRASEOLOGY

The following terms, to denote a number of certain animals or birds collected together, were used in the past, and in some cases are still employed:

ANIMALS.

- A *cete* of Badgers.
- A *sleuth* of Bears.
- A *singular* of Boars.
- A *gang* of Elk.
- A *skulk* of Foxes.
- A *sounder* of Hog.
- A *pride* of Lions.

BIRDS.

- A *sege* of Bitterns.
- A *covert* of Coots.
- A *herd* of Curlews.
- A *badelynge* or *paddling* of Duck.
- A *team* of Duck.
- A *gaggle* of Geese.
- A *skein* of Geese (in flight).
- A *covey* of Grouse.
- A *pack* of Grouse (a gathering of coveys).
- A *charm* of Goldfinches.
- A *cast* of Hawks.
- A *sege* of Herons.
- An *exaltation* of Larks.
- A *sord* or *sute* of Mallard.

- A *watch* of Nightingales.
- A *muster* of Peacocks.
- A *nye* of Pheasants.
- A *covey* of Partridges.
- A *congregation* of Plover.
- A *rush* or *flight* of Pollard.
- A *bcvy* of Quail.
- A *building* of Rooks.
- A *dapping* of Sheldrakes.
- A *walk* of Snipe.
- A *wisp* of Snipe (in flight).
- A *bost* of Sparrows.
- A *munuration* of Starlings.
- A *flight* of Swallows.
- A *herd* of Swans.
- A *spring* of Teal.
- A *company* of Widgeon.
- A *trip* of Wild Fowl.
- A *fall* of Woodcock.

MAXIMS FOR SPORTSMEN

We give below " The Maxims for Sportsmen " which one of us saw framed in a gunroom in the North of Scotland many years ago. We do not know the name of the Author, but all who use a gun or rifle should ponder on his advice and act on it.

If a sportsman true you'd be,
Listen carefully to me.
Never, never let your gun
Pointed be at any one;
That it may unloaded be
Matters not the least to me.

When a hedge or fence you cross,
Though of time it cause a loss,
From your gun the cartridge take,
For the greater safety's sake.

If 'twixt you and neighbouring gun
Birds may fly and beasts may run,
Let this maxim e'er be thine:
Follow not across the line.

Stops and beaters oft unseen
Lurk behind some leafy screen;
Calm and steady always be,
Never shoot where you can't see.

Keep your place and silent be,
Game can hear and game can see;
Don't be greedy—better spared
Is a pheasant than one shared.

You may kill and you may miss,
But at all times think of this—
All the pheasants ever bred
Won't repay for one man dead;
So if ever one flies low,
Prithee, sportsman, let him go.

Some Notes concerning the First-Aid Treatment of Wounds, Jungle Maladies, etc.

The shikari may be called upon at any time to give first-aid treatment in cases of accident or sickness when there is no medical assistance to be obtained. The most important cases he may have to deal with are mauls by the carnivora, as these are always of a serious nature and require immediate treatment on account of the infection introduced at the time of injury. Some knowledge of how to treat these wounds may save life by preventing blood poisoning. Prevention is better than cure, and the best way to save regrettable incidents in the jungle is not to take chance shots at dangerous animals. No liberties should be taken with tiger or panther, and the shikari should bear in mind that the wounding of these animals may end in

fatal accidents. Even with all care, accidents will happen at times, so it is as well to be prepared and to know how to meet them.

Tiger mauls are nearly always fatal for two reasons—firstly, from the extent of the damage caused at the time by such a large and powerful animal and, secondly, from the septic nature of the wounds, which causes blood poisoning later.

Panther mauls are not so serious at the time, but there is the same danger from blood poisoning.

Tigers' and panthers' canine teeth cause deep punctured wounds and septic infection is carried deeply into the tissue. Claws cause punctured wounds or open cuts; they are very septic on account of the foul matter retained in the grooves of the claws. The skin round a punctured wound has a tendency to contract on account of its elasticity and this leads to the closure of the wound and the retention of septic matter in the deep parts.

The object to aim at in the first-aid treatment of these wounds is to get rid of the infection at the earliest possible moment. To do this, the wound must be opened up, washed out, and drained. To carry this out, paint the skin for six inches round the wound with tincture of Iodine on cotton wool; make a free incision through the skin and the deep tissues to the bottom of the wound; wash out well with antiseptic solution, and then pack gauze lightly to the end of the wound to give drainage. Complete the treatment by putting a gauze dressing over the wound, secured by a bandage. A glass syringe is the best thing to use for washing out the wound with the antiseptic solution.

Every endeavour should be made to carry out the treatment with surgical cleanliness. Hands should be scrubbed in hot water with soap and a nail brush for five minutes, and then

placed in antiseptic solution for two minutes. Gauze and lint for dressing should be boiled in a *dekchie* or some other suitable vessel. A safety-razor blade makes a very good surgical knife and should be boiled with the syringe and dressings. The operation has to be done without an anæsthetic, but when the patient knows that it may save his life he will submit to it.

Bear Mauls.—Bear can inflict very serious wounds, but they are not dangerously poisoned like those of the carnivora. The head seems to be the main objective which the bear goes for; if he misses this he gets hold of some part of the body, often the abdomen. The skin and flesh over large areas may be extensively torn and left hanging in flaps. The skin for some distance round the wounds should be painted with Iodine, the wounds syringed well with the antiseptic solution, any torn portions of skin and muscle replaced, and dressings applied. Wounds should not be stitched up in any case of maulings by animals. Bites, if they are deep, should be opened up, syringed with antiseptic lotion and gauze inserted lightly to give drainage. The wounds are not infected in the same virulent way as those caused by carnivorous animals, so there is not the same risk of blood poisoning.

Goring by Bison and Buffalo.—Accidents do happen with these animals, but they are rare. The injuries are probably very serious and there may be broken bones and crushed internal organs. The patient should not be moved until a *charpoy* or improvised stretcher can be obtained. Any open wounds should be cleaned with antiseptic solution and dressed.

Bullet Wounds.—Fortunately it does not often happen, but on a shikar trip a man may be hit by a bullet from the sportsman's rifle. Should such an accident occur, the wound should be treated as described on the next page.

Apply Iodine to the surface of the wound and the surrounding skin, and dress with gauze, wool and a light bandage. If the wound is extensive and lacerated, it should be syringed out with antiseptic solution to remove as much dirt, clothing, etc., as possible before dressing. If the wound is in a limb and bones are broken, the limb must be fixed with splints. Bleeding can generally be stopped by firm pressure with a bandage over the dressings. The shikari should understand how to stop hæmorrhage from the large arteries when they are injured; this is fully explained in the book on "First Aid to the Injured" mentioned later.

Snake Bite.—It is important to know something about Indian snakes and to be able to recognise the poisonous kinds and treat their bites. The shikari should get Col. F. Wall's book, "Poisonous Terrestrial Snakes of our British Indian Dominions and How to Recognise Them, with Symptoms of Snake Poisoning and Treatment." This is the standard work on snakes and deals fully with the subject of treatment of snake poisoning. The only treatment that might be mentioned here is as follows:—

A tight tourniquet, of rubber if possible, should be placed on the limb *above* the bite to stop the circulation. In the leg it should be placed above the knee, and in the arm above the elbow. The site of the bite should be freely opened by long parallel deep cuts made in the length of the limb, and the wounds allowed to bleed freely with the object of getting rid of as much of the poison as possible.

Potassium permanganate crystals moistened with water should be rubbed into the depth of the wounds. Every attempt should be made to allay anxiety and fright, and the patient should be kept warm and quiet. Alcohol should *not* be given. Strong tea, black coffee, or warm milk can be given.

JUNGLE MALADIES.

It is useful to know how to treat the usual minor ailments which the shikari may meet, either in himself or his followers.

Malarial Fever.—Start the treatment with one Calomel tabloid (3 grains) at night, followed by a tablespoonful of Epsom Salts in warm water first thing in the morning, followed in half an hour by a hot cup of tea. Then take 10 grains of Quinine three times a day. If the fever does not come down in a few days it is probably not due to Malaria, and a doctor should be obtained, or the shikari should go in to the nearest station.

Diarrhœa and Dysentery.—These ailments are best treated in the jungle with Castor oil and milk diet. If the case is dysentery and the patient is passing blood and slime, he should place himself under proper treatment as soon as possible. Milk diet mentioned here includes such milk preparations as Benger's Food, Horlick's Malted Milk, or Milk Powder. One of these should always be included in the equipment in case of sickness.

Cholera.—If there is Cholera in the neighbourhood, every precaution should be taken with regard to food and water. Infection is spread by flies, water, milk, and probably dust. All drinking water and milk must be freshly boiled and carefully stored. All food should be freshly cooked. Salads are always dangerous in India. A Cholera patient should be kept warm and given as much water to drink as possible. This should be given in small quantities at a time, to prevent sickness. Enough permanganate crystals should be added to the water to give it a distinct colour. Barley water should be given when the patient is getting better; and later on, milk.

The more the shikari knows about first-aid work, the better. He should have the St. John's Ambulance Association book, "First Aid to the Injured" by James Cantlie. From this he can learn

how to put up broken bones, arrest hæmorrhage, and treat wounds, burns, and the minor ailments which he may be called upon to do in the absence of a doctor.

Antiseptic lotions have been referred to in these notes; these can be made up in the following way:

Carbolic Lotion (1 in 40).—One tablespoonful of carbolic acid to one pint of water.

Perchloride of Mercury Lotion (1 in 1,000).—Dissolve one Saloid of Corrosive Sublimate (Burroughs and Wellcome) in a pint of water.

Corrosive Sublimate is very poisonous and is perhaps better left out of the equipment. It is only mentioned as it can be carried in tabloid form, and some people prefer it for this reason.

Tincture of Iodine.—Useful for all wounds, cuts and abrasions, and for sterilising the skin in the neighbourhood of wounds. It should be applied with a small mop of wool. Two teaspoonfuls to a pint of water makes a very good lotion for cleaning out deep wounds.

The shikari should never be without Tincture of Iodine: it can be used for every kind of wound and is very easily applied and quite safe. The skin round all wounds for six to eight inches should be painted with it as the first step in the treatment.

In the absence of any form of antiseptic, wounds can be quite safely washed out with water which has been sterilised by boiling.

The instruments, dressings and drugs necessary to carry out the treatment mentioned here, are given below. They are also included in the list of articles to be taken to camp given in Chapter I.

One surgical knife (or, in its absence, a Safety razor blade with holder).

One glass syringe of about 2 ozs. capacity.
Bandages (roll) about half a dozen.
Bandages (triangular), three.
Surgical gauze, 3 to 4 small packets.
Cotton wool, 3 to 4 small packets.
Lint, 1 roll.
Carbolic acid, 4 ozs. bottle.
Saloids of Corrosive Sublimate (Burroughs and Wellcome),
one bottle.
Tincture of Iodine, 6 ozs. bottle.

The following drugs will be useful in case of sickness:

Epsom Salts, 8 ozs.
Potassium Permanganate, 4 ozs.
Calomel Tabloids (3 grains), 1 bottle.
Quinine Tabloids (5 grains), 1 bottle.
Aspirin Tabloids (5 grains), 1 bottle.
Cascara Tabloids (5 grains), 1 bottle.
Castor oil, 6 ozs.

CHAPTER V.

THE PRESERVATION OF TROPHIES.

Shikar trophies may be divided into four heads:—

Skulls and Horns.

Whole Skins.

Masks.

Feet.

Each of the above requires a somewhat special method of treatment in the field in order to obtain the best results.

In the case of the first item, Skulls and Horns, these may again be split up into four sub-heads, namely, those of the Antelope, Cervidae, Bovidae and Carnivora. The essential difference between antelope and deer is that the former do not shed their horns, whereas those of the deer family usually shed their antlers annually. We use the word "usually" with intention, because cases have been known in which deer have not annually shed their antlers.

Let us now assume that the sportsman has brought to bag one of the antelope, say a blackbuck. The first thing for him to decide is whether or not he intends to have the head fully set up with the mask, or simply the frontal bone with the horns. If the latter be decided on, it is not necessary to bother about the careful removal of the mask. As much as possible of the flesh of the skull should be removed in the most expeditious manner, the brain pan opened from the back, the

brain scooped out and the skull boiled in a tin or old bath tub, care being taken that the horns do not come in contact with either the fire or the sides of the boiling receptacle. It is quite a good plan, as a safeguard, first to wrap the horns with grass rope before the boiling process is started. After the boiling has proceeded for some time it will be found quite easy to remove most of the remaining flesh with a blunt knife. Continue the boiling until all flesh is removed and then hang up the skull in the wind to dry. After a few days it will be discovered that the tissue between the bone and the horn becomes decomposed and the horns have become loose. They should then be removed, and the boney core allowed to dry, the inside of the horns being treated with carbolic. The skull may then be cut with a fine-tooth hand saw to any desired shape required for mounting on a wooden shield, and then the horns replaced on the pedicles. It is advisable to saw off a certain length of the pedicle in order to facilitate the removal of the horn occasionally.

The treatment of the skulls and horns of antelope is equally applicable to that of the Bovidae—Bison, Buffalo, Tsine and Mithun; but in the case of the deer family, although the method of treating the skull is the same, the antlers are of course not removable.

Should it be desired fully to mount with the mask the head of any of the animals mentioned, care must be taken that no cutting away of the bone of the skull takes place. The lower jaw of the animal must also be preserved; this should be tied to the skull and sent to the taxidermist along with the mask. It may here be remarked that a nest of ants or the water of a running stream will just as effectively clean a skull as the boiling process, but even if this latter method be employed the

horns should still be removed and thoroughly cleaned on the inside before sending the head to the taxidermist or mounting the skull on a shield.

When dealing with the skulls of Carnivora, it is not advisable to boil them if it can possibly be avoided, because boiling is liable to cause the teeth to split. If time permits, it is safer to employ either the ant nest or water method for cleaning the skulls of all Carnivora. In this category bears are also included.

Should the sportsman desire to have a head fully mounted, the following method is recommended for the removal and rough preservation of the mask.

Always cut the neck as long as possible. It should be cut off near the shoulder, then from the centre of a cut joining the back of the horns make a cut straight down the centre of the neck; cuts should then be made round the base of each horn—the mask can then easily be removed, and when mounted by the taxidermist the cuts will not show. Having removed the mask, it should then be pegged out over some straw, and every piece of fat and flesh carefully removed. Great care must be taken with the ears, eyes, and lips, to ensure that everything except the actual skin is removed, and also that no cuts are made through the skin. A fairly strong solution of carbolic, or formaline, or arsenical soap should then be worked into these delicate parts. The whole mask should then be rubbed over with wood ashes, after which the ashes should be removed and the mask left to dry in the shade.

Never attempt to dry a mask or skin in the sun or near a fire; and be careful that any undue stretching is as far as possible avoided.

Be sure that no skin or mask, rough cured by the dry method, is packed for transit until it is thoroughly dry.

In lieu of the dry method of rough preservation described masks may be preserved in a 4 per cent. solution of formaline. Should this method be employed, all flesh and fat should be removed as before, and then the whole mask should be immersed in a solution of 4 per cent. formaline and the container soldered up. Great care must, however, be taken that there is sufficient solution in the container to cover completely the mask in any position of the vessel. A kerosene tin makes a very useful and handy container. This method of preservation possesses many advantages when one is pressed for time, or the climate of the locality is such as to make thorough drying difficult.

The taking off and preservation of whole skins is a matter requiring not only great care, but also knowledge, if good results are to be obtained.

When the young shikari has killed his first tiger he is at once faced with the important problem of preserving the skin. If he has not considered this question beforehand and made himself familiar with the way the skin should be cut for removal and cleaned and preserved, he is sure to have his trophy seriously damaged—perhaps quite ruined. He should know how to mark out the cuts on the body and the limbs so that the skin can be removed with an equal amount of white margin when it is spread out. He should know how the skin should be cleaned, and the importance of removing all fat and flesh, which, if not done thoroughly, leads to the hair slipping. He should understand the importance of treating the ears, eyes, and lips efficiently if his trophy is to be good. The skinning and preservation of the skin cannot be left to the mercies of the average Indian skinner; it must be attended to personally, unless the young shikari is fortunate enough to obtain the services of a trained man, and this is not often possible.

It is well worth while to learn how to skin an animal properly and to become familiar with the different processes for preserving skins before putting oneself in the position of losing skins of record tigers and panthers through want of knowledge. Books on shikar do not generally give much information, and shikaris have all sorts of different advice on this subject. The novice is generally left to find out for himself the mistakes which can be made in skinning an animal, and how skins can be spoiled by wrong incisions and treatment. He usually gets very muddled ideas from the different advice he receives about the preservation of skins, and therefore it is well worth while to learn good sound methods from the start, so as to save disappointment over loss of trophies later on.

Most simple and complete instructions for the treatment of shikar trophies are given in an excellent little book by the well-known firm of taxidermists, Messrs. Van Ingen and Van Ingen of Mysore, called "The Preservation of Shikar Trophies."

The illustrations are very good indeed and the book covers the whole subject. The young sportsman cannot do better than take this book with him on his shikar trip. He should have a good supply of the necessary preservatives, also skinning knives, and 3½-inch wire nails for pegging out skins.

When the skin is thoroughly dry it should be neatly folded, sewn up in gunny and despatched to the taxidermist as expeditiously as possible. If it be intended to mount the head, the skull must also be sent. It is as well to tie a strong label on to both the skin and the skull with the name and address of the owner and date of despatch clearly inscribed thereon.

Whole skins may, if desired, be preserved in a 4 per cent. formaline solution in an exactly similar manner to that described for masks.

The Preservation of Feet.—The feet of Elephant, Rhinoceros, Buffalo, Bison, Tsine, Mithun and some of the deer may be mounted as useful and handsome trophies. Those of Elephant can be used as flower pots, umbrella stands, or as a receptacle for glasses and a decanter. Rhinoceros' feet make quite good cigarette boxes, those of the Bovidae make inkstands, whilst those of deer make attractive paper knives or candlesticks.

The rough preservation of the feet of Elephants is no light task, and great care and patience is necessary in order to remove as much of the flesh as possible. The leg should be cut off to the desired length for the trophy intended. Then with a sharp knife make a straight vertical cut down the back; lay back the skin and remove all bone and flesh. In this matter great care and labour will be necessary in thoroughly cleaning out as much as possible of the soft cushion at the bottom. Having done this, treat with arsenical soap, and get it away to a good taxidermist as soon as possible.

When in camp be sure to keep all trophies and skins out of reach of prowling dogs, jackals and cats. Suspend them to a tree by cords. Many a good trophy has been ruined by want of care in this respect—some have even been carried right away.

CHAPTER VI.

FOOTPRINTS AND OTHER TRAILS OF SOME OF THE WILD ANIMALS OF THE PLAINS OF INDIA AND BURMA.

As previously mentioned we are making no attempt to deal with all the wild animals of the Plains but only with those of which we have had actual experience, and for this purpose we propose to divide these animals into six convenient groups:

1. *The Pachyderms* . . . Elephant and Rhinoceros.
2. *The Bovidae* . . . Buffalo, Bison, Gayal (or Mithun), Tsine.
3. *The Antelope* . . . Nilgai, Blackbuck, Chinkara, Four-horned Antelope (or Chaurisingha).
4. *The Cervidae* . . . Sambhur, Chital, Swamp Deer (or Barasingha), Thamin, Barking Deer (or Kakur), Hog Deer.
5. *The Felidae* . . . Tiger, Panther, Wild Cat.
6. *Various* . . . Bear, Boar, Hunting Leopard, Wild Dog, Wolf, Fox, Hyæna, Otter, Porcupine, Ratel.

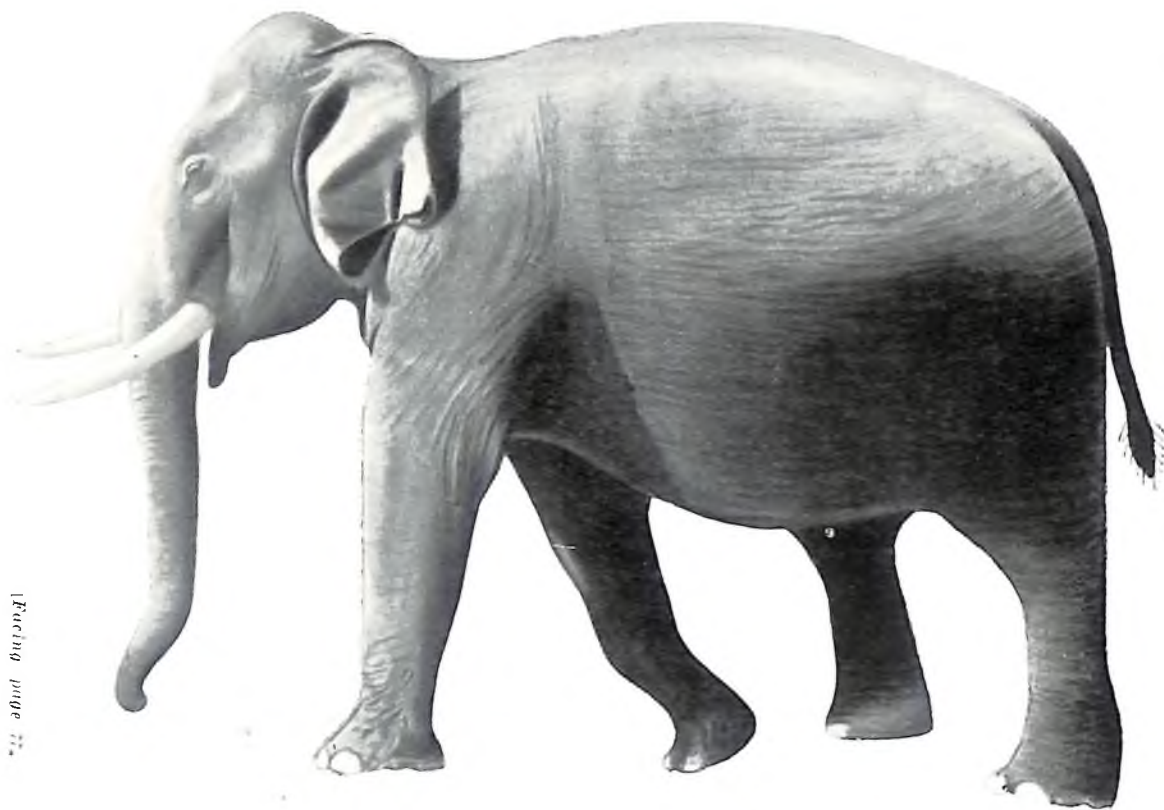
It may be of interest to our readers to know the methods by which the accompanying photographs of the various footprints were obtained. We found it almost impossible to obtain satisfactory photographs of footprints in the jungle, as in the majority

of cases the light was against good results; so in some cases we took plaster casts of selected actual footprints, the plaster being reinforced with pieces of wood or wire to avoid breakage in transit. The plaster cast was then greased and used for making an impression on a pad of clay in a metal tray, which was then photographed. In some cases the ground, with the natural footprint on it, was cut out *en bloc*, taken to some place where the light was good and photographed. In a few cases we managed to get animals in captivity to walk over a pad of plasticine spread on a piece of three-ply board, and then photographed the impression. In some other cases the feet of animals which had been shot were pressed on to a pad of clay, and this impression photographed.

Except where otherwise definitely stated, all photographs have been taken *full size*. Our object in all cases has been to obtain an exact reproduction of the footprint. It will of course be realised that for purposes of comparison we have in each case endeavoured to give as perfect a footprint as possible under favourable conditions; the actual footprints as seen in the jungle may of course vary from these to some extent, depending on the nature of the ground.

We will now give a short description of the animals with illustrations of their footprints.

THE ELEPHANT.



[Facing page 77.]

THE ELEPHANT.

Localities in which found.—Burma, Assam, Bihar and Orissa, Southern India and a small isolated colony near Dehra Dun in the U. P.

Hindustani name.—Hathi.

Average height at shoulder.—Males 9 feet, females 8 feet.

Largest recorded specimen.—10 feet 9 inches.

Measurements of a good average specimen.—Height 9 feet 4 inches. Tusks.—A good pair of tusks will weigh about 95 lbs. the pair, the length of each being about 6 feet.

Twice the girth of an elephant's forefoot gives the height at the shoulder. Thus, if the circumference of forefoot measured with a steel tape be 60 inches, or 5 feet, the owner of that foot is 10 feet high at the shoulder.

It has been stated by some that to track and come up to an elephant which has been feeding in a certain locality during the night and has moved off before dawn is seldom possible of accomplishment. Perhaps we have been singularly fortunate, but two rogue elephants on different occasions were tracked down in this manner and both paid the extreme penalty for their crimes.

To kill an elephant with a single shot requires a thorough knowledge of the anatomy of his skull, as the brain must be reached, and this is a comparatively small mark which lies midway between the earhole and the eye. The sportsman must therefore remember this and, bearing in mind his position relatively to that of the elephant, so place his shot as to reach the brain. The angle of every shot is different; each must be visualised in the sportsman's mind and the point of aim adjusted so that the bullet will reach the brain. The body shot is not

recommended unless you have a .600 bore H. V. rifle. This weapon will drive a solid nickel bullet right through the body of an elephant and pulverise the bone of the shoulder on the far side, thus anchoring the beast if it does not kill him on the spot. Nothing but solid nickel bullets from high velocity rifles, or steel pointed bullets from 4 and 8 bore black powder rifles, should be used against elephant. Soft-nosed bullets, even fired from the most powerful high velocity rifles, are useless and cruel.

The tracking of elephants in soft ground presents little difficulty, as owing to their weight they leave a well defined footprint; but on hard stony ground the tracks are often exceedingly difficult to follow—unless the elephant is obliging enough to break off branches or grass and thus leave a trail which can be picked up.

Elephants have poor eyesight but their senses of smell and hearing are highly developed. Therefore, when tracking, great care must be exercised in watching the wind and moving as silently as possible.

A herd of elephants invariably march in single file. In Burma and Assam we have seen herds of fully fifty elephants; when such herds are on the move the females with their calves go in front and the bulls follow. If such a herd be frightened sufficiently to bolt, the bulls will very soon be found in the van of the retreat, leaving the females and their calves to look after themselves as best they can.

Elephants make a large variety of sounds, both with their trunk and throat. One not easily to be forgotten—especially if you are the cause!—is the shrill trumpet made just before the trunk is coiled preparatory to rushing on an enemy. Some pictures depict elephants charging with trunk outstretched; this,

ELEPHANT.



FOREFOOT: SCALE $\frac{3}{8}$ INCH, FULL SIZE.

[Facing page 28,

ELEPHANT.



BACK FOOT: SCALE $\frac{3}{8}$ INCH, FULL SIZE.

[Facing page 78.

in our opinion, is not correct. An elephant's trunk is a delicate organ; it is always coiled when he charges, and the head is held slightly up. It is on occasions such as these that the 600 H. V. rifle is invaluable: even if you fail to floor him you will certainly turn him with a shot in the head.

When elephants feel that all is not as well as it should be and suspect that an enemy whom they cannot see is near, they make a sharp noise—something between a trumpet and a rumble.

Elephants usually stop feeding by about 10 o'clock in the morning; and then, having found a nice shady place in the forest, lie down to sleep till about 3 in the afternoon.

When sleeping they snore—not very loudly; but they continually raise the ear on the upper side and let it fall on their neck: this noise is often of assistance to the tracker in locating the animal.

It may be mentioned that elephants are specially protected throughout India, and may not be shot unless proscribed for being a public nuisance or danger.

THE GREAT INDIAN RHINOCEROS.

Localities in which found.—Assam and Nepal.

Hindustani name.—Gainra.

Vernacular name.—Bengalee—Gondar.

Assamese—Gore.

Average height at shoulder.—5 feet 8 inches.

Horn measurement.—Record length is $24\frac{1}{2}$ inches, but any horn over 12 inches (measured on the front of the curve) is good.

The great Indian Rhinoceros usually lives in swampy ground and feeds on grass. It feeds in the morning and evening. A shot half way along the neck and about two-thirds the way up is fatal.

In Assam it would be very difficult to obtain a shot at a rhino without the aid of a shikar elephant, as it is difficult indeed to penetrate the high grass in which these animals live, and still more difficult to see unless one is high up.

With the aid of a shikar elephant there is little difficulty in getting to within 30 yards.

The shooting of rhino is not a wildly exciting sport, the main difficulty being in obtaining the necessary permission, which is exceedingly difficult. This is as it should be for any rare or nearly extinct animal.

THE GREAT INDIAN RHINOCEROS.



[Facing page 80.]

RHINOCEROS.



BACK FOOT SUPERIMPOSED ON FRONT: SCALE $\frac{5}{8}$ INCH. FULL SIZE.
IMPRESSION MADE FROM PLASTER CAST.

THE BUFFALO.



Facing page 81.

"The Lord of the Isles."

From a drawing by Kathleen Bishop.

THE BUFFALO.

Localities where found.—Assam, the Central Provinces south of Raipur, some of the Orissa Feudatory States and Zemindaries, and parts of the Madras Presidency.

Hindustani name.—Jungli Bhainsa.

Average height at shoulder.—5 feet 8 inches.

Horn measurements of a good average specimen.—

Length	..	..	..	..	48 inches.
Girth	..	..	..	..	20 inches.
Spread	..	..	..	..	52 inches.
Tip to tip	..	..	..	..	46 inches.
Tip to tip and across forehead	..	..	..	..	106 inches.

NOTE.—There is a recorded measurement of a bull buffalo tip to tip and across the forehead 13 feet 4 inches with a girth of 34 inches.

The buffalo is found in swamps and on the churs of the Brahmaputra in Assam, and in dense forests near grass maidans, as in the Central Provinces and other places mentioned. There must however be a fairly plentiful supply of water, as the buffalo likes nothing better than to wallow. Its chief food is grass, and it feeds in the morning and evening and lies up during the day in marsh, grass or thick jungle. Buffaloes are usually to be found in herds, but solitary bulls are as a general rule far finer specimens than one got out of a herd. They are not shy and will sometimes attack without provocation.

In the Central Provinces, some of the Orissa Feudatory States, and in parts of the Madras Presidency, excellent sport can be obtained by tracking on foot, and with this animal one can always count on the sporting chance of having a real "turn up."

as the bull buffalo, especially of the Central Provinces, does not as a rule part with his life without a struggle.

The buffalo is a powerful heavy beast and only rifles of heavy calibre should be used. A shot from a .600 cordite or 8 bore black powder delivered in the neck, or on or behind the shoulder, is usually sufficient, but do not forget that if you wound a buffalo and he sees you, he will usually charge. Then if you fail to stop him—and nothing but death will do that—he will most certainly carry his rush home—much to your detriment. Our advice therefore is, respect this animal and only use against him weapons of which he is worthy. Those who desire to bring to bag one of these fine beasts must also be prepared to carry through the heat a weapon capable of administering a knock-down blow.

The tracking of buffalo in the Central Provinces in the hot weather is not very difficult, as they are heavy animals and even on hard ground their footprints are sharp and distinct; but on the churs of the Brahmaputra in Assam, where the grass is often over 12 feet high, it is almost impossible to come up with wild buffalo on foot, and shikar elephants have in consequence to be employed. The sport cannot be compared to tracking on foot, but nevertheless there are easier things in the world of shikar than the accurate placing of a bullet fired from a heavy rifle off the pad of a swaying elephant, especially when the object of one's attention happens to be moving fast in high grass.

As a matter of interest it may be mentioned that we have seen a sorely stricken bull buffalo get up and charge a shikar elephant in Assam, only to be stopped for good by a bullet at a range of a few feet.

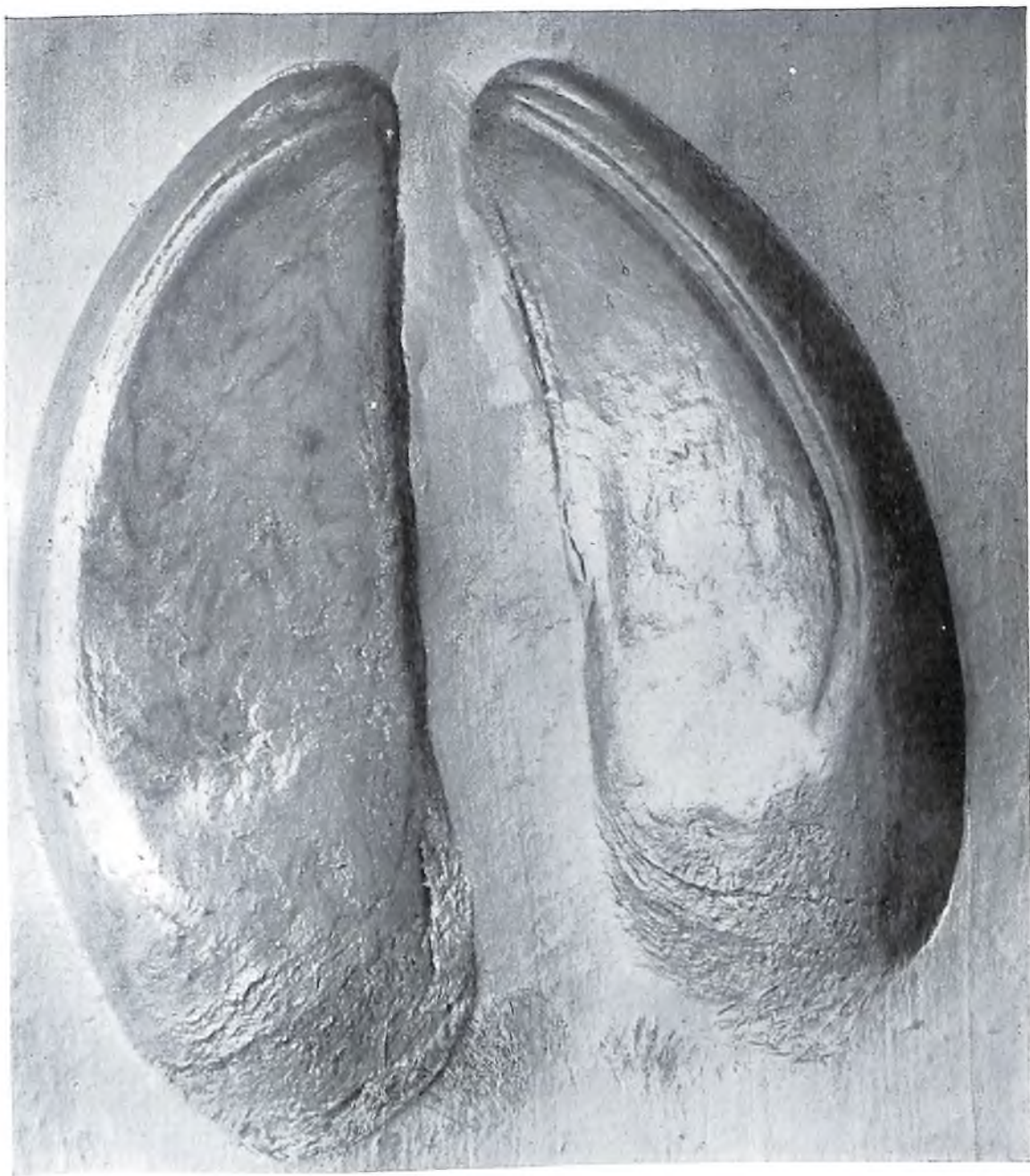
There is no question but that, wherever in India he may be found, the buffalo can be counted on to die fighting to the last.

BUFFALO.



FRONT FOOT: FULL SIZE.
IMPRESSION MADE FROM PLASTER CAST.

BUFFALO.



BACK FOOT: FULL SIZE.

IMPRESSION MADE FROM DEAD ANIMAL'S HOOF PRESSED
ON TO A CLAY PAD.

[Facing page 82.

It is sad to relate that within our personal knowledge the buffalo has been ruthlessly exterminated for want of proper protection in some Central Provinces States and Zemindaries. Even twenty-five years ago it had a more northerly range in this locality than at present, and still stricter protection than is now existing appears to be urgently called for if this magnificent beast is to be saved from complete extinction in Peninsular India.

THE GAUR OR INDIAN BISON.

Localities where found.—Assam, Burma, and in most forests of India where hills exist.

Hindustani names.—Gaur, Banboda.

Average height at shoulder.—About 5 feet 10 inches.

Horn measurements of a good average specimen.—

Length	..	..	..	..	31 inches.
Girth	..	..	..	..	19 inches.
Spread	..	..	..	..	36 inches.
Tip to tip	..	..	..	..	24 inches.

Old bulls are almost black, and the largest bulls are often solitary. Gaur feed chiefly on grass but are also very fond of the shoots and leaves of young bamboos. They feed in the early morning and evening, drink in the afternoon and lie up most of the day in secluded parts of the jungle. Gaur are, as a rule, shy, but we have, just before dusk, walked through a herd of about 40 animals in the open without arousing much concern. The average herd is about 12 but sometimes one comes across collections of as many as 50. Unwounded gaur will seldom, if ever, attack; even those who may be wounded generally make off rather than charge.

Gaur are much addicted to visiting salt licks; if the sportsman be out after these fine animals and there be a salt lick in the vicinity it would be as well to go there first on the chance of picking up the tracks of a good bull. In following the tracks observe the grass which has been bitten off. If any length of time has elapsed since the animal passed, the tip of the bitten grass will be slightly brown. Also observe the age of the

THE GAUR OR INDIAN BISON.



"The Old Solitary Bull."

From a drawing by Kathleen Bishop.

GAUR OR BISON.

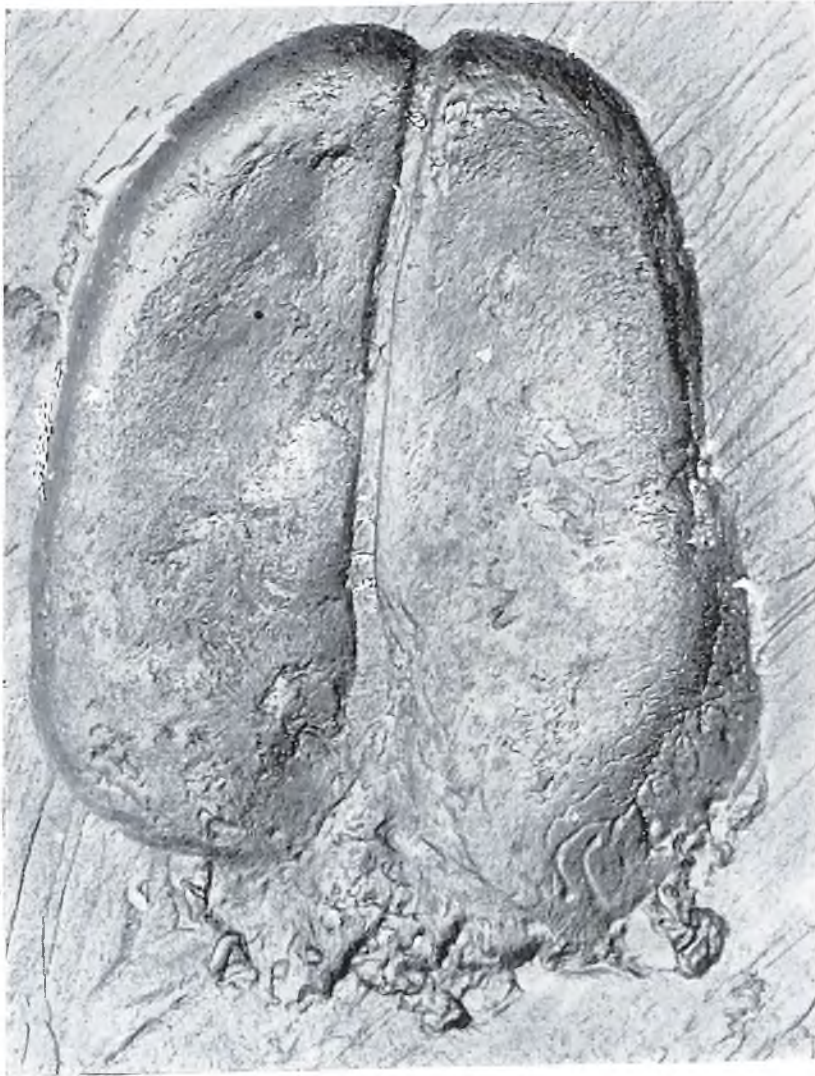


FRONT FOOT.

IMPRESSION MADE FROM PLASTER CAST.

[Facing page 84.

GAUR OR BISON.



BACK FOOT.

IMPRESSION MADE FROM PLASTER CAST.

[Facing page 84.]

droppings; a hard skin on top is also an indication that the animal is in all probability a long way ahead of you, unless he has laid up for the day.

In tracking bison you must be careful to watch the wind, as their sense of smell is highly developed, as is also their hearing.

For bison shooting our advice is, persevere till dark and use the heaviest rifle which you are capable of handling, bearing in mind that you cannot always place a shot just where you wish and a heavy bone-smashing bullet driven by a large charge of powder will save the animal much pain—and you many hours of unsatisfactory toil. Remember that the tracking of bison often involves heavy walking and climbing over hills, and so when you do get the shot, you want to feel that it will not only be the first but the last.

THE GAYAL OR MITHUN.

Localities where found.—Assam and Burma.

Hindustani names.—Gayal, Mithun.

Average height at shoulder.—About 5 feet 2 inches.

Horn measurements of a good average specimen.—

Length	..	..	..	..	16 inches.
Girth	..	..	..	..	18 inches.
Spread	..	..	..	..	26 inches.

The gayal is much like gaur or bison, only smaller; and the horns, instead of being curved, are almost straight, standing out nearly at right angles to the head. What has been said concerning the gaur applies to the gayal, except that they can be domesticated; in Assam they sometimes breed with ordinary cattle.

THE GAYAL OR MITHUN.



(Facing page 86.)

GAYAL OR MITHUN.



FRONT FOOT.

IMPRESSION MADE ON A CLAY PAD BY ANIMAL IN CAPTIVITY.

[Facing page 86.

GAYAL OR MITHUN.



BACK FOOT.

IMPRESSION MADE ON A CLAY PAD BY
ANIMAL IN CAPTIVITY.

[Facing page 86.

TSINE OR BANTENG.



BACK FOOT.

IMPRESSION MADE FROM PLASTER CAST.

[Facing page 82.]

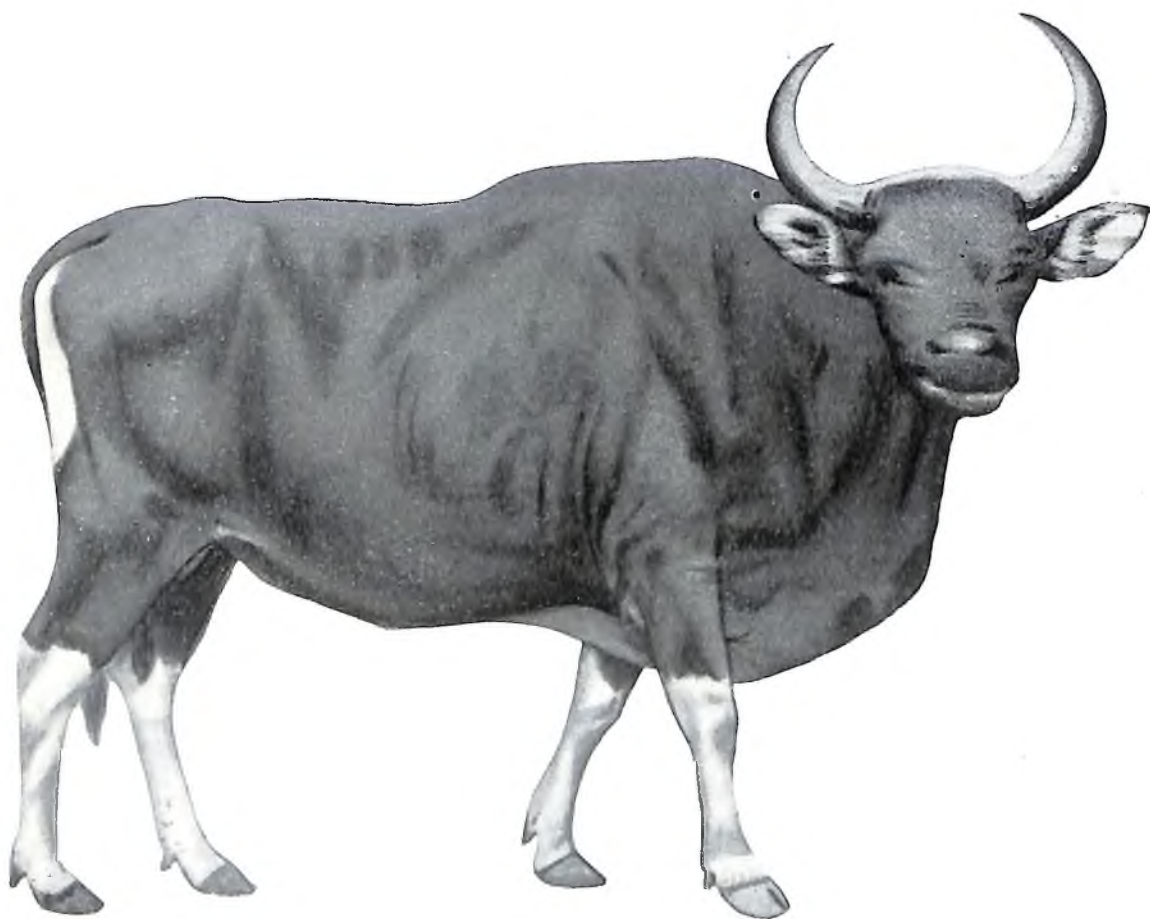
TSINE OR BANTENG.



FRONT FOOT.
IMPRESSION MADE FROM PLASTER CAST.

[Facing page 87.]

THE TSINE OR BANTENG.



(Facing page 87.)

THE TSINE OR BANTENG.

Localities where found.—Burma.

Burmese name.—Hsaing.

Average height at shoulder.—About 5 feet 3 inches.

Horn measurements of a good average specimen.—

Length	..	..	..	..	25	inches.
Spread	..	..	..	..	30	inches.
Girth	..	..	..	..	16	inches.
Tip to tip	..	..	..	..	24	inches.

Tsine are somewhat like gaur in general appearance except that the dorsal ridge is not so developed, and they are dark chocolate in colour, with a whitish mark on the rump. The habits of tsine are much the same as those of gaur except that they are not so partial to hilly country. In our opinion tsine are more difficult to approach, but when face to face with danger they appear to be more easily bewildered than are gaur.

THE NILGAI OR BLUE BULL.

Localities where found.—In most parts of India (but not South of Mysore or in Eastern Bengal) and Assam. It is not found in Burma.

Hindustani names.—Nilgai, Rojh.

Average height at shoulder.—4 feet 6 inches.

Horn measurements of a good average specimen.—

Length	..	..	..	8 inches.
Girth	..	..	..	7 inches.
Tip to tip	..	..	..	6½ inches.

Nilgai, which are the largest of the antelopes of India, live in open forests in the plains and are usually to be found near cultivation. They are very destructive to crops and for this reason are not protected anywhere in India. Nilgai are stupid ungainly animals, easy to approach, and afford little sport except with the spear over rough country, where they can hold their own against the very best horse.

Fully grown bulls are bluish grey, and young bulls and females are brown. The hide, especially on the neck and chest, is very thick and tough. Nilgai have a habit, shared by the rhinoceros, of nightly depositing their droppings in the same place. They are quite easily tamed but can hardly be considered as attractive pets. Nilgai does are easily distinguishable from those of sambhur by their white stockings and longer tails.

THE NILGAI OR BLUE BULL.



[Facing page 88.



FOREFOOT.

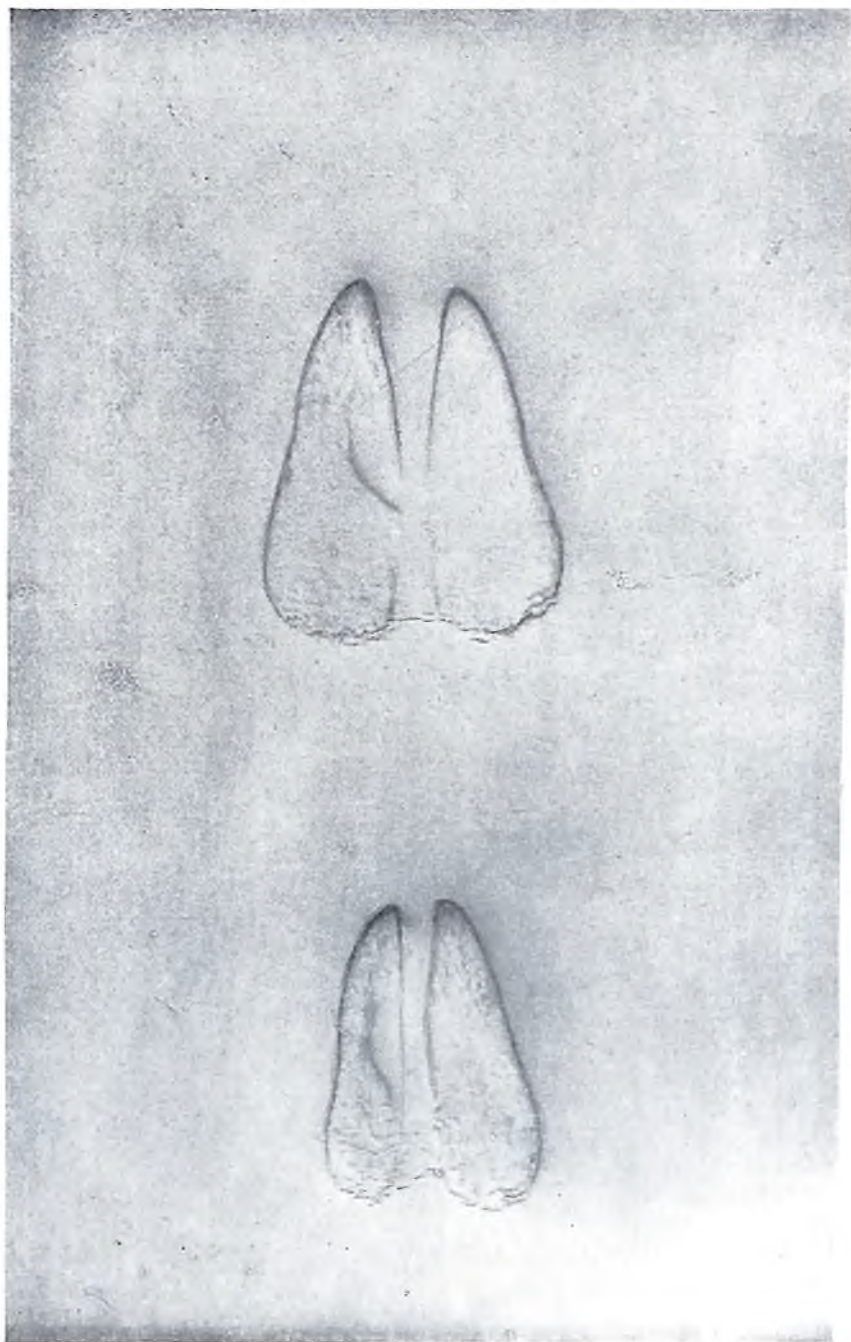


HINDFOOT.

NILGAI.

IMPRESSIONS MADE FROM PLASTER CASTS.

BLACKBUCK.



Top: FOREFOOT. *Bottom:* HINDFOOT.
IMPRESSIONS MADE ON PAD OF CLAY
FROM DEAD ANIMAL.

(Facing page 89.)

THE BLACKBUCK.



(Facing page 89.)

THE BLACKBUCK.

Localities where found.—In most of the plains of India, the best specimens coming from Rajputana. They are not found east of the Brahmaputra River.

Hindustani name.—Kala Harin.

Average height at shoulder.—2 feet 8 inches.

Horn measurements of a good average specimen.—

Length 22½ inches.

Girth 4½ inches.

Tip to tip varies greatly; 14½ inches and 22 inches have both been shot in Rajputana.

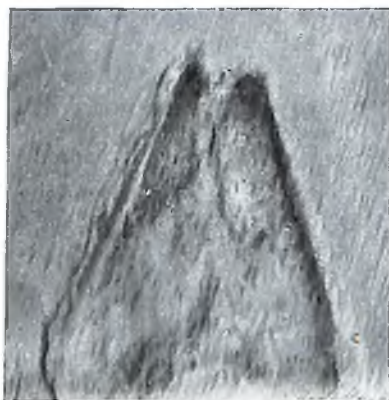
One of us has measured a head of 29½ inches, shot over 35 years ago, but the introduction of the high velocity rifle and modern means of transport have dealt hardly with the blackbuck. To-day, even in Rajputana, one is fortunate to obtain a 24-inch head and so we give 22½ inches as a good average specimen for Rajputana. At Puri, and other places in the south of India, a 17-inch head would be worth having.

Blackbuck usually go about in herds varying between 10 and 50. They live in open plains where the grass is short, and are usually to be found near cultivation. If fairly stalked on foot to, say, within 120 yards, these little animals afford excellent sport, as they possess good sight and smell, and in our opinion they are nearly as difficult to bag under these conditions as a stag in the Highlands of Scotland. We consider there to be a very distinct line between *stalking* and *shooting* blackbuck. Any good rifle shot with a modern high velocity rifle can be fairly certain of killing a buck at 300 yards. This may be a test of marksmanship, but it is not sport. But try and crawl up to within 120 yards of him in the open country in which he lives; if you succeed

in doing so you have earned your trophy. Unless you really want the meat, our advice is, do not take a longer shot than this. They are said to be the fastest animal in the world, and when going all out they can cover just over 20 feet in a stride. Our experience is that to ride and spear them is an impossibility.

As these animals do not inhabit areas covered by the game laws of Government forests, some special measures to protect them appear to be necessary, as we know of certain areas in which they have been exterminated during the last twenty-five years. In our opinion the sale of meat, the possession of doe skins and immature heads should be made a penal offence punishable by a heavy fine or imprisonment, or both.

THE CHINKARA OR INDIAN GAZELLE.



FOREFOOT.



HINDFOOT.

IMPRESSIONS MADE FROM PLASTER CASTS.

(Facing page 31.)

THE CHINKARA OR INDIAN GAZELLE.



[Facing page 51.]

THE CHINKARA OR INDIAN GAZELLE.

Localities where found.—Common in Rajputana, also found in most parts of India except in the extreme south, or to the east of a line drawn north and south through Chakardharpore.

Hindustani name.—Chinkara.

Average height at shoulder.—2 feet 2 inches.

Horn measurements of a good average specimen.—

Length	..	..	..	..	12 inches.
Girth	..	..	..	..	4 inches.
Tip to tip	..	..	..	..	6½ inches.

Chinkara are found in scrub jungle, in ravines, and in the deserts of India. Their principal food is grass but they also eat leaves, buds and crops. Both the male and female carry horns, the horns of the buck having annular rings for rather more than three-quarters of the way up from the base, whilst those of the female, which are much shorter and more slender, are usually smooth. We have seen cases, however, where the female also had horns with annular rings. Chinkara are very fast and cannot, in ordinary circumstances, be ridden and speared. They are most inquisitive animals and for this reason are easy to stalk and should, we think, be afforded the same measure of protection as suggested for blackbuck.

THE FOUR-HORNED ANTELOPE OR CHAURSINGHA.

Localities where found.—The foothills of the Himalayas, the Central Provinces, Rajputana and the north of the Madras Presidency. °

Hindustani name.—Chaursingha.

Average height at shoulder.—2 feet 1 inch.

Horn measurements of a good average specimen.—

Length front horn	..	..	..	1½ inches.
Length rear horn	..	..	..	3¾ inches.
Girth front horn	..	..	..	1¾ inches.
Girth rear horn	..	..	..	2¼ inches.
Tip to tip front horns	..	..	..	1½ inches.
Tip to tip rear horns	..	..	..	2¾ inches.

Chaursingha are light brown in colour, with white below, and have a dark stripe down the front of each leg. They live in light jungle where there are patches of grass, and on grass plains, but in either case there must be water. As a rule only two are found together. Their sense of hearing and smell is highly developed, but their sight is not particularly good.

THE FOUR-HORNED ANTELOPE OR CHAURSINGHA.



[Facing page 92.]

THE FOUR-HORNED ANTELOPE OR CHAURSINGHA.



FOREFOOT.



HINDFOOT.

IMPRESSIONS FROM PLASTER CASTS.

(Facing page 92.)

SAMBHUR.



HINDFOOT PARTLY OVER FOREFOOT.
IMPRESSION MADE FROM PLASTER CAST.

(Facing page 35.)

THE SAMBHUR.



(Facing page 93.)

THE SAMBHUR.

Localities where found.—Throughout India and Burma where there are forests.

Hindustani name.—Sambhur.

Average height at shoulder.—4 feet 6½ inches.

Horn measurements of a good average specimen.—

Length	..	..	..	..	38½ inches.
Girth	..	..	..	..	7½ inches.
Tip to tip	..	..	..	..	28 inches.
Spread	..	..	..	..	35 inches.

Sambhur are dark brown in colour, but lighter or nearly yellow on the underside of the legs. The size of the heads these animals carry varies very much with the locality, the best heads coming from Bhopal and the Central Provinces.

The antlers are shed at the end of March, or early in April, and the new horns begin to grow at the end of May and are clear of velvet at the end of November.

They live in thick forest where there are hills, and feed on grass, leaves, fruits and crops. Their sight, no doubt owing to living in thick jungle, is not particularly good, but their sense of smell and hearing is highly developed. In stalking Sambhur—

- I. Be careful that your direction of advance be such as the wind, if any, is blowing from him towards you.
- II. Always try and keep a tree or bush between you and your quarry.

- III. Make no sudden movement, make as little sound as possible, and avoid movement with a regular tread, as this is a sound foreign to the jungle and is certain to attract attention. If you stand stock-still near a tree or rock, and the wind be right, Sambhur will often pass you by at close range.

CHITAL.



Facing page 35.

FOREFOOT.



HINDFOOT.

IMPRESSIONS MADE ON PLASTICINE PAD BY ANIMAL IN CAPTIVITY.

THE CHITAL OR SPOTTED DEER.



{Facing page 95.

THE CHITAL OR SPOTTED DEER.

Localities where found.—In most parts of India except Assam, the Punjab and Sind.

Hindustani name.—Chital.

Average height at shoulder.—2 feet 10 inches.

Horn measurements of a good average specimen.—

Length	..	..	..	..	34½ inches.
Girth	..	..	..	..	5 inches.
Tip to tip	..	..	..	..	24 inches.
Spread	..	..	..	..	28 inches.

Chital are rufous fawn in colour, spotted with white all over. There is a dark stripe down the centre of the back. The throat, chin, inside of the legs and belly are white. The period of shedding the horns is irregular, but as a general rule horns are shed in August, and the new horn is not clear of velvet till late in February.

Chital live in open forest and must have a plentiful supply of water. They feed on grass, leaves, fruit and crops. They have not particularly good eye-sight or sense of smell and hearing, and are by no means alert or shy. In consequence they are not difficult to stalk and in our opinion they are sadly in need of better protection in many places. The shooting of Chital, or any deer or antelope, at night from motor cars should, we think, be punishable by a heavy fine (not less than Rs. 100)—and for the second offence six months' rigorous.

THE SWAMP DEER OR BARASINGHA.

Localities where found.—The Central Provinces, the United Provinces and Assam.

Hindustani name.—Barasingha.

Average height at shoulder.—3 feet 10 inches.

Horn measurements of a good average specimen.—

Length	..	..	..	34 inches.
Girth	..	..	..	5½ inches.
Tip to tip	..	..	..	34 inches.
Spread	..	..	..	33 inches.
Number of points	..	..	..	12

The Barasingha, in the opinion of many, carries the most handsome trophy of all the animals of the plains of India. A head with 20 points has been known, and one of us once picked up a head with 16 points, the bearer of this magnificent forest of tines having been killed by a tiger. In the United Provinces and Assam barasingha live in swamps, but in the Central Provinces, where swamps are not, they thrive exceedingly well on the grass plains or maidans called “dadars.” This deer does not live in heavy forest and he will not be found very far from the edge of the “dadar.”

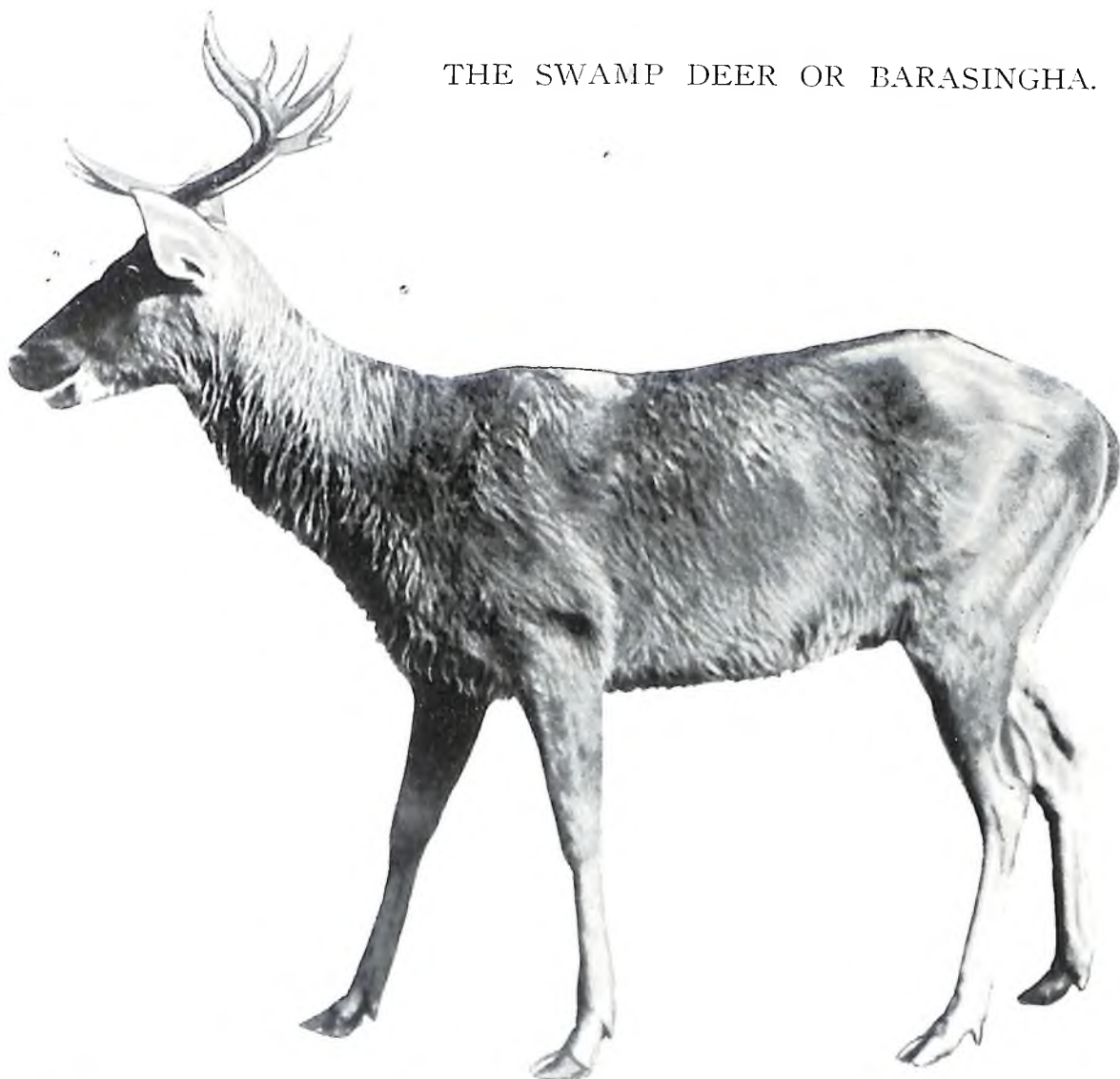
The barasingha is in general brown, being lighter or yellowish on the underside.

The antlers are usually shed in April and begin to grow in June; they are clear of velvet by November.

During the period of the rut, which is from about the middle of December to the middle of January, the stags are constantly fighting.

Barasingha will often be found grazing till well after nine

THE SWAMP DEER OR BARASINGHA.



(Facing page 26.)



HINDFOOT ON SOFT GROUND.



FOREFOOT ON SOFT GROUND.

IMPRESSIONS MADE FROM PLASTER CASTS.

in the morning, and they start again about three in the afternoon. They feed chiefly on grass and young leaves. Their eyesight and hearing are fairly good and their sense of smell is excellent, so when stalking this deer, if you hope to get a shot, be careful to note the direction of the wind.

Owing to the height of the grass in which they live, a shikar elephant is undoubtedly a great help in the stalking of barasingha, but by force of circumstances and choice we have had to stalk and shoot all our barasingha on foot. It is difficult, but the success is well worth the labour and frequent disappointment entailed.

THE THAMIN OR BROW ANTLERED DEER.

Localities where found.—Burma and Manipur.

Burmese name.—Thamin.

Average height at shoulder.—3 feet 9 inches.

Horn measurements of a good average specimen.—

Length	..	..	..	..	36 inches.
Girth	..	..	..	..	5 inches.
Tip to tip	..	..	..	..	24 inches.
Brow Tine	..	..	..	..	14 inches.
Spread	..	..	..	..	31 inches.
Points	..	..	..	..	8

Thamin live on grass plains and in thin forest bordering the plains, and are usually found in herds of from 10 to 40. They are fawn coloured animals, the lower parts being lighter. In the cold weather the stags are much darker.

They usually shed their antlers in July, and are in full horn in February.

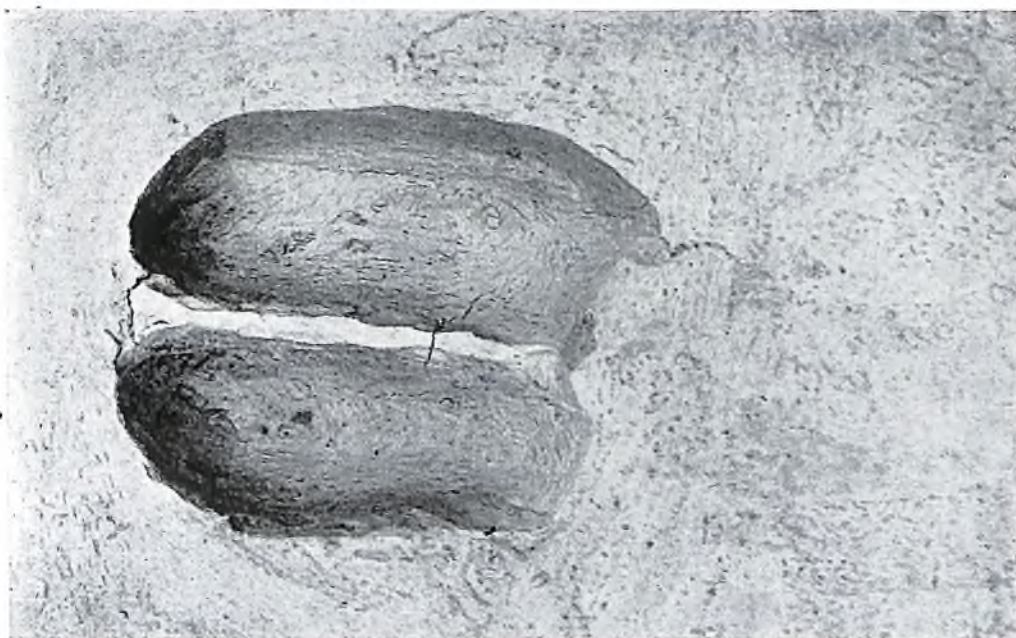
• Thamin appear to have the senses of sight, hearing and smell all fairly well developed; nevertheless, they are not difficult to stalk, provided ordinary precautions are taken.

THE THAMIN OR BROW ANTLERED DEER.



[Facing page 58.]

THAMIN OR BROW ANTLERED DEER.



HINDFOOT.



FOREFOOT.

IMPRESSION MADE BY ANIMALS ON NATURAL GROUND.

[Facing page 98.

HOG DEER.



FOREFOOT LEADING HINDFOOT.

IMPRESSION MADE BY ANIMAL ON NATURAL
GROUND.

[Facing page 99.]

THE HOG DEER.



(Facing page 101.)

THE HOG DEER.

Localities where found.—The United Provinces, Assam and Burma.

Hindustani name.—Para.

Average height at shoulder.—2 feet.

Horn measurements of a good average specimen.—

Length	..	..	..	..	18 inches.
Girth	..	°	..	..	3 $\frac{3}{4}$ inches.
Tip to tip	..	..	..	..	12 inches.

Hog deer live in grass and bush jungle of the plains. Their colour is brown, the underneath portion being a lighter shade.

They shed their horns in April and the new horn is clear by September. They are plentiful in the grass jungle on the banks of the Brahmaputra River in Assam, but it is almost impossible to penetrate this without the aid of a shikar elephant; with this aid there should be no difficulty in bringing one to bag. In the United Provinces they can be quite easily shot on foot.

THE HOG DEER.



(Facing page 16.)

THE HOG DEER.

Localities where found.—The United Provinces, Assam and Burma.

Hindustani name.—Para.

Average height at shoulder.—2 feet.

Horn measurements of a good average specimen.—

Length	..	..	..	..	18 inches.
Girth	..	°	..	..	3 $\frac{3}{4}$ inches.
Tip to tip	..	..	..	..	12 inches.

Hog deer live in grass and bush jungle of the plains. Their colour is brown, the underneath portion being a lighter shade.

They shed their horns in April and the new horn is clear by September. They are plentiful in the grass jungle on the banks of the Brahmaputra River in Assam, but it is almost impossible to penetrate this without the aid of a shikar elephant; with this aid there should be no difficulty in bringing one to bag. In the United Provinces they can be quite easily shot on foot.

THE BARKING DEER OR KAKUR.

Localities where found.—Most parts of India and Burma.

Hindustani name.—Jungli Bukra, or Kakur.

Average height at shoulder.—1 foot 11½ inches.

Horn measurements of a good average specimen.—

Length of horn	..	..	..	4 inches.
Length of pedicle	..	..	..	3¼ inches.
Girth of horn	..	..	..	3 inches.
Tip to tip ..	..	..	..	3½ inches.

The barking deer is deep chestnut in colour, paler below and dark on the back. The belly, chin, throat and inside of the thighs are white.

It lives in shady ravines in thick jungle on hills. When alarmed it makes a noise very like the bark of a dog, and can travel through thick jungle at an astonishingly fast rate.

Its horns are usually shed in May and the new horns are clear by the end of August.

The barking deer lives on grass, buds, fruits, flowers and leaves, and it must have a plentiful supply of water.

It has a very long tongue and can lick its own face all over.

It is often seen when beating for other animals, and one frequently comes across one when wandering through the jungle. Its speed through heavy jungle is amazing. It is easily tamed.

BARKING DEER OR KAKUR.



Top: FOREFOOT. *Bottom:* HINDFOOT.

IMPRESSIONS FROM PLASTER CASTS.

[Facing page 100.]

TIGRESS.



FOREFOOT.

IMPRESSION FROM PLASTER CAST.

(Facing page 101.

TIGER.



HINDFOOT.
IMPRESSION ON CLAY PAD.

[Facing page 101.

TIGER.



FOREFOOT.
IMPRESSION ON CLAY PAD.

(Facing page 101.)

THE TIGER.



Facing page 101.

THE TIGER.

Localities where found.—Most parts of India and Burma.

Hindustani name.—Bagh or Sher.

Average height at shoulder.—3 feet 3 inches.

Measurements of a good average specimen of a tiger (male).—

Total length (between pegs)	..	9 feet 6 inches.
Length of body only	..	6 feet 6 inches.
Girth behind shoulder	..	4 feet 3 inches.
Biceps	..	2 feet 4 inches.
Forearm	..	1 foot 6½ inches.
Round the neck	..	2 feet 7½ inches.
Round the head	..	3 feet 1 inch.
Weight	..	470 lbs.

For some reason the very mention of India appears to be associated with tiger, and if you happen to have served in that country the success or otherwise of your service is often, in the opinion of many at Home, summed up in the number of the tawny coated animals with the black stripes which you may have brought to bag. Both of us have killed tiger from a *machan* in beats, from the back of an elephant, and on foot; but as the ways and doings of this animal have been described by authorities far better versed in the subject than ourselves, we feel that the best advice we can give our readers who may wish further to pursue the subject is to read some of the books mentioned in Appendix A. In this book, therefore, we propose to say very little; but, of that little, remember that tiger require shade, water, and quietude. The majority of these animals kill their prey by breaking the neck, making full use of their own weight in carrying out the operation.

A tiger commences to eat the buttocks of the animal it has killed; and from this, the position of the fang marks on the

neck, and the size and shape of the footprints, you will be able easily to distinguish a tiger kill from that of a panther.

There are also six things we would impress on those going after tiger :

- (i) Use a rifle which will be certain of knocking out the tiger on the spot.
- (ii) Keep your head.
- (iii) Let the tiger pass before you fire, and so minimise the chance of turning it back into the beat.
- (iv) If you intend to have a "beat, tie your " Garah " by the forefoot with a rope which the tiger can break—and so drag the kill to the place where he wants it. His ability to do this will promote a feeling of safety.
- (v) Do not follow a wounded tiger or panther for about three hours ; and when you do, go slowly. Explore step by step all cover before your next advance. These precautions will save your elephant (if you have one), your men and yourself from those unfortunate incidents which one not infrequently hears about in India.
- (vi) When sitting over a kill do not be too impatient to fire—a second tiger may appear. Apart from this possibility you will find it both instructive in the habits of the animal and also a test of your own nerve.

In one of the books which we have mentioned in Appendix A, " Tiger and Other Game," by Colonel A. E. Stewart, some excellent examples of tiger beats under various conditions are given. You will do well to read this chapter carefully, as from it you will glean much valuable information,

PANTHER.



FOREFOOT.

IMPRESSIONS ON CLAY PAD.

HINDFOOT.

THE PANTHER.

Localities where found.—Throughout India and Burma.

Hindustani names.—Chota Bagh, Tendwa.

Average height at shoulder.—2 feet 3 inches.

Measurements of a good average specimen.—

Total length (between pegs)	..	7 feet 2 inches.
Length of body ..	..	4 feet 4 inches.
Weight ° ..	..	150 lbs.

There are two varieties of panther—the heavy game-killing animal of the hill tracts, measuring anything between 7 and 8 feet, and the lighter and small variety, between 5 and 6 feet, which lives near villages and feeds on dogs, goats, sheep, poultry, and the like. The marking of the panther is, as a rule, five spots grouped in the form of a rosette. It is a very stealthy animal—a past master in the art of concealment—and is far less fearsome of man than the tiger.

It usually kills its prey by biting the throat and holding on until the victim is either strangled or dies from loss of blood. Very big panthers do sometimes, however, break the neck of their prey. Panthers invariably start to feed on the stomach of their kill; and although preferring to kill their own food, they will certainly eat carrion—for this reason a scratch from the claws of a panther is far more dangerous than one from those of a tiger. If any of your party are unfortunate enough to get clawed, treat at once with Iodine or other powerful disinfectant. Panthers are usually shot in beats, or by sitting up over a village dog or goat.

THE JUNGLE CAT.

Localities where found.—All over India and Burma; from 8,000 feet to sea-level.

Hindustani name.—Jungli Billee.

Average height at shoulder.—1 foot 3 inches.

Average total length.—2 feet 8 inches.

The jungle cat is usually brown grey in colour, the lower parts being lighter. The tail has often black rings with a black tip.

It exists in grass, jungle or cultivation and is usually to be found near villages. It lives on birds and any small animals which it can kill.

JUNGLE CAT.



Top: FOREFOOT. *Bottom:* HINDFOOT.

IMPRESSIONS ON CLAY PAD.

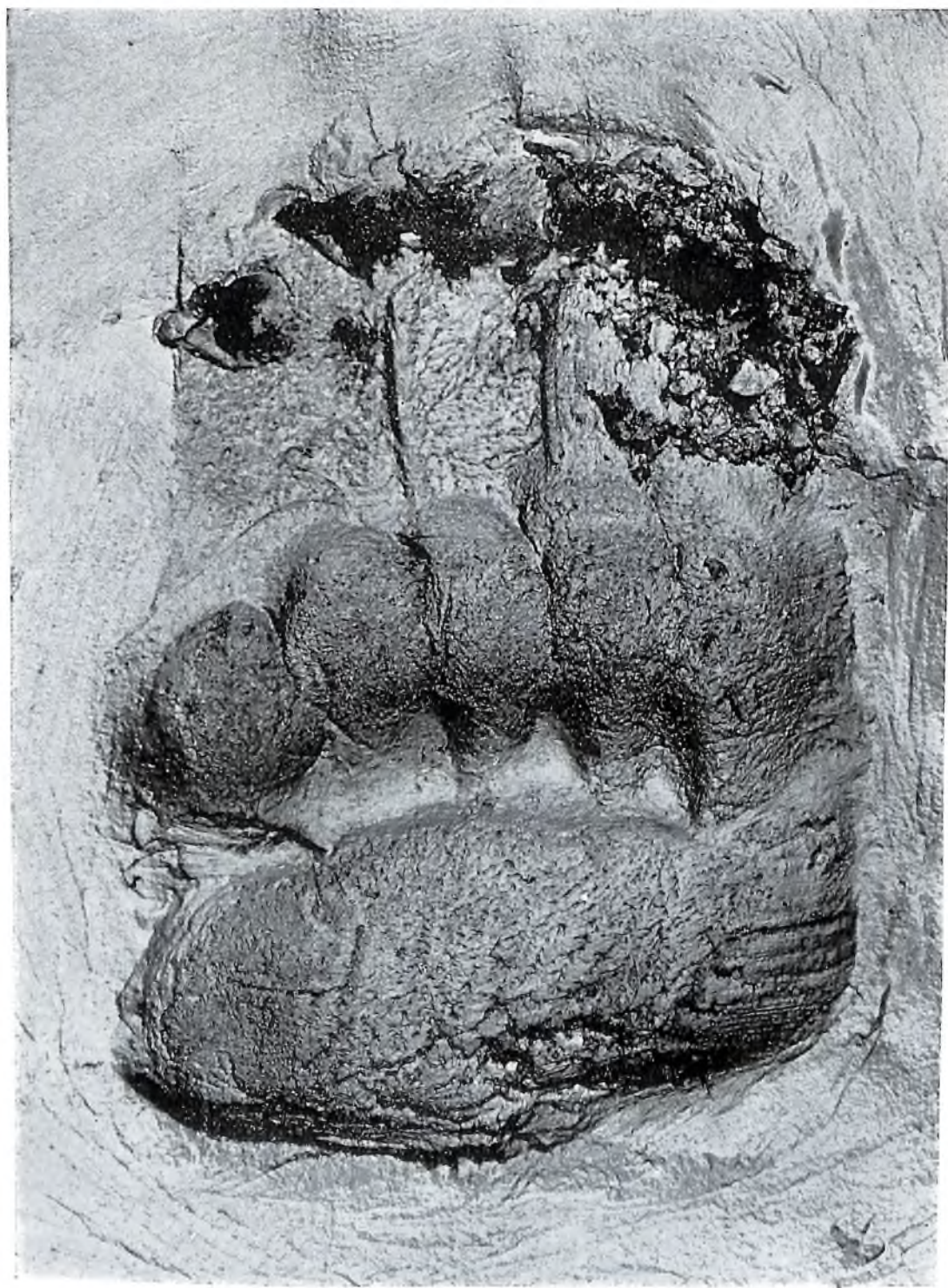
(Facing page 104.

BEAR.



HINDFOOT.
IMPRESSION ON CLAY PAD.

BEAR.



FOREFOOT.
IMPRESSION ON CLAY PAD.

(Facing page 105.

THE INDIAN SLOTH BEAR.



[Facing page 105.]

THE INDIAN SLOTH BEAR.

Localities where found.—Throughout India. Not in Burma.

Hindustani names.—Bhaloo, Reech.

Average height at shoulder.—2 feet 5 inches.

Measurements of a good average specimen.—

Length (between pegs)	..	..	5 feet 8 inches.
Girth	..	..	3 feet 8 inches.
Weight	..	..	275 lbs.

The Indian black bear lives in caves and frequents jungles where there are hills.

It feeds on honey, white-ants, insects of all kinds and fruit.

Without doubt old *Bhaloo* is the biggest buffoon of the Indian jungle. His eyesight and hearing are very indifferent, and for this reason he is often come upon unawares—and very often shows his displeasure by scalping the intruder! His sense of smell is however highly developed, but this seems to be used more as a means of finding food than for purposes of self-preservation.

Bear are fairly difficult to kill and no liberties should be taken with them. They make a tremendous din when wounded, and it is no uncommon sight to see a bear wounded by a bullet attack one of its own kind, when a desperate battle ensues, which probably gives the shikari plenty of time to reload and bag them both. They have a great partiality for the fleshy calyx of the Mohwa tree from which the jungle people distill spirit, and when this flower drops from the trees in a fermented state old *Bhaloo* has the night of his life, seldom returning to his cave in the morning entirely sober.

THE MIGHTY BOAR.

*The Bravest of the Brave.**Localities where found.*—Throughout India and Burma.*Hindustani name.*—Soor.*Measurements of a good average specimen.*—

Height at shoulder	..	..	..	31 inches.
Weight	..	..	..	175 lbs.
Length of tush	..	..	..	7 $\frac{3}{4}$ inches.

No boar below 27 $\frac{1}{2}$ inches in height at the shoulder should be speared.

The wild pig of India associate in sounders, and live in high grass jungle and crops, to which latter they are very destructive.

In the jungle one often sees "pigs' nests," which are mound-shaped shelters of grass used for sheltering their young. Wild pigs are very fond of wallowing. They feed in the mornings and evenings. Their colour is in general black mixed with grey; old boars are almost entirely grey. In pig-sticking the best advice we can give is, keep on the pig you are after, ride for all you are worth, and forget not the words of the Hog Hunters' song:

"Youth's daring spirit, manhood's fire,
Firm hand and eagle eye
Must they acquire who do aspire
To see the grey boar die."

These notes are not meant to be a discourse on hog hunting, so to those of our readers who desire to take part in this, perhaps the greatest of all sports, we advise a careful study.

THE MIGHTY BOAR.



"The bravest of the brave."

Facing page 106.

BOAR.



HINDFOOT.

FOREFOOT.

IMPRESSIONS FROM PLASTER CASTS FROM FAIRLY SOFT GROUND.

[Facing page 106.]

of those classics on the subject from the fluent pens of Lieut.-Genl. Lord Baden-Powell and Lieut.-Genl. Sir A. E. Wardrop.

The very mention of pig-sticking also brings to mind the name of Claude Ismay, one of the finest all-round sportsmen who ever came to India. Not only did this exponent of all manly games make a great name for himself at Polo, both Rugby and Association Football, Hockey and Running, but he was also a hog hunter of the first order and the winner in 1898-99 of that much-prized trophy, the Nagpur Hunt Cup.

There is little, indeed, concerning the wiles of the boar or the management of a horse that Claude Ismay does not know. We believe that, if he could be persuaded to write a book on his sporting reminiscences, it would not only afford considerable pleasure to his many friends but would also be of great assistance to the young sportsman in India, and might be the means of recruiting many to the band of actual hog hunters entitled to join in the famous song "The Boar," the words of which, in spite of the possible charge of repetition, we give below:—

(Tune: "My love is like the red, red rose.")

The boar, the mighty boar's my theme,
Whate'er the wise may say,
My morning thought, my midnight dream,
My hope throughout the day.
Youth's daring spirit, manhood's fire,
Firm hand and eagle eye
Must they acquire who do aspire
To see the grey boar die.
Then pledge the boar, the mighty boar,
Fill high the cup with me,
Here's a health to all who fear no fall,
And the next grey boar we see!

We envy not the rich their state,
Nor kings their crowned career,
For the saddle is our throne of health,
Our sceptre is the spear ;
We rival, too, the warrior's pride,
Dress stained with purple gore,
For our field of fame is the jungle-side,
Our foe the jungle boar.
Then pledge the boar, *etc.*

When age hath weakened manhood's powers,
And every nerve unbraced,
Those scenes of joy will still be ours,
On mem'ry's tablets traced,
When with the friends whom death hath spared,
When youth's career is run,
We'll talk of the chases we have shared,
And the tushes we have won.

HUNTING LEOPARD.



[Facing page 109.]

THE HUNTING LEOPARD.



[Facing page 109.]

From Sanderson's Sketch.

THE HUNTING LEOPARD.

Localities where found.—Rajputana, Central India, Central Provinces, Punjab.

Hindustani name.—Cheetah.

Average height at shoulder.—2 feet 7 inches.

Measurement of a good average specimen.—From nose to tip of tail (between pegs), 7 feet 1 inch.

This animal has a tawny yellow skin covered with single black spots, not rosettes as in the case of the panther, and it is also lighter in build and longer in the leg. It lives in rocky hills near places where blackbuck or chinkara are plentiful. It is very fast and, if it can get up fairly close, can often catch a blackbuck in its first rush. Its claws are semi-retractile.

THE WILD DOG.

Localities where found.—Most of the forests of India.

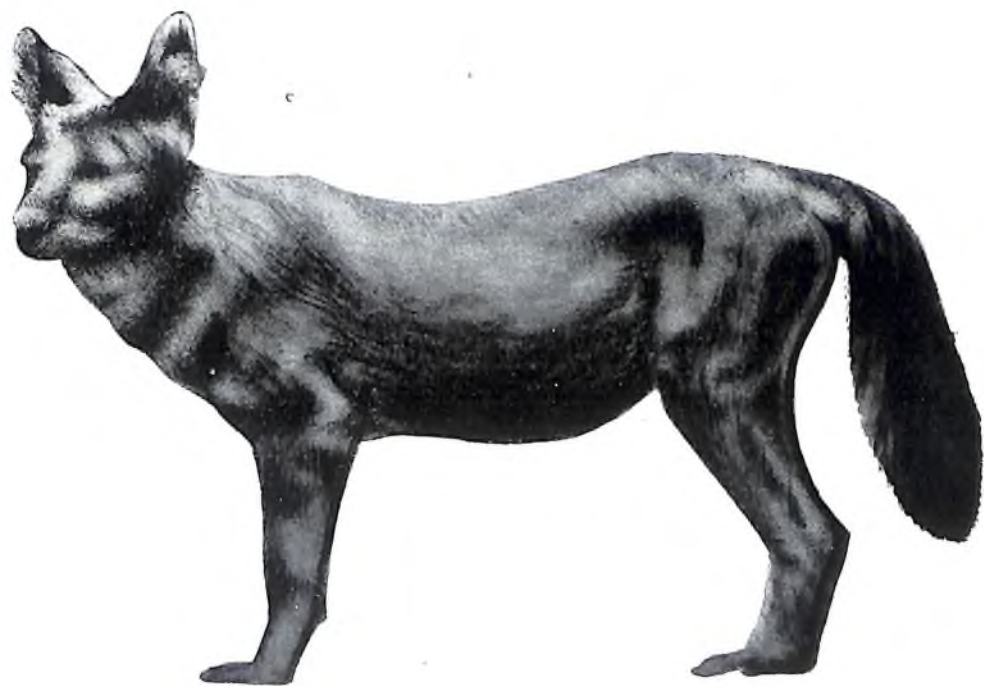
Hindustani name.—Jungli Kutta.

Height at shoulder.—22 inches.

Weight.—About 40 lbs.

Wild dogs are in appearance much like an ordinary tame animal of the fast running type. They are of a rusty red colouration, with light yellow under the belly, and have a fine bushy tail with a black tip. They have long silky hair, and a considerable quantity of hair between the toes. They are wonderfully agile and are without doubt the greatest pest of the jungle. In places where a pack of wild dogs exist, every other animal will very soon clear out, so it is advisable to destroy these beasts by every means in your power.

THE WILD DOG.



[Facing page 110.]



FOREFOOT.



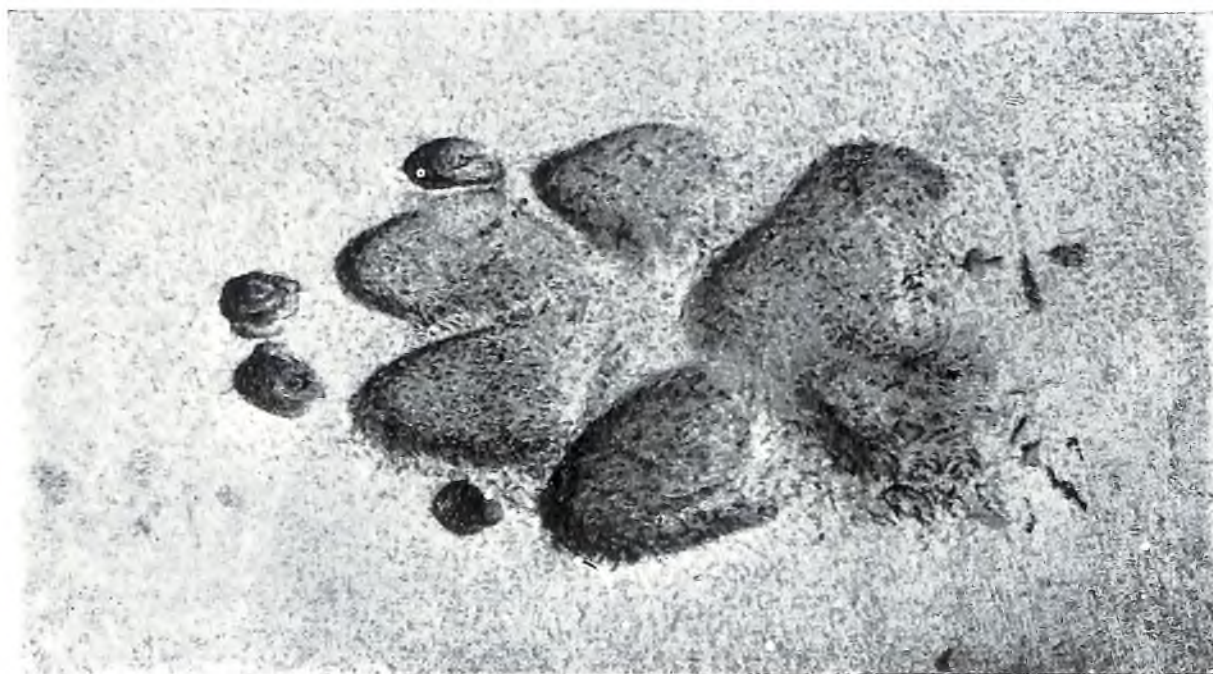
HINDFOOT.

IMPRESSIONS ON CLAY FROM PLASTER CASTS.

WOLF.



HINDFOOT.



FOREFOOT.

IMPRESSIONS ON CLAY PAD.

[Facing page 111.]

THE WOLF.

Localities where found.—Rajputana and most parts of India, except Lower Bengal.

Hindustani names.—Beriya, Bighana.

Average measurement.—Total length about 4 feet 2 inches.

Weight.—About 40 lbs.

The Indian wolf of Rajputana is fulvous grey, with a mixture of black on the back. It has been known to carry off children, and usually lives on sheep, goats and other small animals; it will eat carrion.

It lives in open plain country with light jungle, and breeds in holes in the ground. One of us killed a wolf in Rajputana in the cold weather on an almost open field, when it took little notice of our advance. It apparently has no fear of man.

THE FOX.

Localities where found.—Most parts of India. It is not found in Burma.

Hindustani name.—Lomri.

Measurement.—From nose to tip of tail, 2 feet 8 inches.

Weight.—About 7 lbs.

The majority of foxes found in India are silver grey, with a white chin. They live on fruit, grain, birds, reptiles, insects and eggs. The Indian fox is very quick and can dodge with great dexterity; in this matter its somewhat lengthy tail of about 13 inches is of considerable assistance. It has a remarkable laughing cry.



FOREFOOT.



HINDFOOT.

IMPRESSIONS ON CLAY PAD.

FOX.



Top: FOREFOOT.

Bottom: HINDFOOT.

IMPRESSIONS FROM A SINGLE PLASTER CAST.

(Note the outward turn of Hindfoot)

THE HYÆNA.



[Facing page 113.]

THE HYÆNA.

Localities where found.—Most parts of India.

Hindustani name.—Lugger bagha.

Measurements.—

Height at shoulder	..	..	about 2 feet 2 inches.
Length from nose to tip of tail	..	..	about 5 feet.
Weight	..	..	about 80 lbs.

The hyæna is yellowish grey in colour, with narrow black stripes. It carries a mane. Its forequarters are considerably higher than its hindquarters, and this probably assists in adding to its already hideous appearance. The hyæna has been known to kill goats and other small animals, but it usually feeds on carrion. It has very powerful jaws and can crack the big bone of a bullock with one bite; but in spite of this power this unprepossessing animal is the biggest coward of the Indian jungles. It lives in caves in rocky hills, or holes which it digs in the sides of deep nullahs.

Beware of this animal when sitting over a tiger or panther kill, as it will eat or mangle a tiger after you have shot him if you do not guard your trophy.

THE OTTER.

Localities where found.—Central Provinces and most parts of India.

Hindustani name.—Panikutta.

Average weight.—About 21 lbs.

The Indian otter is exactly similar in appearance to that found in Great Britain, but the coat is not so thick. It feeds chiefly on fish; but as it has been found away from water, it presumably on occasions indulges in other food.

OTTER.



Top: FOREFOOT. *Bottom:* HINDFOOT.
IMPRESSIONS ON CLAY FROM PLASTER CASTS.
Facing page 114.

PORCUPINE.



FOREFOOT.

HINDFOOT.

IMPRESSIONS ON CLAY PAD.

Illustrating page 115.

THE PORCUPINE.

Localities where found.—Central Provinces, parts of Rajputana and Bengal.

Hindustani name.—Sahi, Sayel.

Average length.—About 31 inches.

Average weight.—35 lbs.

The porcupine lives on vegetables, roots and fruit. Its power of smell is highly developed.

This animal lives in caves and holes in the ground, and as a rule only comes out at night. In the hot weather, however, it sometimes lies out during the day in cool shady places in the jungle.

The quills of the porcupine are very strong and sharp, and can inflict serious wounds. It carries a group of open quills in the tail which it uses like a rattle.

Tiger are very partial to porcupine flesh and often show wounds caused by the quills. Many a shikari has often enjoyed a tasty meal from the flesh of this little animal.

THE RATEL.

Localities where found.—Central Provinces and most parts of India.

Hindustani name.—Boireench.

Average measurement.—Total length, including tail, about 32 inches.

The under part of the body, to about half-way up the sides, is black, and a sharply defined silver grey band runs from the face nearly to the end of the tail. The forefeet have very powerful claws.

The ratel usually lies up in earth, but it is sometimes found under thick bushes. It can climb trees. In normal circumstances it only comes out of its earth at night, and it indulges in a very considerable amount of digging. The ratel lives on small mammals, birds and fruit; it frequently eats carrion.



FOREFOOT.



HINDFOOT.

IMPRESSIONS MADE ON CLAY PAD.

RATEL.

APPENDIX A.

LIST OF BOOKS ON SPORT AND WEAPONS RECOMMENDED AS A
NUCLEUS FOR A LIBRARY IN INDIA.

NAME OF BOOK.	AUTHOR.	PUBLISHER.
Notes on Sporting Rifles .. <i>(Second Edition)</i>	Major Gerald Burrard, D.S.O. ..	Messrs. Edward Arnold & Co., London.
The Sporting Rifle and its Projectiles <i>(Second Edition)</i>	Captain James Forsyth ..	Messrs. Smith Elder & Co., 65 Cornhill, London, E.C.
Exterior Ballistics	Lt.-Col. Sir Philip W. Richardson, Bart., O.B.E., V.D., and Major C. W. Wirgman, T.D.	The National Rifle Association.
Modern Sporting Gunnery ..	Henry Sharp	Messrs. Simpkin Marshall Hamilton Kent & Co., London.
The Hodsock Ballistic Tables for Rifles.	F. W. Jones, O.B.E. ..	Messrs. Edward Arnold & Co., London.
The Indian Field Shikar Book .. <i>(Seventh Edition)</i>	W. S. Burke	Messrs. Thacker, Spink & Co., Calcutta.
Rowland Wards' Records of Big Game.	J. G. Dolman and J. B. Burlace ..	Messrs. Rowland Wards, 167, Piccadilly.

Shikar Notes for Novices ..	Hon'ble J. W. Best ..	The Pioneer Press, Allahabad.
Wild Animals in Central India ..	A. A. Dunbar Brander, F.Z.S., F.R.G.S.	Messrs. Edward Arnold & Co., London.
Wild Beasts and Their Ways ..	Sir Samuel Baker ..	Messrs. Macmillan & Co., London.
Thirteen Years among the Wild Beasts of India. (<i>Seventh Edition</i>)	G. P. Sanderson ..	Messrs. John Grant, 31 George IV Bridge, Edinburgh.
Tiger and Other Game ..	Col. A. E. Stewart ..	Messrs. Longmans Green & Co., 39 Paternoster Row, London, E.C. 4.
Days and Nights with Indian Game	Lieut.-Genl. Sir A. E. Wardrop	Messrs. Macmillan & Co., St. Martin's Street, London.
The Highlands of Central India ..	Captain James Forsyth ..	Messrs. Chapman & Hall, Ltd., London.
Indian Jungle Lore and the Rifle ..	"Silver Hackle" ..	Messrs. Thacker, Spink & Co., Calcutta and Simla.
Pig Sticking or Hog Hunting ..	Lieut.-Genl. Lord Robert Baden- Powell.	Messrs. Herbert Jenkins & Co., 3 York Street, St. James', London.
Modern Pig Sticking ..	Lieut.-Genl. Sir A. E. Wardrop	Messrs. Macmillan & Co., St. Martin's Street, London.
The Adventures of Jungle John } The Further Adventures of Jungle John. }	John Budden ..	Messrs. Longmans Green & Co., 39 Paternoster Row, London, E.C. 4.
With a Camera in Tigerland ..	F. W. Champion, I.F.S. ..	Messrs. Chatto & Windus, 97 and 99 St. Martin's Lane, London.
Sporting Memories ..	Major-General N. Woodyatt ..	Messrs. Herbert Jenkins & Co., 3 York Street, St. James', London.

APPENDIX B.

SOME CALCULATIONS ON BALLISTICS.

To obtain the striking velocity at a known range of a bullet of a known weight, shape and muzzle velocity.

For a projectile travelling in a vacuum the path can be determined theoretically, since we know that the horizontal component of the muzzle velocity remains constant throughout the path of the projectile, as once it has left the muzzle it is acted upon by no force with a horizontal component. The vertical component is the only one that alters, and this alteration takes place every instant on account of the vertical force of gravity which acts upon the projectile.

When the range is sufficiently small, so that that portion of the circumference of the earth over which the projectile passes can be considered straight and not curved, then the path of the projectile is a parabola.

In actual practice, however, the projectile has to pass through the air, and its mass has acting upon it not only the force of gravity in a vertical direction but also forces due to air resistance, which forces act along the same line as the path of the projectile but in the opposite direction.

The amount of these resisting forces has, up to the present, not been determined mathematically. It is considered that they are due to direct compression of the air and frictional resistance along the surface of the projectile, and that

the values of these resistances vary with the condition of the air, such as (1) the specific gravity of the air, (2) the composition, *i.e.*, presence or not of moisture, and (3) whether the air is in motion in any direction or even only oscillatory. Resort therefore has to be made to experiment to determine the value of these resistances.

Now we know that, if projected in a vacuum, equal horizontal intervals of space are covered by a projectile in equal spaces of time. If, when projected in the atmosphere, the actual times taken to cover these same intervals of space are obtained by experiment, we can deduce the air resistance forces. Also if the striking energy is experimentally found over known ranges, the air resistance forces can be deduced. Both of these types of experiments have been carried out.

Striking velocities have been found experimentally by means of the Ballistic Pendulum by Lord Cottesloe and Lt.-Col. H. Mellish in 1897-99, and from the information obtained by these experiments Mr. F. W. Jones compiled his Hodsock Ballistic Tables which are now considered to be the most reliable in existence for rifle work.

The Ballistic Pendulum, the instrument used for determining the striking energies of rifle bullets, works on the principle that energy cannot be lost but only dissipated. Thus at the moment before the bullet hits the pendulum, it has a certain energy, the measure of which is its mass and its velocity. It had more energy at the muzzle, the mass then being the same but the velocity greater, the difference, of course, having been dissipated in heating and putting in motion the air through which the bullet passed.

The moment after impact, the velocity of the bullet is reduced to the common resultant velocity of both pendulum and bullet.

Except for the small amount of energy lost during impact in heat, the equation, $mV = Mv$ holds good — m being the mass of the bullet and V its velocity at the instant before impact, and M being the mass of pendulum and bullet combined, and v the velocity of this combination.

This Mv is measured by the amount the pendulum swings back multiplied by a factor to allow for the frictional and other resistances of the apparatus.

In practice the sportsman is only concerned with relatively short ranges and with relatively high velocities, so that the path of the bullet, and therefore the air resisting forces, are practically horizontal; and as his chief aim is to know the striking energy, it is reasonable for him to take the air resistances as computed from the pendulum experiments which determined the striking energy rather than from those computed from varying decreases of velocity.

For velocities over 1,120 feet per second Mr. Jones deduced the formula:

$$R = \frac{1}{12.07474} \times (v - 950)^{0.7}$$

where R = resistance in lbs. per circular inch on a standard shape bullet at any instant,

and v = velocity at the same instant.

By circular inch is meant the area of a circle of 1 inch diameter, and the standard shape is such that the air resistance at 1,300 feet per second on one circular inch is 5 lbs.

The actual standard shape does not necessarily exist—it is simply a conception and may have any form which results in the resistance of 5 lbs. per circular inch at 1,300 feet per second. Actually the Military Bullet approximates to this value.

To find the Striking Velocity

Let w = weight of bullet in lbs.

d = diameter in inches of a bullet which has not been fired through a ring.

Since by a circular inch we mean the area of a circle whose diameter is 1 inch (in reality it is the actual area of the circle divided by $\frac{\pi}{4}$), it follows that the area of a circle whose diameter is d inches is d^2 circular inches, because the actual area of a circle of d inches diameter is d^2 by $\frac{\pi}{4}$, and this actual area divided by $\frac{\pi}{4}$ is d^2 .

Hence $\frac{W}{d^2}$ = weight in lbs. per circular inch of bullet.

Let n = shape co-efficient for the particular bullet, so that at 1,300 feet per second velocity the air resistance to this bullet = $5n$ lb. per circular inch.

The whole resistance to the bullet at 1,300 feet per second
= $5n d^2$ lbs.,

and resistance at v ft. per second = $\frac{nd^2}{12.07474} \times (v - 950)^{0.7}$ lbs. (1).

Now the velocity changes instant by instant and, consequently, so does the resistance.

Let U = initial muzzle velocity in ft. per second,

V = final or striking velocity in ft. per second,

S = range in ft.

The problem is to find V , the other two quantities being known.

As it has already been premised that sportsmen are concerned only with short ranges and high velocities, we need only consider the horizontal path, forces and velocities.

Now $F = Ma$, (2)

When F = force,

M = Mass,

a = acceleration,

and if a is constant

$v = a \times t$ (3),

where v = velocity after a space of t secs. with initial velocity *nil*.

If a is not constant it is still true for infinitely small intervals of time. It is therefore more true to say

$$dv = a dt \quad (4),$$

which is the mathematical way of saying that the infinitely small increase in velocity is equal to the acceleration acting at the moment multiplied by the infinitely small space of time.

$$\text{From (2) } a = \frac{F}{M} \text{ or } \frac{Fg}{w}.$$

Substituting R of equation (1) for F , we get

$$a = \frac{nd^2}{12.07474} \times \frac{(v-950)^{0.7}}{w} \times g.$$

But $\frac{w}{nd^2} = C$, which is called the Ballistic co-efficient of the bullet;

$$\text{then } a = \frac{(v-950)^{0.7}}{C \times 12.07474} \times g.$$

Now $dv = a dt$,

$$\therefore dv = \frac{(v-950)^{0.7}}{C \times 12.07474} \times g dt \quad (5).$$

$$\text{or } \frac{dt}{c} = \frac{dv \times 12.07474}{(v-950)^{0.7} \times g} \quad (6).$$

Space covered in dt seconds at velocity $V_1 = v dt = ds$.

$$\therefore \frac{ds}{c} = \frac{v dv \times 12.07474}{(v-950)^{0.7} \times g} \quad (7).$$

We now integrate equation (7) between the limits

$$U_1 = U \text{ (muzzle velocity) } - 950$$

$$\& V_1 = V \text{ (striking velocity) } - 950.$$

and we get

$$\frac{S}{C} = 1187.84 (U_1^{0.3} - V_1^{0.3}) + 0.288545 (U_1^{1.3} - V_1^{1.3})$$

and this is the equation which gives us the striking velocity ($V_1 + 950$) in terms of the known muzzle velocity ($U_1 + 950$); range S and Ballistic co-efficient of the bullet C .

Simplified, this equation will take the form

$$hV_1^{1.3} + kV_1^{0.3} = m \quad (8)$$

$$\text{where } h = 0.288545 \times C$$

$$k = 1187.84 \times C$$

$$\text{and } m = 0.288545 \times C \times U_1^{1.3} + 1187.84 \times C U_1^{0.3} - S.$$

Unfortunately this form of equation is ill adapted for direct solution; we therefore resort to the expedient of changing our unknown from striking velocity to range; and by assigning different values to V (the striking velocity), we get the ranges (s) at which these values of V attain.

For example:

Let U (the muzzle velocity) be 2,500 ft. per second,

then $U_1 = 2,500 - 950 = 1,550$ ft. per second

and let C (the Ballistic coefficient) = .24.

Now let us assign the value of 1,943 feet per second to the striking velocity V , and then from equation (8) calculate the range at which this striking velocity attains.

$V_1 = V - 950 = 1,943 - 950 = 993$ ft. per second.

Substituting these values of U_1 and V_1 in equation (8), we get

$$\begin{aligned} & 0.288545 \times C \times 993^{1.3} + 1187.84 \times C \times 993^{0.3} \\ &= 0.288545 \times C \times 1550^{1.3} + 1187.84 \times C \times 1550^{0.3} - S \\ \text{or } \frac{S}{C} &= .288545 \times 1550^{1.3} + 1187.84 \times 1550^{0.3} - .288545 \times 993^{1.3} \\ & \quad - 1187.84 \times 993^{0.3} \end{aligned}$$

From the table of logarithms we find

$$\log. 1550 = 3.1903317$$

$$\text{and } \log. .288545 = 1.4602136$$

$$\begin{aligned} \therefore \log. (.288545 \times 1550^{1.3}) &= 1.4602136 + 1.3 \times 3.1903317 \\ &= 1.4602136 + 4.14743121 \\ &= 3.60764481 \end{aligned}$$

and again from the tables we find that 3.60764481 is the logarithm of the number 4051.77;

4051.77 is therefore the value of the expression

$$.288545 \times 1550^{1.3}$$

Similarly:

$$\log. 1187.84 = 3.0747580$$

$$\begin{aligned} \text{and log. } (1187.84 \times 1550^{0.3}) &= 3.0747580 + 0.3 \times 3.1903317 \\ &= 3.0747580 + 0.95709951 \\ &= 4.03185751 \end{aligned}$$

and the number of which this is the logarithm is 10761.12 ;

$$\text{and log. } 993 = 2.9969492 ;$$

$$\begin{aligned} \text{So log. } (.288545 \times 993^{1.3}) &= 1.4602136 + 1.3 \times 2.9969492 \\ &= 1.4602136 + 3.89603396 \\ &= 3.35624756 \end{aligned}$$

and the number of which this is the logarithm is 2271.16 ;

$$\begin{aligned} \text{and log. } (1187.84 \times 993^{0.3}) &= 3.0747580 + 0.3 \times 2.9969492 \\ &= 3.0747580 + 0.89908476 \\ &= 3.97384276 \end{aligned}$$

and the number of which this is the logarithm is 9415.49.

$$\begin{aligned} \text{Therefore } \frac{S}{C} &= 4051.77 + 10761.12 - 2271.16 - 9415.49 \\ &= 14812.89 - 11686.65 \\ &= \underline{3126.24}, \end{aligned}$$

and $S = 3126.24 \times C$, and $C = .24$

$$\begin{aligned} \therefore S &= 3126.24 \times .24 \\ &= \underline{750.2976} \text{ ft. } (= 250.1 \text{ yards}). \end{aligned}$$

In the above example we have shown that, with a muzzle velocity of 2,500 feet per second and a ballistic co-efficient of .24, the striking velocity of 1,943 feet per second is attained at a range of 750.3 feet.

If the ballistic co-efficient had been unity, this same striking velocity would have been attained at a range of 3126.24 feet.

We can obviously, in a similar manner, work out several other examples, taking the same initial velocity but putting $C = 1$, and so obtain a sufficient number of points to plot a

curve showing the final velocity at various ranges for ballistic co-efficient unity; and this curve will enable us to obtain the value of the striking velocity at any range and for any value of C.

The Hodsock Ballistic tables previously mentioned as having been compiled by Mr. F. W. Jones, O.B.E., gives these results in tabular form, but as a certain amount of calculation is necessary in order to obtain the striking velocity of bullets at various ranges from those tables, we have provided in Chapter III a set of sliding scales which gives the desired result without any computation whatever.

The following table gives the values of bullets for the rifles mentioned in Chapter III for the purpose of utilising the Scales.

d = the diameter in inches of the unfired bullet,

n = the shape co-efficient of the bullet,

c = the ballistic co-efficient of the bullet.

<i>Rifle</i>		<i>d</i>	<i>n</i>	<i>c</i>
8 Bore (Black Powder)	.. ..	0.835	2.00	0.128
.577 (Black Powder)	.. ..	0.585	1.92	0.141
.600 H. V.	.. ..	0.620	1.75	0.191
.470	.. ..	0.476	1.30	0.242
.375 Mag. (300 grains)	.. ..	0.375	1.10	0.277
.375 Mag. (270 grains)	.. ..	0.375	1.10	0.249
.375 Mag. (235 grains)	.. ..	0.375	1.20	0.191
9.5 mm (Mannlicher Schonauer)	.. ..	0.375	1.15	0.238
.350 Mag. (225 grains)	.. ..	0.357	1.10	0.223
.318 Mag. (250 grains)	.. ..	0.327	1.15	0.290

NOTE.—The bore, or more correctly the calibre, of a rifle is the diameter measured across the lands of the rifling. In the case of the .375 Magnum the diameter across the lands of the rifling is in reality .369 inches and the diameter of the unfired bullet .375 inches.

639.1

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