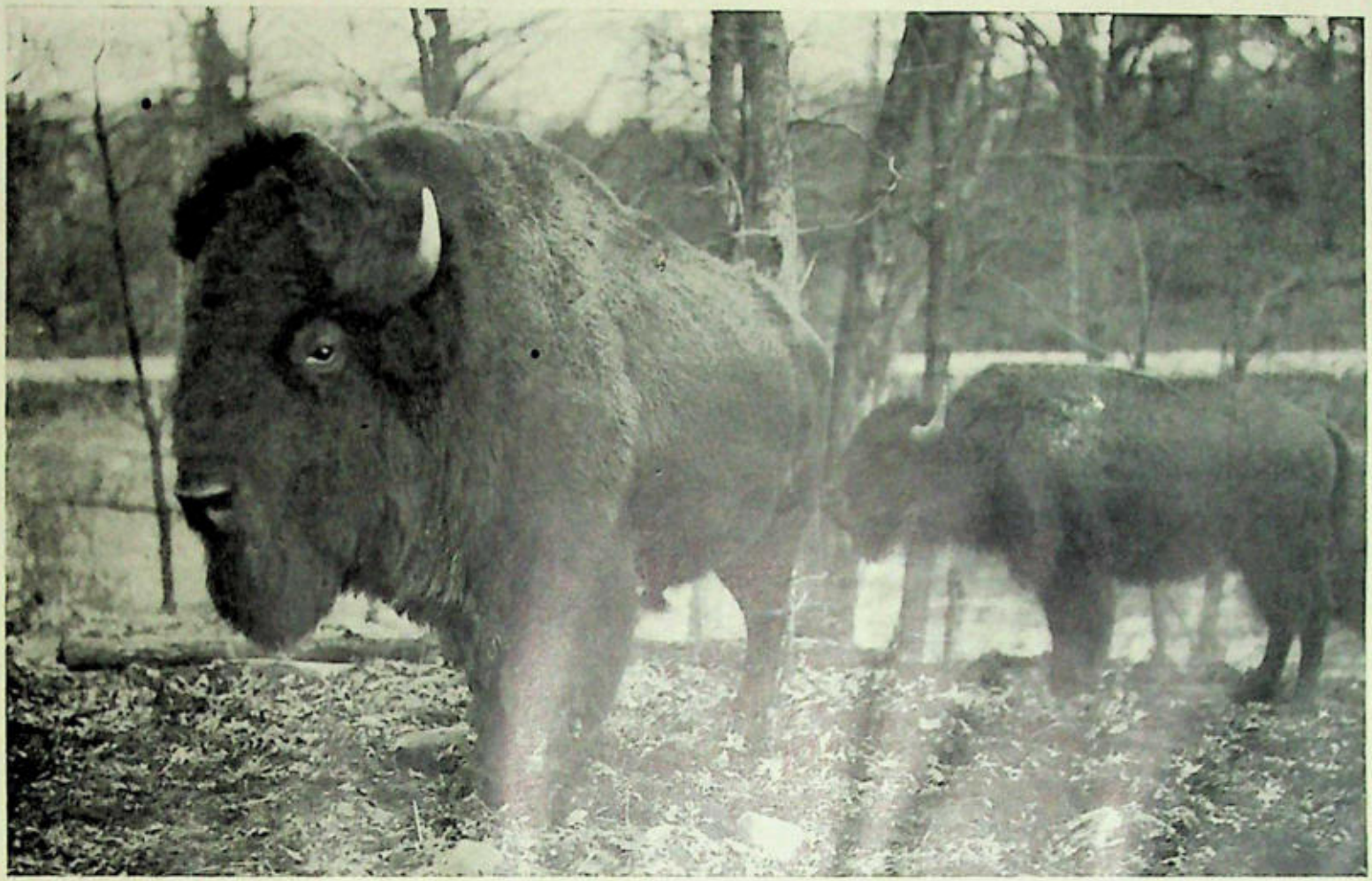


AMERICAN BISON IN THE ZOOLOGICAL PARK (1905).

TENTH ANNUAL REPORT

OF THE

NEW YORK ZOOLOGICAL SOCIETY

CHARTERED IN 1895

OBJECTS OF THE SOCIETY

A PUBLIC ZOOLOGICAL PARK

THE PRESERVATION OF OUR NATIVE ANIMALS

THE PROMOTION OF ZOOLOGY

1905

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Cochrane, John W.,
Cockerill, John F.,
Cockeroft, Miss E. V.,
Cockran, Hon. W. Bourke,
Codman, Mrs. Ogden,
Coffin, Daniel M.,
Coffin, William Edward,
Cohen, Samuel M.,
Colbron, Paul Townsend,
Colburn, N. A.,
Colby, Howard A.,
Cole, Edward F.,
Collier, Peter F.,
Collier, Price,
Collier, Mrs. R. J.,
Collins, Clarence Lyman,
Collins, Dr. Stacey Budd,
Collins, Mrs. Ellen,
Collins, Miss Gertrude,
Collord, George W.,
Comstock, Mrs. H. G.,
Condon, Thomas Gerald,
Conger, Henry C.,
Connor, Gerald C.,
Content, Harry,
Coombe, T. Gorton,
Cooper, Theodore,
Corbin, Austin,
Corbin, Mrs. Austin,
Corning, C. R.,
Corwine, William R.,
Constain, Eugene H.,
Coster, Charles,
Coster, Edward Livingston,
Coster, Henry A.,
*Cotter, John,
Cotton, W. J.,
Cowdin, Winthrop,
Cowl, Clarkson,
Cowles, David S.,
Cox, Charles F.,
Cox, Jennings S.,
Cox, Mark T.,
Craigie, Archibald Walpole,
Cram, Mrs. Kathrine G.,
Crane, Albert,
Cravath, Mrs. Paul D.,
Crawford, Thomas,

* Deceased.

Crawford, Dr. W. H.,
Crawford, William,
Cromwell, James W.,
Cromwell, Lincoln,
Cronemeyer, Robert,
Cronin, Charles H.,
Crosby, C. H.,
Cross, George D.,
Cross, Mrs. C. Vanderbilt,
Crossley, G. Reginald,
Cruickshank, James,
Curtis, Edward W.,
Cutler, Charles F.,
Cutter, Ralph L.,
Cutting, R. Fulton,
Cutting, W. Bayard,
Dailey, Granville F.,
Daintry, W. Mansell,
Daly, Mrs. Marcus,
Damon, William E.,
Dana, William B.,
Daniels, George H.,
*Danne, Dr. Frederic,
Dards, Charles A.,
Davenport, Prof. Charles B.,
*Davenport, Ira,
Davenport, Mrs. Ira,
Davidge, William H.,
Davies, Frederick M.,
Davies, J. Clarence,
Davies, Julien Tappan,
Davies, William Gilbert,
Davis, Charles H.,
Davis, Daniel A.,
Davis, Gherardi,
Davis, Howland,
Davis, Joseph P.,
Davis, Morgan,
Davison, Charles Stewart,
Davison, George Howard,
Day, Arthur M.,
Day, Mrs. Henry Mills,
Day, Horace Lincoln,
Dean, Prof. Bashford,
*DeBocande, Eugene,
De Coppet, Henry,
Deeves, Richard,
De Forest, Robert W.,
Degener, J. F.,
DeGoicouria, A. V.,
De Klyn, B. F.,
Delafield, Frederick P.,
Delafield, Miss Julia Livingston,
Delano, Frederic A.,
Delano, Warren, Jr.,
Delanoy, William C.,
Delesker, Charles,
Deming, L. C.,
Denicke, J. B.,
Derby, Dr. Richard H.,
De Rham, H. Casimir,
Devereux, Walter B.,
De Vinne, Theodore Low,
De Witt, Walter G.,
De Witt, William G.,
Dexter, Stanley W.,
Dey, Anthony,
Deyo, Robert E.,
Dickerson, E. N.,
Diehl, George H.,
Dienst, A. P.,
Dillingham, Frank A.,
Dimock, George E.,
Ditmars, R. L.,
Dixon, Dr. George A.,
Dixon, Robert Nicer,
Dodd, Robert H.,
Dodge, D. Stuart,
Dodge, Elizabeth W.,
Dodge, Miss Grace H.,
Dodge, Norman W.,
Dodge, Mrs. William E.,
Dohse, John,
Dominick, H. Blanchard,
Dommerich, L. F.,
Doremus, F. S.,
Doubleday, F. N.,
Douglas, James,
Douglass, Alfred,
Dows, Mrs. David,
Dows, Mrs. David, Jr.,
Dows, Tracy,
Drake, William H.,
Drakenfeld, B. Ferdinand,
Drayton, J. Coleman,
Draz, Francis,
Dressel, John A. H.,
Drummond, I. Wyman,
Duane, Richard Bache,
DuBois, Cornelius,
DuBois, Dr. Matthew B.,
Duer, William A.,
Dulles, William, Jr.,
Duncan, Stuart,
Duncan, W. Butler,
Dundas, Ralph Wurts,
Dunham, Dr. Carroll,
Dunham, Edward K.,
Dunham, G. H.,
Dunn, Gano S.,
Dunne, Edward B.,
Dunne, James,
Duryea, Harry H.,
Duryea, Gen. Hiram,
Dutcher, William,
Edgar, D.,
Edgar, Herman L. R.,
Edgar, Miss Julia L.,

* Deceased.

EDGAR, NEWBOLD,
EDGELL, GEORGE S.,
EDMONDS, JOHN W.,
EGERTON, M.,
EGGELING, OTTO,
EGLESTON, D. S.,
EIDLITZ, ROBERT JAMES,
ELBERS, MRS. FRITZ,
ELDER, MRS. MATILDA A.,
ELDRIDGE, FREDERICK L.,
ELDRIDGE, ROSWELL,
ELDRIDGE, WILLIAM T.,
ELLIS, WILLIAM H.,
ELLSWORTH, DUNCAN S.,
ELLSWORTH, JOHN MAGEE,
ELLSWORTH, LINCOLN,
EMANUEL, J. H., JR.,
EMERY, JOHN J.,
EMIGH, MOTT,
EMMET, C. TEMPLE,
EMMET, MISS LYDIA F.,
EMMET, ROBERT TEMPLE,
EMMET, MRS. WILLIAM J.,
ENDICOTT, ROBERT,
ENGLISH, E. M.,
ENO, JOHN CHESTER,
EPSTEAN, EDWARD,
ERBSLOH, R.,
ERDMANN, MARTIN,
ESCHMANN, F. W. R.,
ETTLINGER, LOUIS,
EUSTIS, JOHN E.,
EVANS, MRS. CADWALADER,
EVANS, RICHARD,
EVARTS, A. W.,
EVARTS, SHERMAN,
FAAS, JOHN,
FABBRI, ALESSANDRO,
FABBRI, ERNESTO G.,
FABBRI, MRS. ERNESTO G.,
FAHNESTOCK, HARRIS C.,
FAHNESTOCK, WILLIAM,
FAIRBANKS, HENRY P.,
FAIRCHILD, DAVID,
FAIRCHILD, H. S.,
FAIRCHILD, NELSON,
FALK, GUSTAV,
FALVEY, FRANK A.,
FARGO, JAMES C.,
FARNHAM, PAULDING,
FARRAR, NATHANIEL B.,
FARRELLY, T. CHARLES,
FARRINGTON, HARVEY,
FEARING, GEORGE R.,
FEARON, J. S.,
FELLOWES, CORNELIUS,
FERGUSON, HARRY L.,
FERNSTROM, H.,
FIELD, WILLIAM B. OSGOOD,
FISCHER, WILLIAM H.,
FISHER, L. G.,
FISK, HARVEY EDWARD,
FITCH, EZRA H.,
FITZGERALD, GEN. LOUIS,
FLAGLER, HARRY HARKNESS,
FLINT, AUSTIN, JR.,
FLOWER, ANSON R.,
FOHR, FRANZ,
FOOT, JAMES D.,
FORBACH, CHARLES,
FORD, MISS LESLA,
FORRESTER, GEORGE B.,
FOSTER, EDWARD W.,
FOSTER, GIRAUD,
FOSTER, J. HEGEMAN,
FOSTER, MACOMBE G.,
FOSTER, SCOTT,
FOWLER, OTIS L. R.,
FOWLER, THOMAS POWELL,
FRASER, ALEX V.,
FRASER, MRS. GEORGE S.,
FRASER, MISS S. GRACE,
FRASER, WILLIAM C.,
FRENCH, DR. CECIL,
FRIED, SAMSON,
FRISSELL, A. S.,
FULDA, DR. CARL,
FULDA, DR. CLEMENS,
FULLER, CHARLES D.,
FULLER, MRS. EUGENE,
FULLER, HENRY D.,
FULTON, JOHN, JR.,
FUNKE, EDMUND A.,
GANZ, ANTHONY,
GARLAND, JAMES A.,
GARRETT, JOHN W.,
GAUTIER, DUDLEY G.,
GAY, JOSEPH E.,
GEER, MRS. WALTER,
GERARD, MRS. JAMES W.,
GERLI, EMANUEL,
GERRISH, JOHN BROWN,
GERRY, PETER G.,
GERSTER, DR. ARPAD G.,
GHEE, THOMAS,
GIBNEY, DR. VIRGIL P.,
GILBERT, CLINTON,
GILLETTE, DR. CURTENIUS,
GILSEY, HENRY, JR.,
GLAZIER, HENRY S.,
GLEASON, MICHAEL,
GLYN, W. E.,
GOADBY, W. H.,
*GODDARD, F. N.
GODFREY, MRS. E. D.,
GODWIN, HAROLD,
GOLDSCHMIDT, S. A.,
GOOD, MARTIN Q.,

* Deceased.

Goodhue, Charles E.,
Goodhue, Mrs. S. C.,
Goodman, Samuel,
Goodridge, Mrs. F. G.,
Gotthelf, Charles,
Gotthelf, Herman,
Gotthold, Frederic,
Gould, Charles A.,
Gould, Charles W.,
Gould, Edwin,
Gould, George H.,
Goulden, Joseph A.,
Granberry, W. H.,
Grant, Chapman,
Grant, R. S.,
Graves, William L.,
Greeff, Ernest F.,
Greene, Gen. Francis V.,
Greenough, John,
Greenwood, Isaac J.,
Greer, Charles,
Gregor, Elmer R.,
Grinnell, George Bird,
Griscom, Clement A., Jr.,
Griswold, Chester,
Gross, Frank,
Gudewill, Rev. Rudolph H. E.,
Guggenheim, Simon,
Gulliver, William C.,
Gurnee, Walter S.,
Gwynne, John A.,
Haas, Otto,
Hague, James D.,
Haight, Charles S.,
Haines, Charles D.,
Haines, Henry F.,
Hallock, Charles P.,
Halls, William, Jr.,
Halstead, Miss L. P.,
Hamersley, Louis Gordon,
Hamilton, Miss Adelaide,
Hamilton, Miss Elizabeth Stewart,
Hamilton, William Pierson,
Hammond, James B.,
Hammond, Mrs. John Henry,
Hanson, Prof. Harry D.,
Harbeck, Charles T.,
Hard, Anson W.,
Hardenbergh, Mrs. John A.,
Hardenbergh, T. E.,
Harmon, Mrs. Clifford,
Harper, Lathrop C.,
Hartog, Ferdinand J., Jr.,
Harvey, Eli,
Haskell, George M.,
Hasslacher, Jacob,
Hastings, Mrs. Thomas,
Hatfield, Thomas F.,
Havemeyer, F. C., Jr.,
Havemeyer, H. O., Jr.,
Havemeyer, T. A.,
Haven, George G., Jr.,
Havens, Albert G.,
Hawe, Matthew,
Hawley, Edwin
Haynes, William De Forest,
Heckscher, John Gerard,
Hedges, Job E.,
Heiman, Abraham,
Heiman, E.,
Heiman, Mrs. Sophie,
Heins, George L.,
Heinsheimer, L. A.,
Heintz, John C.,
Heitemeyer, Clemens,
Held, Dr. R. Johnson,
Hencken, Hancke,
Hendricks, Francis,
Henkel, John,
Henriques, Dr. H. A.,
Hermann, Ferdinand,
Herrman, Mrs. Esther,
Herter, Dr. Christian A.,
Herzog, Lewis,
Hess, Selmar,
Hewitt, Mrs. Abram S.,
Hewitt, Herbert H.,
Hill, E. B.,
Hill, Henry,
Hills, Mrs. Alfred K.,
Hilyard, George D.,
Hinchman, Walter,
* Hinton, Dr. John H.
Hiss, Philip,
Hitchcock, Center,
Hocart, J. H.,
Hodenpyl, Anton G.,
Hoe, Richard M.,
Hoe, Mrs. Richard M.,
Hoe, Mrs. Robert,
Hoffman, Mrs. E. A.,
Holbrook, Mrs. F. S.,
Holbrook, Miss Lilian,
Holden, Edwin B.,
Holden, George A.,
Holland, Hedley L.,
Hollins, Henry B.,
Hollister, H. H.,
Holt, Henry,
Homans, Mrs. Edward C.,
Homer, Wallace,
Hooley, Edwin S.,
Hopf, M. G.,
Hoppin, Hamilton L.,
Hoppin, Samuel Howland,
Hoppin, William W., Jr.,
Hoskier, H. C.,
Howland, Henry E.,

* Deceased.

Howland, Mrs. Henry E.,
Hoyt, Colgate,
Hoyt, George S.,
Hoyt, Gerald C.,
Hoyt, Goold,
Hoyt, Mrs. Jesse,
Hughes, Charles E.,
Humphreys, Mrs. Edward Walsh,
Huntington, Rev. W. R.,
Huppel, J. Christopher G.,
Hussey, William H.,
Husted, Miss M. Katharine,
Husted, Seymour L., Jr.,
Hutchins, Augustus Schell,
Hutter, Karl,
Huyler, John C.,
Hyde, B. T. Babbitt,
Hyde, Clarence M.,
Hyde, Dr. Frederick E.,
Inches, George B.,
Ijams, J. T.,
Inness, George, Jr.,
Inslee, Mrs. Helen C.,
Iselin, Adrian, Jr.,
Iselin, C. Oliver,
Iselin, Columbus O'Donnell,
Iselin, Miss Georgine,
Iselin, John H.,
Isham, Charles H.,
Isham, Miss Julia,
Isham, Samuel,
Ivory, L. C.,
Jackson, Frederic Wendell,
Jackson, Dr. George Thomas,
Jackson, R. G.,
Jackson, Samuel Macauley,
Jackson, Theodore F.,
Jacob, Charles,
Jacob, Lawrence,
Jacobi, Dr. A.,
Jacobus, John S.,
Jacquelin, Herbert T. B.,
Jacquelin, John H.,
James, Arthur Curtiss,
James, Dr. Robert C.,
James, Dr. Walter B.,
Janeway, Dr. Edward G.,
Jeidell, Hugh,
Jenkins, William B.,
Jennings, Frederick B.,
Jennings, Philander R.,
Jennings, Walter,
Jester, Claude W.,
Jesup, Charles M.,
Jewett, C. H., Jr.,
Johnson, David S.,
Johnson, Mrs. F. Coit,
Johnston, William J.,
Joline, Adrian Hoffman,
Jones, H. Bolton,
Jones, Mrs. John D.,
Jones, Lewis Q.,
Judson, H. J.,
Kahn, Louis,
Kahn, Otto H.,
Kallman, Charles,
Kane, John Innes,
Kane, Miss Louisa Langdon,
Kane, S. Nicholson,
Karatsonyi, Martin,
Keech, Frank B.,
Keil, Will. M.,
Kelley, Austin P.,
Kellogg, Mrs. Charles,
Kelly, Eugene,
Kemp, Arthur T.,
Kent, Edwin C.,
Keuffel, Wilhelm,
Kidder, James Hathaway,
Kimball, Alfred R.,
King, Edward,
King, James Gore,
King, Mrs. Leroy,
King, N. K.,
King, Rupert Cochrane,
King, William F.,
* King, William W.
Kinney, Morris,
Kip, Ira A., Jr.,
Kitching, Frank W.,
Klaw, Marc,
Klee, Benjamin,
Knapp, Dr. Herman,
Knapp, John M.,
Knoedler, Roland F.,
Kohlman, Charles,
Kolb, Gustave F.,
Koppel, Frederick,
Kraus, Daniel,
Kretz, Howard C.,
Kuhn, George J.,
Kuhne, Percival,
Kunhardt, Henry R.,
Kuttroff, Adolf,
Lacombe, Hon. E. Henry,
Ladew, Mrs. Edward R.,
La Farge, Oliver H. P.,
Lagai, Dr. George,
Lambert, Dr. Alexander,
Lambert, Dr. Samuel W.,
Lamont, Mrs. Daniel S.,
Landon, Mrs. E. H.,
Landon, Francis G.,
Lane, Edward V. Z.,
Lane, James Warren,
Lange, J. D.,
Langeloth, J.,
Langmann, Dr. Gustav,

* Deceased.

Lathrop, Francis,
Latting, Charles P.,
Laudauer, I. N.,
Lawrence, Cyrus J.,
Lawrence, John Burling,
Lawrence, Newbold T.,
Lawrence, Townsend,
Lawrence, Walter Bowen,
Lawrence, W. V.,
Layng, J. D.,
Ledoux, Dr. Albert R.,
Lee, Mrs. Frederic S.,
Lee, Prof. Frederic S.,
Lee, J. Bowers,
Lee, William H. L.,
Lefferts, Marshall C.,
Le Gendre, William C.,
Leitner, Jacob,
Le Roy, Alfred,
Lesher, A. L.,
Letkemann, H. V.,
Levy, Emanuel,
Lewis, Frederic Elliott,
Lewis, Miss Marguerite,
Lewis, Percy Pyne,
Lewis, Wadsworth Russell,
Lewis, Dr. William J.,
Lewisohn, Adolph,
Libbey, O. B.,
Liebenau, Albert,
Liebertz, Joseph,
Lincoln, Lowell,
Litchfield, Edward H.,
Littauer, William,
Livermore, John R.,
Livingston, William S.,
Lobenstine, William Christian,
Lockwood, Williston B.,
Loeber, Charles,
Logan, Walter S.,
Longfellow, Mrs. Frederick W.,
Lowell, Miss Carlotta Russell,
*Lowell, Mrs. Charles Russell.
Lucksinger, Jacques,
Lueder, A.,
Lusk, Prof. Graham,
Luttgen, Walther,
Lyman, Frank,
Lynde, Francis E. P.,
Lynde, Rollin H.,
McAlan, John,
McAlpin, Mrs. Charles W.,
McAlpin, George L.,
*McCall, John A.,
McClure, S. S.,
McCurdy, Richard A.,
McKim, Rev. Haslett,
McKim, John A.,
McKim, LeRoy,
McKinney, Glenn Ford,
McLean, James,
McVickar, Edward,
Mace, Arthur J.,
Maclay, Mrs. Robert,
Macy, George A.,
Magee, John,
Mager, F. Robert,
Mahl, William,
Mairs, George H.,
Mali, Pierre,
Mann, William d'Alton,
Mapes, Daniel, Jr.,
Mapes, Ernest S.,
Markoe, Dr. J. W.,
Marling, Alfred E.,
Marlor, Henry S.,
Marsh, C. P.,
Marshall, Charles H.,
Marston, Edwin S.,
Martin, William R. H.,
Martinez, Migual R.,
Maslen, Richard R.,
Mathews, Thomas,
Matthiessen, Miss Marie,
Maxwell, Robert,
Mehl, Henry,
Mellen, Charles S.,
Merkel, Hermann W.,
Meyer, N. Hermann,
Meyer, Thomas C.,
Meyrowitz, Emil B.,
Middlebrook, Frederick,
Mikkelsen, Mrs. M. A.,
deMilhau, Louis John,
Milbank, Albert J.,
Miles, John,
Miller, Mrs. Charles E.,
Miller, Edward F.,
Miller, Frank C.,
Miller, Roswell,
Milliken, S. M.,
Mills, Abraham G.,
Mills, Andrew,
Mills, D. O.,
Milmine, C. E.,
Minott, W. A.,
Mitchell, F. Kendall,
Mitchell, H. Raymond,
Moench, Hugo,
Moffat, George Barclay,
Montant, Alphonse,
Montgomery, Richard M.,
Moore, Casimir de R.,
Moore, Charles Arthur, Jr.,
Moore, Miss Faith,
Moore, Dr. John W.,
Moore, Miss K. T.,
Moore, Mrs. W. D.,

* Deceased.

Morgan, Miss Annie T.,
Morgan, Miss C. L.,
Morgan, Edwin D.,
Morgan, George E.,
Morgan, George H.,
Morgan, Mrs. J. B.,
Morgan, J. P., Jr.,
Morgan, Mrs. J. Pierpont,
Morgan, Junius S.,
Morgan, Mrs. Junius S.,
Morgan, Dr. Thomas H.,
Morrell, Mrs. Robert Lee,
Morris, Dave H.,
Morris, Fordham,
Morris, John Jacob,
Morris, Dr. Lewis Rutherfurd,
Morse, Charles H.,
Mortimer, Richard,
Morton, A. L.,
Morton, Mrs. Henry Samuel,
Mott, Henry C.,
Mott, John Bowen,
Mott, Jordan L., Jr.,
Mueller, Charles F.,
Munroe, Henry W.,
Murgatroyd, John,
Murray, A. S.,
Neilson, Dr. Howard S.,
Nelson, James W.,
Nesmith, James,
Neumer, Ferdinand,
Nichols, Acosta,
Nichols, George L.,
Nichols, John W. T.,
Niles, Robert L.,
Noble, Alfred,
Noble, H. G. S.,
Norrie, A. Lanfear,
Notman, John,
*Nott, Dr. Frederick J.
Noyes, Mrs. Henry D.,
Oakley, H. Cruger,
O'Connell, Michael,
Ogden, Charles W.,
Ogden, M. C.,
Olcott, Dudley, 2d,
Olsen, Charles P.,
Olyphant, Robert,
Olyphant, Robert M.,
Onativia, John Victor,
O'Rourke, John F.,
Osborn, Mrs. Henry Fairfield,
Ostrander, Miss Mary M.,
Otten, Mrs. Gertrude,
Outerbridge, Dr. Paul,
Ovens, James,
Overton, Dr. Frank,
Painter, Dr. H. McM.,
Palmer, Nicholas F.,
Palmer, S. S.,
Pancoast, Richard,
*Parker, Francis Eyre,
Parsons, Edwin,
Parsons, Mrs. Edwin,
Parsons, H. de B.,
Parsons, John E.,
Parsons, William Barclay,
Paterson, R. W.,
Paul, John J.,
Paul, W. A. O.,
Peabody, Stephen,
*Pell, Mrs. Alfred,
Pell, Stephen H. P.,
Pelton, Franklin D.,
Pendleton, Francis Key,
Penfold, William Hall,
Penniman, George H.,
Perkins, Robert P.,
Perry, Charles J.,
Peters, Charles G.,
Peters, Samuel T.,
Peters, William Richmond,
Pfizer, Charles, Jr.,
Pickhardt, Carl,
Piel, Gottfried,
Piel, Michael,
Pierce, Henry Clay,
Pierrepont, Miss Anna Jay,
Pierson, Gen. J. Fred,
Pinchot, Gifford,
Platt, Frank H.,
Platt, Miss Marion Erskine,
Plympton, Gilbert M.,
Poggenburg, H. F.,
Poland, Dr. Samuel,
Pollock, George E.,
Poor, Henry V.,
Porter, Clarence,
Porter, William L.,
Post, Abram S.,
Post, Edward C.,
Post, George B., Jr.,
Post, Mrs. H. A. V.,
Post, William H.,
Postley, Clarence A.,
Potter, Miss Blanche,
Potter, Edward Clarkson,
Potter, Frederick,
Potter, Miss Martha,
Potts, William Brevoort,
Pratt, George D.,
Prentice, John Hill,
Prentiss, George Lewis,
Prime, Miss Cornelia,
Prince, Edward S.,
Prince, Prof. J. Dyneley,
Pryer, Charles,
Putnam, R. M. S.,

* Deceased.

PUTNAM, WILLIAM A.,
PYLE, JAMES TOLMAN,
PYNE, M. TAYLOR,
PYNE, MRS. M. TAYLOR,
QUINTARD, DR. EDWARD,
RAND, GEORGE C.,
RANDALL, FRANK E.,
RANDOLPH, EDMUND D.,
RANDOLPH, WILLIAM W.,
RANFT, RICHARD,
RAPALLO, EDWARD S.,
RATHBORNE, RICHARD C.,
RAUCH, WILLIAM,
RAWLINS, J. ARMSTRONG,
READ, WILLIAM A.,
REDMOND, GOOLD H.,
REDMOND, HENRY S.,
REESE, T. T.,
REIMER, OTTO E.,
REINCKE, E. A.,
REINHARDT, GEORGE N.,
REYNOLDS, E. B.,
REYNOLDS, JAMES BRONSON,
RHEINELANDER, CHARLES E.,
RHINELANDER, FREDERIC W.,
RHINELANDER, MISS SERENA,
RHOADES, JOHN HARSEN,
RICHARD, AUGUSTE,
RICHARD, EDWIN A.,
RICHARDS, E. O.,
RIKER, JOHN L.,
RIKER, SAMUEL,
RIPLEY, H. DILLON,
RIPLEY, JULIAN A.,
RIPLEY, LOUIS A.,
RIVES, GEORGE L.,
ROBBINS, CHANDLER,
ROBERTSON, MRS. FANNY P.,
ROBERTSON, R. H.,
ROBINS, THOMAS,
ROBINSON, ELI K.,
ROBINSON, G. H.,
ROBINSON, G. N.,
ROBINSON, HENRY A.,
ROBINONS, JOHN G.,
ROBISON, WILLIAM,
ROCKWOOD, WILLIAM H.,
ROE, FRANK O.,
ROE, IRVING L.,
ROELKER, ALFRED,
ROESLER, AUGUST,
ROGERS, E. L.,
ROGERS, JAMES H.,
ROKENBAUGH, HENRY S.,
ROOSEVELT, W. EMLEN,
ROOT, ELIHU,
ROPES, ALBERT G.,
ROSE, JOHN J.,
ROSS, P. SANFORD,
ROSSITER, E. V. W.,
ROTH, FREDERICK G. R.,
ROTHWELL, JAMES E.,
ROWELL, GEORGE P.,
RUNGIUS, CARL,
RUNYON, CARMAN R.,
RUPPERT, JACOB,
RUPPERT, MRS. JACOB,
RUPERTI, JUSTUS,
RUSS, WILLIAM V.,
RUSSELL, ARCHIBALD D.,
RYAN, J. D.,
RYLE, ARTHUR,
ST. JOHN, F. L.,
SACKETT, CLARENCE,
SACKETT, MISS GERTRUDE T.,
SACKETT, MRS. S. E.,
SAGE, DEAN,
SAGE, JOHN H.,
SAGE, MRS. RUSSELL,
SAMPSON, ALDEN,
SAMPSON, CHARLES E.,
SAUTER, FREDERICK,
SCHAEFER, HENRY,
SCHANCK, GEORGE E.,
SCHANG, FREDERICK,
SCHAUE, C. F.,
SCHEFER, CARL,
SCHIEFFELIN, MRS. H. M.,
SCHIEFFELIN, WILLIAM JAY,
SCHILLING, ROBERT H.,
SCHIRMER, GUSTAV,
SCHIRMER, RUDOLPH E.,
SCHMIDT, F. LEOPOLD,
SCHMITT, WILLIAM P.,
SCHNEIDER, G. E.,
SCHOLLE, A. H.,
SCHULTZE, JOHN S.,
*SCHUMACHER, C.
SCHUYLER, MISS LOUISA LEE,
*SCHWAB, MRS. GUSTAV.
SCHWARZ, HENRY F.,
SCOTT, HON. FRANCIS M.,
SCOTT, WILLIAM,
SCRIBNER, ARTHUR H.,
SCRYMSER, JAMES A.,
SEARS, ROBERT B.,
SEDGWICK, ROBERT,
SEE, A. B.,
SELIGMAN, ALFRED L.,
SELIGMAN, JEFFERSON,
SETON, ALFRED, JR.,
SEWALL, FRED. W.,
SEXTON, LAWRENCE E.
SEYBEL, DANIEL E.,
SHAPIRO, D.,
SHAW, CHARLES HERBERT,
SHAW, JAMES G.,
SHAW, WALTER W.,

* Deceased.

SHEFFIELD, JAMES R.,
SHELDON, GEORGE R.,
SHELDON, WILLIAM C.,
SHERMAN, GARDINER,
SHIPWAY, JOHN H.,
SHRADY, HENRY M.,
SHURTLEFF, ROSWELL MORSE,
SIEGEL, JACOB,
SILLECK, HENRY G., JR.,
SILLECK, MRS. HENRY G., JR.,
SILLIMAN, HARPER,
SIMMONS, JOSEPH F.,
SIMPSON, JOHN W.,
SIMPSON, WILLIAM,
SKEEL, FRANK D.,
SKIDMORE, WILLIAM L.,
SLADE, FRANCIS LOUIS,
SMILEY, DANIEL,
SMILLIE, CHARLES F.,
SMILLIE, JAMES D.,
SMITH, AUGUSTINE J.,
SMITH, F. M.,
SMITH, H. SANBORN,
SMITH, J. HENRY,
SMITH, LUCIUS H.,
SMITH, NATHANIEL S.,
SMITH, PHILIP S.,
SMITH, ROBERT W.,
SMITH, DR. SAMUEL,
SMITH, WILLIAM ALEXANDER,
SMITHERS, CHARLES,
SMITHERS, F. S.,
SMYTH, PHILIP A.,
SNOW, C. G.,
SOLTMANN, E. G.,
SOMERVILLE, CHARLES STUART,
SORCHON, MRS. VICTOR,
SOUTHACK, FREDERICK,
SPEAR, JAMES, JR.,
SPEDDEN, FREDERIC O.,
SPEIR, MRS. CECILIA M.,
SPENCER, SAMUEL,
SPIEGELBERG, F.,
SPITZNER, GEORGE W.,
SPOFFORD, MRS. J. L.,
SPRING, MISS ANNA RIKER,
SPRINGMEYER, ALBERT A.,
SPURR, E. W.,
SQUIBB, CHARLES F.,
SQUIBB, DR. EDWARD H.,
STAFFORD, WILLIAM FREDERICK,
STANDISH, MYLES,
STANTON, JOHN,
STANTON, JOHN R.,
STARR, LOUIS MORRIS,
STEBBINS, JAMES H.,
STEERS, HENRY,
STEEVES, JOHN F.,
STEINBECK, EDWARD,
STEPHENS, OLIN J.,
STERN, ISAAC,
STERN, VESTY J.,
*STERNBACH, CHARLES,
STEVENS, ALEXANDER H.,
STEVENS, FREDERIC W.,
STEWART, WILLIAM R.,
STILLMAN, JAMES A.,
STILLMAN, T. E.,
STIMSON, DR. DANIEL M.,
STOKES, H. B.,
STOKES, MISS OLIVIA E. PHELPS,
STONE, MASON A.,
STONE, WALTER KING,
STOUT, ANDREW V.,
STOUT, JOSEPH S.,
STOW, GEORGE G.,
STRANGE, A. B.,
STRATFORD, PROF. WILLIAM,
STREAT, JAMES,
STREETER, D. D., JR.,
STURGES, HENRY C.,
STUYVESANT, RUTHERFURD,
SULLIVAN, MRS. JAMES,
SUSSER, JOHN M.,
SUTPHEN, JOHN S., JR.,
SUYDAM, HARRY L.,
SWAYNE, FRANCIS B.,
SWENSON, S. J.,
SYMS, DR. PARKER,
TABER, MISS MARY,
TAFT, HENRY W.,
TALCOTT, JAMES,
TATHAM, CHARLES,
TATUM, A. H.,
TAYLOR, DWIGHT W.,
TAYLOR, GEORGE,
TAYLOR, HENRY R.,
TAYLOR, HERBERT C.,
TAYLOR, JAMES B.,
TAYLOR, KNOX,
TAYLOR, LLOYD,
TAYLOR, MOSES,
TAYLOR, STEVENSON,
TENNEY, C. H.,
TERRY, JOHN T.,
TERRY, REV. RODERICK,
TESLA, NIKOLA,
THACHER, MRS. GEORGE W.,
THACHER, THOMAS,
THAYER, HARRY BATES,
THOMAS, DR. ALLEN M.,
THOMAS, SETH E.,
THORNDIKE, DR. TOWNSEND W.,
THORNE, JONATHAN,
THORNE, NEWBERRY D.,
THORNE, W. V. S.,
TIFFANY, LOUIS C.,
TILFORD, HENRY M.,

* Deceased

Tilt, Benjamin B.,
Tilton, Joseph W.,
Timmermann, Henry G.,
Tod, J. Kennedy,
Todd, H. H.,
Tousey, William,
Townsend, Edwin S.,
Townsend, Isaac,
Townsend, J. Henry,
Townshend, John,
Tows, Coe Downing,
Traber, A. P.,
Trask, Spencer,
Trotter, William,
*Trowbridge, Edwin D.
Trowbridge, Frederick K.,
Truax, Hon. Charles H.,
Truslow, T. Brooks,
Tuckerman, Alfred,
Tuckermann, Paul,
Turnure, Arthur,
Turnure, Geo. E.,
Tweddell, William H.,
Underwood, William Lyman,
Upmann, Carl,
Valentine, Dr. William A.,
*Van Brunt, Hon. C. H.
Van Cortlandt, Augustus,
Vanderbilt, Alfred G.,
Vanderpoel, Mrs. John A.,
Van der Smissen, Dr. G. J.,
Van Emburgh, D. B.,
Van Nest, Mrs. Alexander T.,
Van Nest, G. Willett,
Van Norden, Theodore Langdon,
Van Norden, Warner,
Van Pelt, Gilbert S.,
Van Winkle, Edgar B.,
Varnum, James M.,
Verdi, Miss Mary,
Victor, A.
Viele, Herman K.,
Vivanti, Ferruccio Anselmo,
Vogel, Herman,
Vorce, A. D.,
Waddington, George,
Wadsworth, Clarence S.,
Wadsworth, W. P.,
Wagner, Otto,
Wagstaff, C. Du Bois,
Wainwright, J. Howard,
Walcott, Frederic C.,
Walker, George L.,
Walker, George W.,
Waller, Robert, Jr.,
Walsh, Samuel A.,
Wanninger, Charles,
Warburg, Paul M.,
Ward, Artemas,
Ward, Mrs. George Cabot,
Ward, Henry C.,
Ward, J. Q. A.,
Wardner, Henry Steele,
Wardwell, William T.,
Warren, John Hobart,
Waterbury, John I.,
Watson, Charles F.,
Watson, Rev. J. Henry,
Weatherbee, Edwin H.,
Webb, F. Egerton,
Webb, Dr. W. Seward,
Weber, Louis,
Welling, R. W. G.,
Wells, Oliver J.,
Wendell, Evert Jansen,
Wendell, Mrs. Jacob,
Wertheim, H. P.,
Westover, M. F.,
Wheeler, Everett P.,
Wheelock, Dr. George G.,
Whitaker, H. P.,
White, Alain C.,
White, Horace,
White, John Jay,
White, Leonard D.,
White, Stanford,
White, S. V.,
White, William W.,
Whitehouse, J. Henry,
Whitehouse, William F.,
Whiting, Dr. Charles A.,
Whiting, Miss Gertrude,
Whiting, Giles,
Whitman, Clarence,
Whitman, William, Jr.,
Whitney, Miss E. C.,
Whitridge, F. W.,
Wickersham, George W.,
Wiener, Felix F.,
*Willard, E. A.
Willets, John T.,
Williams, Mrs. G. G.,
Williams, Richard H., Jr.,
Williams, Thomas,
Williams, Waldron,
Wills, Charles T.,
Wilmerding, Gustav L.,
Wilmsen, William,
Wilson, Dr. Edmund B.,
Wilson, George T.,
Wilson, Henry R.,
Wilson, William,
Wiltsee, Ernest A.,
Winant, Frederick,
Winckelbach, L. O.,
Winthrop, Egerton L.,
Winthrop, Egerton L., Jr.,
Winthrop, Robert Dudley,

* Deceased.

Wisner, Charles,
Witherbee, Frank S.,
Witthaus, Dr. Rudolph A.,
Wolff, Emil,
Wood, Arnold,
Wood, Gilbert Congdon,
Wood, J. Walter,
Wood, William Congdon,
Wood, William H. S.,
Woodcock, Edwin,
Woodcock, R. C.,
Woodhouse, J. S.,
Woodward, James T.,
Wright, J. Dunbar,
Wright, Mrs. J. Hood,
Wright, John Howard,
Wright, Mrs. Mabel Osgood,
Wyckoff, Rev. Charles S.,
Youmans, Ephraim M.,
Young, A. Murray,
Young, Frederick Stafford,
Young, George W.,
Young, John Alvin,
Young, John W.,
Young, Richard N.,
Zabriskie, Andrew C.

Corresponding Members.

Barbour, Mrs. S. E.,
Brown, Herbert,
Brown, William Harvey,
Cornish, C. J.,
Elrod, M. J.,
Golding, Capt. Thos.,
Griffith, William A.,
Stone, Andrew J.,
Wilson, T. E.

Summary of Membership.

Benefactors	1
Total number of Founders	24
" " Associate Founders	11
" " Patrons	44
" " Life Members	190
" " Annual Members	1,374
Total of all classes	1,644

Qualifications for Regular Membership.

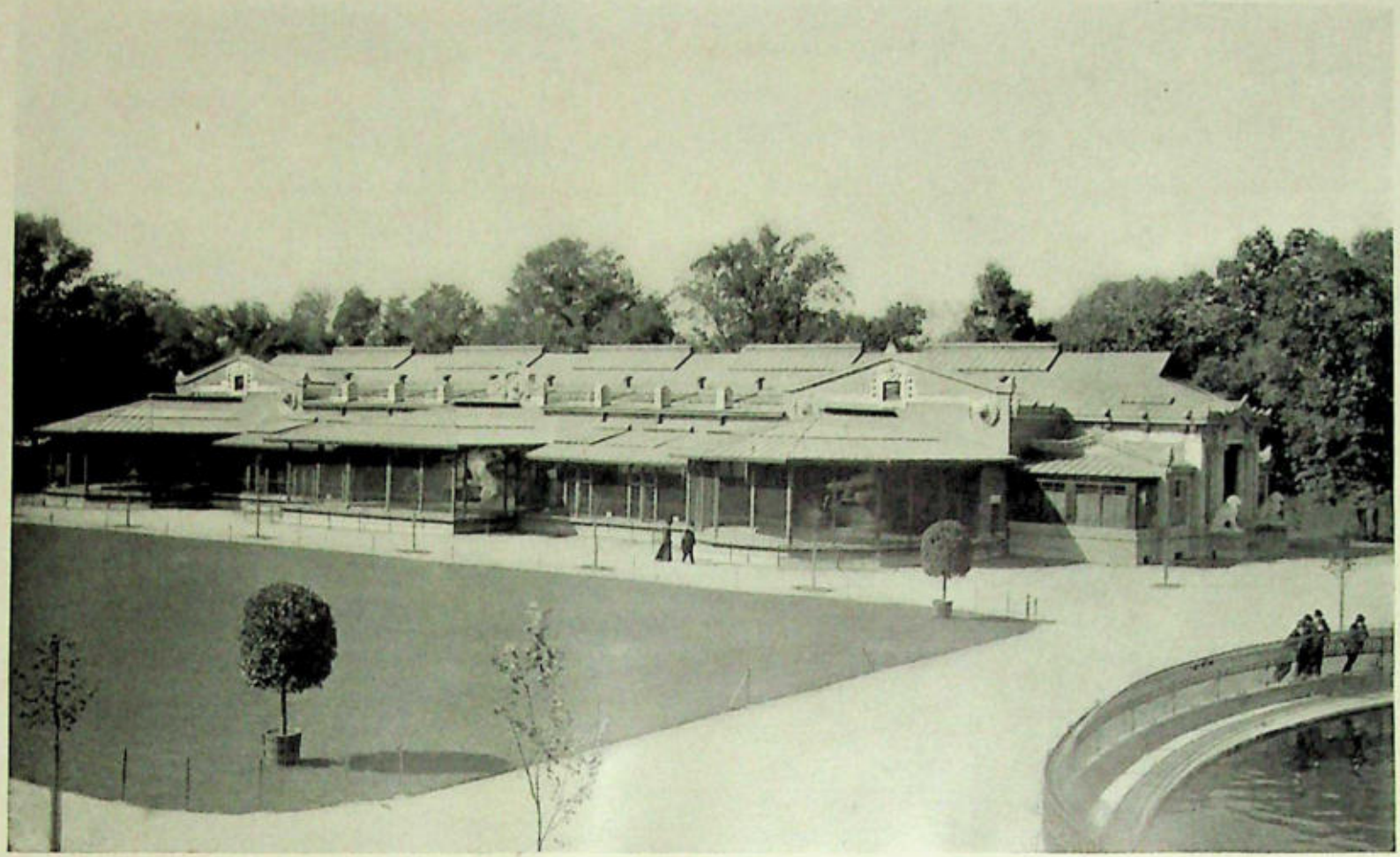
Annual Members	$ 10	Associate Founders	$ 2,500
Life Members	200	Founders	5,000
Patrons	1,000	Benefactors	25,000

Form of Bequest.

I do hereby give and bequeath to the "New York Zoological Society," *of the City of New York,*

.....

.....



THE LION HOUSE; BAIRD COURT

View from the Rockefeller Fountain

REPORT OF THE EXECUTIVE COMMITTEE

TO THE BOARD OF MANAGERS.

THE Executive Committee of the Board of Managers of the New York Zoological Society takes pleasure in reporting on the continued development of the New York Zoological Park and the New York Aquarium. A large amount of construction work has been under way in the Park during the year 1905, and the efforts of your Committee have been especially directed toward the completion of Baird Court and its approaches, especially on the north, where the Concourse, when finished, will afford direct access for automobiles and carriages from Pelham Avenue. The scheme for the treatment of this most important section of the Park has been given the closest consideration. Work is well advanced on the Court itself, and plans for the Concourse are practically completed.

During the past year the attendance at the Zoological Park showed a notable advance over 1904 and reached the enormous total of 1,233,527, an increase of 128,912. This does not include great throngs who visited that portion of the Park lying east of Boston Road, of which no count has been kept.

The attendance at the Aquarium during the year 1905 was 1,726,170, an increase of 100,400, and a daily average of 4,729. The attendance at the Zoological Park and the Aquarium taken together has steadily increased, and has reached a grand total for the two institutions of 2,959,698, representing an annual cost to the City of New York of less than seven cents for each visitor.

The membership of the Society on January 1, 1906, was as follows:

Founders	25
Associate Founders	11
Patrons	44
Life Members	180
Annual Members	1,335
Making a total of	1,595

FINANCES.

Animal Fund.—The Animal Fund during the year has been augmented by gifts aggregating $11,938.50 and by nearly $15,000 from the Park privileges. There was expended for animals during the year the sum of $27,492.40, and there remains on hand a balance of $2,940.23.

Income Account.—The Income Account (formerly known as the General Fund) is barely sufficient to meet the present needs of the Society and can be increased only by the addition of new members to our list. It is hoped that every effort will be made by the present members to send to your Committee the names of new candidates, and thus enlarge the Society's field of usefulness.

General Fund.—The General Fund (formerly known as the Park Improvement Fund) shows a balance of $9,856, and has been little used during the current year. It is hoped that this fund will ultimately be sufficiently enlarged by bequest and otherwise to constitute an endowment fund, the income from which can be used for the general work of the Society.

Ground Improvement Fund.—The Ground Improvement Fund has been heavily drawn on during the year for construction. The amount expended was $337,240.61, leaving a balance available of $219,112.00, all of which will be required to complete the work under way or outlined in this report.

With the approval of the Mayor application was made to the Board of Estimate and Apportionment for a bond issue of $300,000 to provide for the construction of the Elephant House and its yards in 1906 and for other improvements.

Maintenance of the Zoological Park.—It is the privilege of your Committee to be able to report that no deficiency has been incurred this year in the maintenance of the Park. The amount appropriated, $134,965.00, has proved sufficient, with rigid economy, to maintain the Park and its collections. The great increase in exhibits, however, rendered necessary an increase for 1906, and the amount appropriated, $144,965.00, an advance of $10,000 over 1905, will probably enable the Society to meet the annual charges without a deficit.

Maintenance of the Aquarium.—The Society voluntarily asked for only $45,000.00 for the maintenance of the Aquarium, instead of the $46,500.00 originally supplied by the City. With the strictest economy this amount has proved sufficient for that institution.

and your Committee expects to be able to maintain the Aquarium during 1906 with that amount.

Aquarium Improvement Fund.—During the past year $16,632.88 was expended from the Aquarium Improvement Fund and a balance of $8,694.64 remained at the beginning of the year, all of which is either under contract or is required to complete improvements under way.

In the Treasurer's report detailed statements of all the above funds are to be found.

IMPORTANT GIFTS TO THE PARK.

The most noteworthy gift of the year was the collection of pheasants and other birds for the complete stocking of the Pheasants' Aviary, which was presented by Mr. Jacob H. Schiff. Mr. Nelson Robinson has contributed to the Animal Fund the sum of $2,500 for the purchase of a young African rhinoceros, whenever one can be procured; Mr. C. Ledyard Blair presented a fine young female eland, and Mr. Charles T. Barney presented the young West African elephant "Congo," an animal of great rarity and interest. Miss Jean W. Simpson has authorized the purchase of a gorilla, which when secured will be presented by her. Mr. William Rockefeller added to the herd of deer already presented by him three fine specimens, a buck and two does, of the rare and interesting Burmese thameng or brow-antlered deer.

The Duke of Bedford presented a full-grown Tashkent wapiti, an animal very similar to the Altai wapiti, but larger than our male specimen of the latter.

The Society is also indebted for substantial gifts of money to the following gentlemen:

Mr. Grant B. Schley,
Hon. Levi P. Morton,
Mr. John L. Cadwalader,
Mr. James J. Hill,
Mr. Morris K. Jesup,
Mr. John S. Barnes,
Mr. Philip Schuyler,
Mr. Cleveland H. Dodge.

PUBLICATIONS.

During the year the usual Annual Report and quarterly Bulletins have been published, together with several books of views of the Park.

The most important publication was "Sea Shore Life," the

manuscript of which was presented to the Society by Dr. Alfred Goldsborough Mayer, now the Director of the Carnegie Laboratory at Dry Tortugas, Florida. It is a profusely illustrated description of the invertebrates living along our coast. The book has been sent to all the members of the Society upon written request and has been placed on sale at the Aquarium.

It is not the policy of your Committee at this time to undertake the publication of expensive and elaborate books, as during the continuance of the work of construction and the installation of new exhibits at the Park, and as long as the membership remains small, much scientific work of great value, and especially costly publications, must be deferred to such time as the financial condition of the Society justifies expenditures of this character.

NEW BUILDINGS AND INSTALLATIONS.

The most important building completed during the year was the large Bird House at the northwest corner of Baird Court, which was thrown open to the public on July 4, 1905. It contains a large and representative collection of perching birds, together with members of various other orders. The provisions for ventilation and abundant light in this building have resulted in the maintenance of the collections in excellent health. A large addition to this building, to be especially devoted to parrots and to be known as the Glass Court, is in process of construction and will be opened to the public during the summer of 1906.

The boundary walls, with coping, along the western and northern sides of Baird Court are in process of construction. The flights of granite steps on the north end of the Court, leading down to the Concourse, and the formal garden between them, are also under contract, and will be completed early in the coming summer. Carefully selected shade trees have been planted and the Sea Lion Pool, in the center of Baird Court, has been completed, and a shelter provided for the inmates. With these improvements Baird Court will be nearly in final shape.

The Pheasants' Aviary was also finished and stocked in September, 1905. It contains at present 22 distinct species, represented by about 50 specimens. As soon as the weather permits the open-air runways will be equipped with plants and vines, and doves and pigeons will be liberated in the upper portions.

The Camel House, located near the Southwest Entrance, was completed during the year and will be occupied shortly by the camels.

Two Public Comfort buildings on the east side of Bronx River have been completed and accepted, and are now ready for use.

The Tortoise and Lizard Yards at the east end of the Reptile House have been built, and were utilized during the past summer.

During the year a large portion of the boundary and interior fences have been renewed in a very thorough and substantial manner, and it was also found necessary to reconstruct several miles of walks and roads which were built by the City when the Park was first opened. These old paths and roads were in every case replaced by permanent and thoroughly drained roadbeds of Telford macadam. A number of important new roads and walks have been constructed, notably from the new Boston Road Entrance, which has been designed to meet the requirements of visitors using the Subway. This new entrance will be located at Boston Road and 182d Street, and will admit visitors directly into the Park through two broad walks in the old Buffalo Range; one westward along the boundary plantations to the Antelope House and the other northward along high ground to the Buffalo Barn and the Beaver Valley Walk will supply a short route from West Farms to Baird Court, and from there to Osborn's Walk and the Northwest Entrance. This new system will serve to distribute the crowds and will take visitors at once to the exhibits.

The path between the Bear Dens and the Rocking Stone Restaurant has been lowered some four feet by the cutting away of the summit rock, and handsome steps of granite have been substituted for the former steep steps of undressed bluestone.

A new walk from the Beaver Pond northward to the waterfall and the new entrance at Boston Road Bridge have been constructed, taking visitors through a practically untouched forest, which your Committee propose to leave in an absolutely natural condition as a wild plant and flower preserve. In order to protect the roots of the trees and to leave undisturbed the forest undergrowth this walk has been built largely of planks, and it is intended that this portion of the Park shall not be utilized for animal exhibits.

Following out these improvements the bed of Lake Agassiz has been cleaned out and deepened some four feet, and a large amount of work has been done on the northern portion of the Park beyond the Lake. This section had not been treated and required much planting, grading, and fencing.

WORK IN PROGRESS.

Contracts have been awarded for the construction of the Entrance Pavilion at West Farms, and for a building for Small Deer and Antelopes, located in the old Antelope Range west of the present Antelope House. On both these structures work will begin in the spring. The Small Deer House will afford accommodation for small deer and some of the lesser antelopes now quartered in the Antelope House and other buildings, and will enable us to place on exhibition at least twenty-five new species.

A contract has been awarded, and work is under way, for the construction of a Barn and Service Yards northwest of the Service Building. This is greatly needed in the administration of the Park, and will result in substantial economies.

Plans and specifications for the Boat House and Riverside Restaurant, to be located at the south end of Bronx Lake, are in the hands of the printer, and the building will be constructed during the coming season.

PLANS FOR 1906.

An Aviary for Grouse will be erected during the spring, immediately north of the Pheasants' Aviary.

Plans have been approved for a Biological Laboratory, to adjoin the Service Building.

Plans for the Concourse and for its entrance on Pelham Avenue are practically completed, and contracts therefor will be awarded shortly.

It is hoped that all these items, together with a large amount of miscellaneous construction, will be completed during the coming year, and will bring the Park up to a far higher level of development than at present.

The most important installation remaining is the Elephant House, which will be located immediately south of Baird Court. Plans for this building are at present receiving careful study from the Committee, and a contract for its construction will be awarded during the coming spring.

The Administration Building still remains unprovided for, and the Committee is most desirous to have the necessary funds donated by some friend of the Society. It is believed that when built it will be a most effective means of attracting members to the Park and that it will afford special facilities for their families and friends. In this way your Committee believes that the mem-

bership of the Society can be greatly enlarged and strengthened. The site selected is the northeast corner of Baird Court, opposite the Bird House. This building will be of fireproof construction, and will contain the archives and records of the Society, which are rapidly accumulating, and which already are of great value. The library of the Society will also be placed here, within easy access of members and students. The exhibition hall will contain a very valuable collection of heads, horns, antlers, skins, and a complete series of photographs of all the animals in the Park. In addition to this, ample provision will be made for a collection of animal sculptures and paintings.

The Executive Committee and the Director of the Park will have their offices in this building, and every facility will be provided for the comfort and entertainment of members and their families and friends.

West Farms Block.—On November 28, 1905, the Commissioners of the Sinking Fund formally transferred to the Society the block bounded by 180th and 181st streets, Boston Road and Bronx Street; and plans for the development of this plot, in connection with that portion of the Zoological Park adjoining it, have been prepared, and its development will be undertaken during the coming year. The acquisition of this land provides an adequate and dignified approach from the south to the Zoological Park and to the Boat House and Riverside Restaurant, as well as easy access to that portion of the Park lying to the east of Bronx River.

The termination of the Subway system of Rapid Transit at 180th Street and Boston Road, immediately opposite the Zoological Park, has made the Boston Road Entrance, for the time being, our most important approach.

East Side Extension.—Perhaps the most notable event in the history of the Society since the acquisition of the land now comprising the Zoological Park has been the extension of Bronx Park to the east. For some three years the Society has used every effort to induce the City to acquire the area lying immediately to the east of the Zoological Park and preserve the magnificent forest for park purposes. The trees have been, from time to time, to some extent injured by cutting and fire. In the last days of 1905 the Society's efforts culminated, and the City acquired title to this forest land. Special arrangements were at once made to protect the trees.

This addition involves the obliteration of the unsightly collection of houses known as Bronxdale, and will enable the City to

construct a connecting Boulevard between Pelham Parkway and West Farms, thus lessening the traffic on Boston Road, so that the latter may be reserved for park use only. This extension of Bronx Park comprises ninety-nine acres, and the map on page 30 shows clearly the former outlines of Bronx Park and the recent additions.

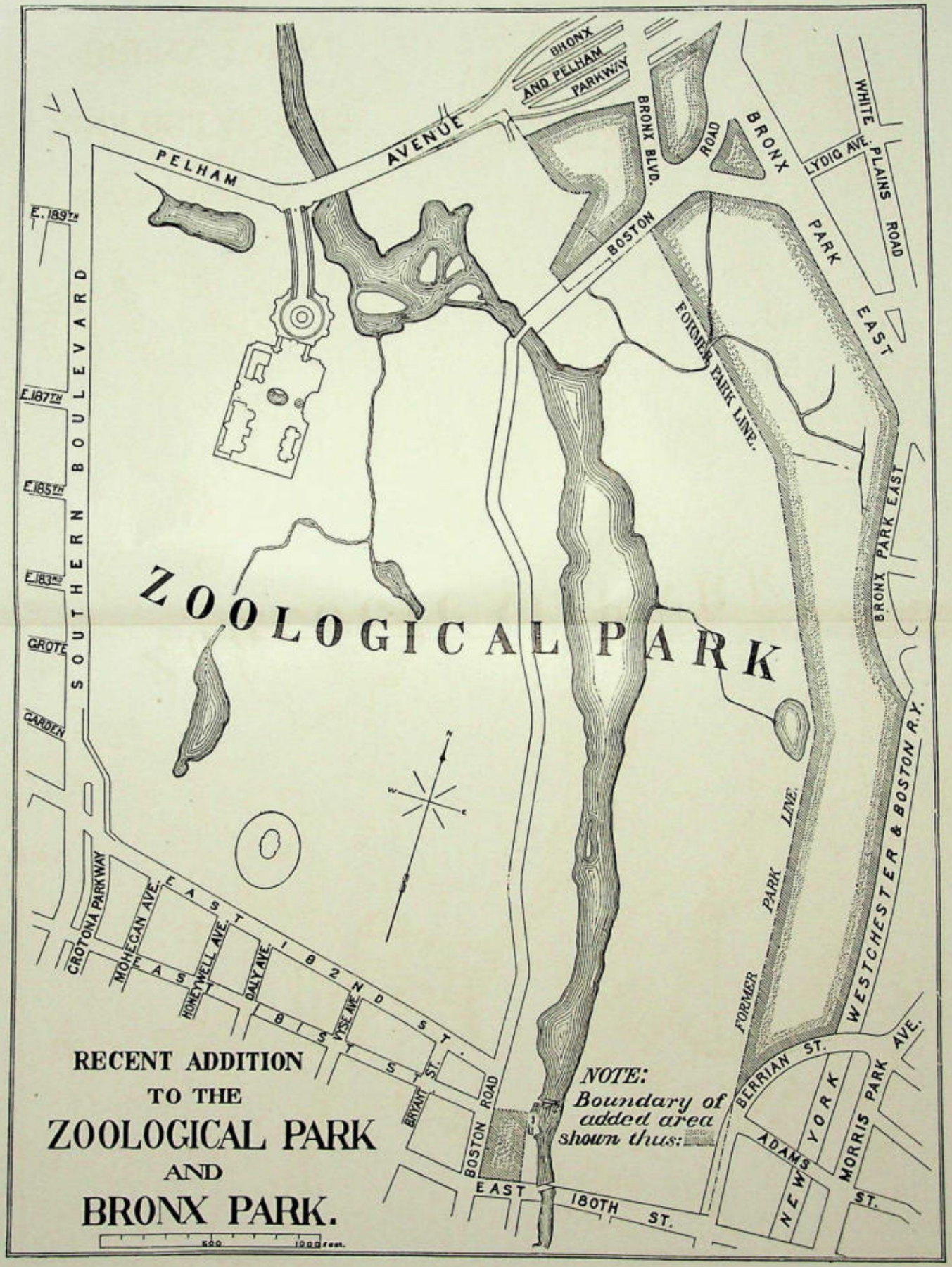
It is the intention of your Committee, as far as possible, to carefully preserve that portion of the old Boston Post Road lying within the present boundaries of the Zoological Park. This interesting bit of old road formed part of the highway which, beginning at the City Hall traversed the Bowery, formed what is now Third Avenue, and crossed the Bronx River in the territory of the Zoological Park, running thence northeast to Boston. Its historical interest is great, and it has remained essentially unchanged. It can be widened some ten feet without injury to its present irregular course or the destruction of a single tree.

At the urgent request of the Society the Park Department succeeded, after several years' effort, in having the unsightly telegraph poles removed from Boston Road, much to the improvement of its appearance.

ANIMAL COLLECTIONS.

The animal collections at the Park have been greatly increased in numbers and in the value of their component parts, especially in the Department of Birds. This has been made possible by the completion of the Bird House and the Pheasants' Aviary. The last report of your Committee showed 643 birds, representing 14 orders and 165 species. To-day there are 1,560 birds, representing 26 orders and 354 species. The completion of a few more small installations will equip the Park with probably the most extensive bird collection in the world.

Owing to the fact that the existing buildings are full to repletion the collections of Mammals and Reptiles have not increased in like proportion. A number of small mammals and also of the smaller carnivora have been added, and the reptile collections have been enlarged by some new rarities. At present there are in the Park 624 Mammals, 687 Reptiles, 1,560 Birds, making a total of 2,871 specimens, representing 656 species.


BRONX AND PELHAM PARKWAY
PELHAM AVENUE
BRONX BLVD.
BRONX ROAD
WHITE PLAINS ROAD
LYDIG AVE.
BOSTON
PARK EAST
FORMER PARK LINE.
E. 189TH
E. 187TH
E. 185TH
E. 183RD
GROTE
GARDEN
SOUTHERN BOULEVARD
ZOOLOGICAL PARK
BRONX PARK EAST
WESTCHESTER & BOSTON R.Y.
FORMER PARK LINE.
CROTONA PARKWAY
MOHEGAN AVE.
EAST
HONEYWELL AVE.
DALY AVE.
182ND ST.
BRYANT ST.
BOSTON ROAD
EAST 180TH ST.
BERRIAN ST.
YORK
ADAMS
NEW
MORRIS PARK AVE.
ST.
NOTE:
Boundary of added area shown thus:
RECENT ADDITION TO THE ZOOLOGICAL PARK AND BRONX PARK.
500
1000 feet.

MEDICAL DEPARTMENT.

The report of the Medical Department, which appears in this volume, shows that continued success has followed the efforts of our Veterinarian and Pathologist in their efforts to keep down the death-rate. During 1905 there have been fewer cases of sickness in every department of the Park than in any previous year, and a corresponding reduction in the number of deaths.

Among the mammals, in spite of an increase of the number of animals on exhibition, there were only 92 deaths in 1905, as compared with 106 for 1904. It would appear, therefore, that the death-rate had been reduced to a minimum. Of course, it is not possible to reduce the rate much below the present, as many of the animals on exhibition are naturally short-lived.

Among the primates tuberculosis has been almost stamped out, as we have only lost one monkey from this cause during the past year, and cage paralysis has also been much less troublesome than formerly. Among the ungulates, particularly among those from the Old World, the standard of health has been high, and an increased birth-rate has resulted.

BIOLOGICAL LABORATORY.

The projection of a biological laboratory is in the line of the development of the medical and pathological department, which was established in 1901 and has rendered such conspicuous service in ascertaining the causes of animal diseases, proper methods of prevention and treatment, and rapid diminution of the death-rate. The laboratory will make better accommodation than the present quarters in the Park afford, not only for the services of the veterinarian, Dr. Blair, and of the pathologist, Dr. Harlow Brooks, but for the physiologist, Prof. William Gies, who has kindly volunteered his services and those of the department of physiological chemistry of Columbia University. In the dissecting and operating room facilities will be afforded for the autopsies and anatomical preparations for the American Museum of Natural History and other institutions. The adjoining hospital with its open connecting yards will offer the best facilities for the observation and care of injured or diseased animals.

The Society has been a pioneer in the development of expert researches in comparative medicine and pathology, and the laboratory marks the continued determination to take the utmost advantage of the scientific opportunities which the large collection of

animals affords for discoveries which will be of importance not only to the animals but to man.

FORESTRY DEPARTMENT.

Under the head of construction work no reference was made to planting, although this department had its most active season since the beginning of the Park.

Early in the year Mr. James L. Greenleaf was appointed Consulting Landscape Architect, and under his supervision Mr. Merkel, the chief forester, prepared and carried out an elaborate system of plantations for the south and west boundaries of the Park. These sides of the Park have been exposed through the grading of East 182d Street and the Southern Boulevard, which resulted in the destruction of the trees formerly standing on those streets.

Other plantations of shrubs and flowering plants, notably along Beaver Valley Road, have been made, and nurseries containing many thousands of trees and shrubs have been established.

The total number of trees set out was 5,351, and 13,450 shrubs have been planted during the year. It is the intention of your Committee to devote as much money as possible hereafter from our Maintenance Fund to the protection and improvement of the large trees, as they are among the most valuable features of the Park, which, if injured or destroyed, can never be replaced. Nearly $1,500.00 was spent during the year to preserve the chestnut trees from the attack of a fungoid growth, known as *cytospora*, which made its appearance during the smmer.

Your Committee fear that the efforts of the Society will be vain unless the coöperation of those controlling the adjoining park area is secured, as the plague, even if entirely exterminated in our grounds, can reënter from the rest of Bronx Park.

NEW YORK AQUARIUM.

During the year 1905, $16,632.88 was spent out of the construction fund provided for improvement of the Aquarium. The most important work done with this money was the construction of conduits under the main floor of the Aquarium to contain new water and steam pipes, the original piping system having entirely broken down.

Large filters were also installed in connection with the new tank for the storage of fresh sea-water. This will provide a uni-

form and closed circulation of water and will be put in operation as soon as certain small details have been completed.

These details have proved very troublesome, as it has been necessary to have all the pipes lined with lead in order to prevent the gradual accumulation of rust and the discoloration of the water in the tanks.

When this system is completed and has been put in operation your Committee expect to be able to exhibit a large series of inveretebrates, which cannot be maintained owing to the diluted character of the salt water now in use.

A new iron and plate-glass vestibule has been constructed at the entrance and a new system of transparent card labels for the collections has been installed.

The Fish Hatchery has been kept in operation during the year and the hundred or more tanks of the Aquarium have been kept filled to their utmost capacity.

Contracts have been awarded for a complete heating and ventilating system, and when this is installed the offensive odors which are noticeable on crowded days will be eliminated.

There are on exhibition nearly 2,500 specimens of fishes and other invertebrates, representing about 150 species. This does not include young fish in the hatchery and invertebrates.

GAME PROTECTION.

Among the original objects of the New York Zoological Society at the time of its organization was game protection. The necessity, however, for the concentration of the Society's energy and funds on the development of the Zoological Park forced this matter into the background. During the last year the activity of game destroyers, especially Italians, became so great that the Society felt obliged to give serious attention to this subject.

A special Department for Game Protection was established, and Mr. George O. Shields was appointed Special Agent of Game Protection. An active campaign was organized against the killing of song birds in the outlying districts of the City of New York, which was going on without interference from the police. So bold had these bird killers become that they actually invaded the lands of the Zoological Park and shot birds and squirrels.

As a result of this campaign about 15 persons were arrested and are now awaiting trial. Nearly 3,000 notices, calling the attention to the law prohibiting the carrying of fire-arms by unnaturalized aliens, were distributed and posted throughout the State.

The efforts of this Department will be directed, during the coming season, to securing the enactment of laws prohibiting the use of the automatic shot-gun, a new and most dangerous weapon of extermination which has recently been placed upon the market.

In 1905 the Society took an active part in the defeat of the bill to remove the restriction on spring duck-shooting, and urged the passage of a bill to prohibit the cold storage of game during the closed season. This latter bill, however, failed of passage.

The Society's bill for the protection of land turtles became a law. This legislation was made necessary owing to the fact that Chinamen were developing a taste for box turtles which bid fair to result in their extermination, especially on Long Island.

In connection with this work of game preservation the Society has inaugurated a movement by private societies and individuals to establish herds of bison on government lands in such locations that the bison can live as close to nature as a large range will permit.

The Wichita Forest Reserve in southwestern Oklahoma seemed to afford the best opportunity for locating such a herd. The Society decided to donate to the National Government a herd of 15 or 20 bison on the condition that the Government provide the necessary fences and protection. A definite offer of 18 bison was made on the above basis, and accepted by the Secretary of Agriculture. The Bureau of Forestry and the Biological Survey have both coöperated with the Society and selected a site in the Wichita Forest Reserve containing twelve square miles.

It is the purpose of the Society to take about eight head of bison from its present herd and purchase about ten others. The herd thus composed will contain at least three distinct strains of blood, and it is hoped that on such a large range as the animals will have they will increase rapidly, and that the danger of inbreeding will be reduced to a minimum. Congress will be asked to appropriate $15,000 for the construction of the boundary fences, and if this amount is obtained the reserve can be organized, fenced, and the bison turned loose in the autumn of 1906.

LEGISLATION.

During the session of 1905 a bill was introduced in the Legislature at Albany authorizing the appointment of a Committee to inquire into the feasibility of the acquisition of sufficient land along the entire length of the Bronx River for a public Parkway, and for protection of the stream from pollution and for the pres-

ervation of the supply of water. During the rush of business at the close of the session this bill was lost, but it will be introduced again this year.

OBITUARY.

The Executive Committee regret to record the death, during 1905, of an Associate Founder—Mr. James C. Carter—and of three Patrons—Messrs. Frederick A. Constable, Henry H. Cook, and Adrian Iselin.

ACKNOWLEDGMENTS.

The Committee desires to renew its expression of appreciation of the energy and skill of the Director of the Park and the Director of the Aquarium and their respective staffs.

It also desires to acknowledge the courtesy shown by the Mayor, Hon. George B. McClellan, and by the Comptroller, Hon. Edward M. Grout. The former has repeatedly manifested his sympathy and interest in the completion of the Park. Mr. Grout was especially helpful in acquiring the area to the east of the Park, and also in his support of the Zoological Park as a whole.

During the various changes in the Commissionership of the Park Department for the Borough of the Bronx, the members of that Department have been uniformly helpful and friendly toward the work at the Park, and special acknowledgment is here made to Mr. Martin Schenck, Chief Engineer, Mr. William P. Hennessy, Assistant Engineer, and Mr. G. K. Ackerman, Chief Clerk, all of the Park Department of the Borough of the Bronx.

Respectfully submitted,

CHARLES T. BARNEY, *Chairman.*

HENRY FAIRFIELD OSBORN,	PHILIP SCHUYLER,
MADISON GRANT,	WILLIAM WHITE NILES,
JOHN S. BARNES,	SAMUEL THORNE,

LEVI P. MORTON, *ex-officio.*

January 1, 1906.

GAME PROTECTION IN 1905.

By MADISON GRANT.

IN 1905 the Executive Committee of the New York Zoological Society took up the matter of game protection in the vicinity of New York, and, as a means to this end, established a special department.

This was one of the original objects of the Society when incorporated, but owing to the press of other work, especially the construction work in the New York Zoological Park, it had to be postponed.

A systematic campaign against the automatic shot-gun was inaugurated, and the Society has met with almost universal support in its effort to have prohibited by law the use of this new instrument of destruction to wild life. Bills are being introduced in the different State legislatures and in Congress for the Federal Territories to prevent the use of this gun, and some, at least, of these bills will become law.

Many complaints have reached the Society from residents of the suburban districts of New York and the outlying towns and villages of the constant killing of birds and squirrels, and in fact anything alive, by foreigners, especially Italian laborers. When these depredations extended into the grounds of the Zoological Park on the east of the Bronx River, the Committee instructed its agent in charge of the game department, Mr. George O. Shields, to commence a vigorous campaign, and if possible obtain the conviction of some of these law-breakers as an example.

As a first step, the Society's special officer, Henry Van Benschoten, was instructed to pay special attention to violators of the bird and game laws. Through his activity the following persons were arrested in the Zoological Park, and punished as shown:

ANDDINO CHIOZO.—Arrested January 18, 1905, for shooting Birds on the Boston Road. Fined $5.00 by Magistrate Breen.

LOUIS DORFINGA.—Arrested May 11th, for shooting Robins. Fined $1.00 by Magistrate McAvoy.

ANTONION BALENTICER.—Arrested June 7th, for disorderly conduct. Fined $5.00 by Magistrate Baker.

HARRY STEIN.—Arrested June 25th, for stealing young birds from their nests. Fined $5.00 by Magistrate Olmstead.

THOMAS RYAN.—Arrested December 19, 1905, for cutting branches from a hemlock tree. Reprimanded by Magistrate Steinhart.

During the summer it was brought to the attention of the Zoological Society that a most murderous onslaught of song-birds was being made by Italians in the vicinity of Wakefield, N. Y. Accordingly, two raids on the depredators were organized by Mr. H. W. Merkel, assisted by Mr. Shields and the State Game Protector, John Ferguson, from Long Island, and Messrs. Rudolph Bell and John J. Rose, of the Zoological Park force. Two police officers were procured from the Wakefield Precinct to take charge of the prisoners, and the following were arrested: John Eitney, James Ferrilla, Giovanni Contomessa, Frank Pacello, Hubert Amodeo, Joseph Comonico, Gaetano Amodeo.

In the possession of these men forty-three song-birds were found, and permanently preserved as evidence against them. They were held under bonds for trial at Special Sesssions, and the cases, when reached in January, 1906, were handled in behalf of the Society with great energy and judgment by Mr. William White Niles, who was assisted by Assistant District-Attorney Krotel.

Pacello, Comonico, and Gaetano were fined $50.00 each and sentenced to ten days in prison. Contomessa was fined $25.00; Amodeo, on account of his youth, was discharged, and Ferilla was remanded for sentence at a later date.

In order to break up the Italian habit of slaughtering song-birds for food, the Society caused 3,000 copies of the recently enacted State law prohibiting the carrying of firearms by aliens to be printed and distributed by Mr. Shields throughout the State. Information regarding this law was published in every Italian newspaper of New York City.

In the month of October Mr. Hornaday attended the annual convention of the New York State League for the Protection of Forests, Fish, and Game, in order to interest that body in the passage of a law against the use of the automatic gun. A resolution condemning the use of the automatic gun and calling upon the Legislature to enact a law preventing its use in the State of New York was, after prolonged discussion, adopted with but one dissenting vote.

By special request, the Director attended the annual meeting of the Lewis and Clark Club, of Pittsburg, for the purpose of

addressing that organization on "immediate needs in the protection of wild life."

Two members of the Zoological Park force, who have shown special aptitude for the work, have been appointed deputy game wardens by the State Forest, Fish, and Game Commission. They are Rudolph Bell and John J. Rose, and both rendered conspicuous services in the arrest and conviction of the seven Italians named above, and in other lines of game protection.

Treasurer's Reports.

FOR THE YEAR ENDING DECEMBER 31, 1905.

The annual expenditures of the various funds are shown in appended statements.

Park Improvement Fund.

(Changed to "General Fund.")

FOR PERIOD ENDING MAY 3, 1905.

Cash in Treasury, January 1, 1905.....	$13,866 88

RECEIPTS.

Nothing.

EXPENDITURES

Maintenance Shortage for 1904.....	$1,894 37
Cash balance closed into new "General Fund" account.....	11,972 51
	$13,866 88

H. R. MITCHELL,
Chief Clerk.

PERCY R. PYNE,
Treasurer.

January 1, 1906.

General Fund.

(Formerly "Park Improvement Fund.")

FOR PERIOD ENDING DECEMBER 30, 1905.

Cash in Treasury, May 3, 1905, transferred from "Park Improvement Fund" $11,972 51

RECEIPTS.

Nothing.

EXPENDITURES.

Lion House roof	$144 00	
Transferred to "Income Account"	1,972 51	$2,116 51
Cash balance, December 31, 1905		9,856 00
		$11,972 51

H. R. MITCHELL,
Chief Clerk.

PERCY R. PYNE,
Treasurer.

January 1, 1906.

General Fund.

(Changed to "Income Account.")

FOR PERIOD ENDING MAY 3, 1905.

Cash in Treasury, January 1, 1905		$3,166 12
RECEIPTS.		
Annual dues	$5,240 00	
Life membership fees	800 00	
Miscellaneous receipts	20 43	6,060 43
		$9,226 55
EXPENDITURES.		
Stationery and office supplies	$381 45	
Annual report	180 67	
General office expenses	730 32	
Library	280 78	
Treasurer's office expenses	240 22	
Secretary's salary	1,333 32	
Bulletin	238 98	
Publications for members	57 53	
Miscellaneous expenses	488 77	
Mailing circulars	557 00	
Photographs and slides	428 59	
Aquarium	10 00	
Museum supplies	25 57	
Employers' insurance	325 00	
Aquarium publications	131 85	
Interest	311 72	$5,721 77
Cash balance closed into Income Account, May 3, 1905		3,504 78
		$9,226 55

H. R. MITCHELL,
Chief Clerk

PERCY R. PYNE,
Treasurer.

January 1, 1906.

Income Account.

(Formerly "General Fund.")

FOR PERIOD ENDING DECEMBER 30, 1905.

Cash in Treasury, May 3d, transferred from "General Fund"		$3,504 78
RECEIPTS.		
Annual dues	$7,200 00	
Life memberships	400 00	
Stokes's bird fund	67 50	
Employers' insurance	1 56	
Miscellaneous receipts	325 00	
Transferred from "General Fund" (formerly "Park Improvement Fund")	1,972 51	9,966 57
		$13,471 35
EXPENDITURES.		
Stationery and office supplies	$406 85	
General office expenses	1,201 41	
Library	137 32	
Interest	375 25	
Treasurer's office expenses	270 68	
Secretary's salary	2,666 68	
Bulletin	909 70	
Publications for members	649 53	
Miscellaneous expenses	247 39	
Audit of account	150 00	
Mailing circulars	200 00	
Aquarium publications	1,710 64	
Photographs and slides	740 05	
Museum supplies	51 10	
Game protection	755 89	
Annual report	2,807 49	
Aquarium	20 00	
Wichita buffalo herd	170 25	$13,470 23
Cash balance, December 30, 1905		1 12
		$13,471 35

H. R. MITCHELL,
Chief Clerk.

PERCY R. PYNE,
Treasurer.

January 1, 1906.

Animal Fund.

Cash in Treasury, January 1, 1905			$3,677 77
RECEIPTS.			
Receipts at Park:			
Admissions	$6,849 00		
Checking	46 40		
Rents	754 21		
Boating	500 00		
Sale of animals	568 55		
Miscellaneous	98 20		
Privilege account (season of 1905)	5,000 00		
Rocking Stone Restaurant	1,000 00	$14,816 36	
Special Subscriptions:			
Morris K. Jesup	250 00		
John L. Cadwalader	500 00		
Jacob H. Schiff	3,000 00		
Cleveland H. Dodge	250 00		
John S. Barnes	250 00		
Grant B. Schley	1,000 00		
James J. Hill	500 00		
Phillip Schuyler	250 00		
Levi P. Morton	1,000 00		
George C. Clarke	250 00		
William Rockefeller	562 50		
Nelson Robinson	2,500 00		
C. Ledyard Blair	1,500 00		
Miscellaneous	126 00	11,938 50	26,754 86
			$30,432 63
EXPENDITURES.			
Purchase of Animals:			
Mammals	$15,414 20		
Birds	7,737 34		
Reptiles	854 35	$24,005 89	
Travelling and other expenses		983 10	
Express and other charges		2,503 41	$27,492 40
Cash balance, December 30, 1905			2,940 23
			$30,432 63

H. R. Mitchell,
Chief Clerk.

Percy R. Pyne,
Treasurer.

January 1, 1906.

Maintenance Fund.

RECEIPTS.

Received from the city on account of maintenance appropriation of $134,965 for the year	$112,020 20	
Balance due from the city on account of maintenance	22,944 80	
		$134,965 00

EXPENDITURES.

General administration	$12,617 60	
Maintenance of buildings and care of animals	36,041 72	
Maintenance and care of grounds	34,905 31	
Tools and hardware	3,381 70	
Paints and oils	2,045 04	
Office supplies and printing	752 79	
Repairs	388 65	
Telephone service and tolls	1,040 07	
Postage and telegraph, and express	1,016 63	
Food for animals	24,051 53	
Fuel	7,615 02	
Drugs and medicines	305 69	
Lumber	1,851 11	
Miscellaneous supplies	734 38	
Plumbing supplies	823 71	
Electric lighting	297 04	
Nursery stock and seeds	101 51	
Medical attendance (animals)	360 00	
Office furniture and fixtures	441 73	
Fencing and netting	331 39	
Signs and labels	190 45	
Engineering supplies	61 62	
Cement	89 90	
Janitor's supplies	401 82	
Glass and glaziers' supplies	143 12	
Mats and floor coverings	316 55	
Sanitation	235 87	
Horses and vehicles	1,193 85	
Nursery supplies	115 55	
Uniforms and badges	1,615 75	
Telephone and electrical supplies	12 17	
Rubber hose	271 20	
Surgical instruments and appliances	14 49	
Alterations in office	296 50	
Ice	302 50	
Medical attendance (employees)	138 00	
Sand	463 04	
		$134,965 00

H. R. Mitchell,
Chief Clerk.

Percy R. Pyne,
Treasurer.

January 1, 1906.

Ground Improvement Fund.

Appropriation No. 4.

RECEIPTS.

Unexpended balance of Appropriation No. 3, brought forward		$4,106 42
Appropriation by Board of Estimate and Apportionment:		
Available July 8, 1904	$275,000 00	
Available May, 1905	275,000 00	
Premium on bonds	2,246 19	552,246 19
		$556,352 61

EXPENDITURES.

Through Park Department:		
Contract, Conrad Hewett, Pheasants' Aviary	$19,546 00	
Contract, George L. Walker Co., Glass Court, Bird House	24,199 00	
Contract, John V. Schafer, Jr., Co., Baird Court	67,000 00	
Contract, Guidone & Galardi, two Toilet Buildings	8,385 00	
Contract, Peter Tiernan, Camel House	2,800 00	
Contract, Wright & Son, Feed Barn	15,316 00	
Contract, J. J. Buckley, Public Comfort Building	19,200 00	
Contract, Guidone & Galardi, Small Deer House	41,543 00	
Contract, William Horne & Co., West Farms Entrance Pavilion	5,008 00	
Contract, Granite Steps near Bear Dens	1,569 00	
Contract, John P. Kane & Co., Cement	993 75	
Contract, Brown & Fleming, Broken Stone	7,437 50	
Contract, August Bans, Sewer Pipe	333 72	
Miscellaneous Expenditures by Park Department	2,491 46	
		$215,822 43
By the Zoological Society:		
Pheasants' aviary	$1,475 35	
Reconstruction of walks	14,197 46	
Forestry and planting	25,086 54	
Guard rails	2,931 91	
Ostrich and Mammal House walks and yards	1,757 30	
Miscellaneous ground improvement items	10,687 10	
Baird Court boundary and concourse	1,300 00	
North End of Baird Court	4,835 96	
Electric Conduit	204 04	
Small Deer House Walks and Yards	1,415 58	
Improvement North of Lake Agassiz	6,267 99	
New Walks	12,034 47	
Southern Boundary Fence	5,060 12	

Lion House roof	$1,400 00	
Public Comfort Station east of Bronx River	1,852 90	
Bird House	3,287 75	
Sea Lion pool	2,655 64	
Buffalo range grading and seeding	1,946 48	
Improvements east of Bronx River	55 12	
Excavating Lake Agassiz	2,615 60	
Grading elk range and filling pond	2,573 93	
Tortoise yards	1,349 98	
Beaver Pond pipe line	1,042 75	
Maral Deer Shelter	294 23	
Moving Buffalo House and corrals	1,403 85	
New shops	915 44	
Western range fences	4,570 01	
Subway Entrance Plaza	3,922 29	
Restaurant steps	1,288 11	
Landscape architecture	1,664 79	
Boston Road Public Comfort Station	628 50	
Feed barn	60 00	
Camel House yards and fences	627 09	121,408 28
Balance available for expenditure		219,121 90
		$556,352 61

H. R. MITCHELL,
Chief Clerk.

PERCY R. PYNE,
Treasurer.

January 1, 1906.

Aquarium Improvement Fund.

RECEIPTS.

Balance of $40,000 Appropriation as per Report of 1904....		$25,327 52
Premium account sale of bonds.....		241 26
		$25,568 78

EXPENDITURES.

Through Park Department:		
Jacob Marks, account Reservoir Cover.....	$390 00	
Barney & Chapman, Architects' Commissions	19 50	
Ralph F. Gerstle Co., account Steam Heating Apparatus.....	15,448 00	
Barney & Chapman, Architects' Commissions.....	772 40	
Barney & Chapman, Architects' Commissions on W. F. Howe & Co.'s bid of $9,222. Contract not awarded.....	230 55	
Pay-roll, Chief Engineer, June 15th.....	13 69	$16,874 14
Balance available for expenditure.....		8,694 64
		$25,568 78

E. R. Sampson,
Disbursing Clerk.

Percy R. Pyne,
Treasurer.

January 1, 1906.

Aquarium Fund.

RECEIPTS.

Received from New York City on account of Aquarium appropriation for 1905		$45,000 00

EXPENDITURES.

Pay-rolls	$29,308 22	
Alterations and repairs	3,344 48	
Coal	5,245 02	
Live specimens	1,487 90	
Fish food	1,604 27	
Gas	784 80	
Electric light	177 96	
Telephone service and tolls	198 80	
Ice	62 27	
Incidental expenses	500 00	
Uniforms	7 00	
Books for Library	41 05	
Furniture	212 88	
Supplies (general)	1,436 17	
Stationery and printing	198 68	
Cartage (fish and cans)	269 00	$44,968 50
Balance unexpended		31 50
		$45,000 00

E. R. SAMPSON,
Disbursing Clerk.

PERCY R. PYNE,
Treasurer.

January 1, 1906.

THE AUDIT COMPANY

OF NEW YORK

43 Cedar Street

NEW YORK, *March* 8, 1906.

We certify that the foregoing statements, showing the condition of the various funds of the New York Zoological Society on December 30, 1905, are true exhibits of the various accounts.

The items of $215,822.45, expenditures on the Ground Improvement Fund, No. 4, and the Aquarium Improvement Fund, were disbursed by the Park Department. As this money has not passed through the books of the Society, the items have not been verified by us.

THE AUDIT COMPANY OF NEW YORK.



AUDUBON COURT FROM THE ANTELOPE HOUSE

REPORT OF THE DIRECTOR

OF THE

ZOOLOGICAL PARK.

IN several respects the year 1905 has been the most satisfactory of any in the Zoological Park's history. The number of living animals rose well beyond the 2,500 mark, the attendance was the greatest yet recorded, the death-rate among the animals was the lowest, the net income from privileges was the largest thus far realized, and the salaries of the Park employees were increased to a fair, living basis. In addition to all this, the weather throughout the year, from early spring until the end of December, was auspicious for our planting operations, and for the very extensive construction works that were carried on throughout the Park. The only gravely annoying feature of the year was the dog nuisance, which broke out like an epidemic during a short period of the reconstruction of fences on our southern boundary.

The close of the year finds the year's work well rounded up, our programme for 1905 practically complete, and the animal collections generally in good shape for the winter.

ATTENDANCE.

The number of persons visiting the Park steadily increases, due, in part, to the new means of access furnished by the Subway line to West Farms. During the first three months following the completion of that line, the public did not seem to be aware of the existence of the new approach. For the last three months of the year, however, the attendance doubled. The entrance figures at the Buffalo Entrance considerably exceeded those of the Northwest Entrance, which previously had taken the lead.

The monthly attendance record for the year is as follows:

Month.	1904.	1905.
January	19,798	23,788
February	19,547	20,969
March	55,303	48,508

Month.	1904.	1905.
April	88,148	126,611
May	227,484	179,590
June	128,067	139,361
July	147,015	147,596
August	156,460	152,691
September	129,259	133,146
October	71,694	144,542
November	48,105	72,994
December	13,736	43,722
Yearly totals	1,104,616	1,233,528
Average daily attendance	3,027	3,380
Increase for 1905		128,912

COLLECTIONS.

As usual, the greatest difficulty of the Zoological Park staff has been in finding room for the animals that the Society desires to exhibit, and accumulates. No sooner is a new installation ready than it is promptly filled. The new Asiatic Deer House became so overcrowded—by the arrival of rare new species and by births—that the accommodations for this group of deer required to be permanently extended. The Red Deer barn was appropriated, extended on the western side for the Maral deer, and remodelled inside, as permanent quarters for four more species. For the Red Deer herd, a very comfortable shed was erected on the south side of the barn.

The Small Mammal House was filled with unusual deliberation, in order to choose the most interesting types of animals. To-day it is quite full, with a collection that contains such rarities as the wolverine, fisher, echidna, anteater, hyena dog, serval, clouded leopard, white-whiskered paradoxure, a fine array of viverrines generally, Canada lynx, Arctic fox, capybara, and many other rodents of special interest. Beyond question, visitors find this collection quite as interesting as any other in the Park.

A new centre of popular interest, and it may justly be added of delight, is the new Bird House, opened on July 4th. It is so light and airy, so well adorned with plants, and so full of happy bird life, its charm is irresistible. Every bird is so abundantly provided with cage-room and companions that the prison suggestion is quite absent. There are no small cages and no unhappy

birds. All the smaller passerine birds are so installed that each cage is a flying cage. The central flying cage contains a happy family of about 150 birds, representing 5 Orders—perchers, waders, swimmers, upland game birds, and others. In the new Bird House the only jarring note is the mixture of song-birds with screaming macaws, parrots, and cockatoos in the south hall. But the completion of the Glass Court addition to the building will change all that, for the present south hall will then be devoted wholly to the song-birds of the temperate zone.

It has been a great pleasure to increase the collections, during the past year, to a noteworthy extent. At the close of 1903 the total number of specimens exhibited was 1,802, representing 436 species; whereas at present we have 2,867 specimens, representing 657 species, a gain of 221 species and 1,065 specimens.

The Pheasant Aviary is the only installation in the Park which is not yet completely stocked. Already it contains 24 species of pheasants, but the pigeons, doves, and small upland game birds will not be added until next year.

DEPARTMENT OF MAMMALS.

William T. Hornaday, Curator; Raymond L. Ditmars, Assistant Curator.

The most notable accessions of the past year were the West African Elephant, "Congo," gift of Mr. Charles T. Barney; a female Eland, gift of Mr. C. Ledyard Blair; a Tashkent Wapiti, gift of the Duke of Bedford; 3 Burmese Thameng Deer, gift of Mr. William Rockefeller; 5 White Mountain Goats; a Persian Wild Ass, from the Philadelphia Zoological Gardens; a pair of Chapman Zebras, and a Tapir from the National Zoological Park.

Among the smaller animals, the most valuable accessions were a Great Anteater; 2 Capybaras; 2 Clouded Leopards; a Wolverine; and a Grizzly Bear from White Horse, Yukon Territory, secured through Mr. Charles Sheldon.

The birth-rate for the year was very satisfactory, and included the following animals:

BIRTHS DURING 1905.

3 Lemurs.	4 Lions.
1 Green Monkey.	1 Tiger.
1 Long-armed Baboon.	1 Raccoon.
15 Gray Wolves.	3 Coypu Rats.
18 Coyotes.	1 Leucoryx Antelope.
1 Russian Brown Bear.	1 Nilgai.

6 American Bison.	1 Red Deer.
3 Axis Deer.	4 Indian Sambar Deer.
2 Sika Deer.	2 Barasinga Deer.
2 Fallow Deer.	1 Tahr.
1 Elk.	1 Grant Zebra.

1 Altai Wapiti.

In the Small Mammal House the collection of viverrines is particularly full. That building now contains representatives of six of the Mammalian Orders, as follows: Feræ, or Carnivora; Glives, or Rodentia; Ungulata; Edentata; Marsupialia and Monotremata. Already that building is a favorite resort for classes of pupils from the various schools of the city.

The collection of Ungulates (hoofed animals) will be noted elsewhere in this volume in a special article.

In addition to the acquisition of many valuable new specimens during the past year, there is also cause for satisfaction in the low death-rate, and the absence of serious accidents other than those caused by the outbreak of sheep-killing dogs. Since all native hoofed animals have been deprived of their previous grazing privileges and quartered on the bare ground of their corrals gastro-enteritis has rarely occurred. The bison and elk herds now are in the best condition they ever were in, and the birth in the former of six healthy calves may well stand as evidence of the vigor of the herd as a whole.

During the rebuilding of certain boundary fences, the sudden onslaughts by night of cunning and murderous dogs resulted in the death of seven axis and fallow deer before our fences could be rebuilt. This experience was described in the Bulletin No. 19. The most valuable animal lost during the year was a buffalo cow, whose heart was pierced by a small piece of hay-bale wire which was taken into the stomach with food. Keeper John Quinn succeeded in carrying his entire collection of deer, wapiti, and wild horses through the year with only two deaths. In view of the fighting proclivities of many of his animals, this fact is well worthy of permanent record.

The very valuable collection in the Antelope House has also been maintained in fine condition. The losses to it during the year consisted of a blesbok and a male nilgai, both of them animals of fourth-rate financial value.

From the collection of apes and monkeys tuberculosis has been so nearly eliminated that only one case occurred during the year. The three Anthropoid apes have been kept in fine, vigorous

health, and their growth has been rapid. In fact, the orang-utan, who has learned the use of the lever, has been with considerable difficulty prevented from wrecking the interior of his room with the aid of his trapeze bar. It may yet be necessary to remove his trapeze, in order to save the walls of his domicile from being torn to splinters.

MAMMALS ON HAND, DECEMBER 31, 1905.

Primates	30	species.	86	specimens.
Carnivora	52	"	151	"
Pinnipedia	1	"	7	"
Rodentia	23	"	140	"
Ungulata	62	"	225	"
Marsupialia ...	5	"	10	"
Edentata	2	"	4	"
Insectivora	1	"	1	"
Total	177	"	625	"

DEPARTMENT OF BIRDS.

C. William Beebe, Curator.

In this department the most important events of the year were the opening of the large Bird House and of the Pheasant Aviary, with collections of appropriate species. This relieved the overcrowded Aquatic Bird House and the Ostrich House, and furnished exhibition room for many important Orders of birds hitherto unrepresented in the collection. Every specimen which now arrives at the Park—whether arboreal, swimmer, or wader; whether feeding on fish, seed, or insects—is sure of a range perfectly adapted to its habits. The large Bird House, in furnishing roomy cages, good light and air, and the Pheasant Aviary, in being absolutely rat and mink proof, have both of them fulfilled the expectations of the designers.

Perching birds, which in the Aquatic Bird House had remained for five years in their immature plumage, have in one moult, in the new glass-roofed building, assumed perfect plumage.

With hundreds of new birds arriving during the last few months, the problem of bird food was given more careful attention than ever before. No prepared food is now purchased, but each day a fresh supply is mixed in the Bird House, the proportion of the half-dozen or more ingredients being a matter of constant variation, based on the daily condition of the birds. As a

consequence, most gratifying success has been attained in carrying new arrivals through their first moult—the most critical period in the life of a captive bird. Both in the care of difficult birds and in the preparation of foods Keeper Stacey has displayed most commendable intelligence and industry.

The development of a hospital in one of the upper rooms of the Bird House has proved to be of great utility in caring for sick or injured individuals.

Since January 1, 1905, the collection of birds has increased over 150 per cent in individuals and over 100 per cent in species. Of the 36 Orders of the living birds of the world, 26 are represented, almost all of the remaining 10 being small, isolated groups, such as the sand-grouse, hemipods, hoatzin, etc.

It is the aim of the Curator to make the collection as fully representative as possible of the birds of North and South America; and this has been so far successful that 22 out of the 26 Orders, and 203 out of the 355 species, here shown are found in the New World. Only 2 Orders of North American birds are unrepresented.

A very successful innovation has been the grouping in one cage, or in several adjoining cages, of the birds of some particular region or country. Thus, the common birds of Europe occupy a large cage by themselves; while the weavers of Africa, the toucans, hornbills, etc., are similarly segregated.

The birds of the Bahamas and of Cuba are represented by 27 of the species peculiar to those islands. The rearing of two broods of Canada Geese, of eight each, and the hatching of a young White Ibis is worthy of note. By means of much experimenting in the line of new food, a diet perfectly adapted for flamingoes has been formulated. As a result, several very young birds have been successfully brought to maturity.

Among many interesting and unusual birds may be mentioned the black Bennet Cassowary, Elegant Tinamou, Black Cock and Capercaille, Bleeding Heart and Victoria Crowned Pigeon, Ivory Gull, Avocet, five species of Gallinules, seven species of Swans, five species of Tree-ducks, Eider Duck, Solitaires, Mocking Thrushes, Cuckoos, Nuthatches, Swallows, Warblers, and every species, save one, of the Thrush Family inhabiting the eastern part of our country.

Special attention is called to the excellent work that is being done by the Curator in the matter of descriptive labelling, and also in providing picture labels for purposes of identification. Despite the great number of small birds in the new Bird House,

nearly every species is rendered recognizable by the extensive series of bird-portrait labels that have been provided.

Judging from the nest-building operations that already are under way in the new building, many of the birds feel thoroughly at home and contented. The collection of pigeons and doves is quite large and interesting. The "happy family" of miscellaneous Orders and species in the central flying cage is a very pleasing spectacle, and the general good health and happiness of all the birds in the new building furnish convincing testimony of the intelligent and painstaking care which they receive from Curator Beebe and Keepers Stacey and Van Zandt.

The list of pheasants now in the new Pheasant Aviary is well worthy of permanent record here.

LIST OF PHEASANTS PRESENTED BY MR. JACOB H. SCHIFF.

	Males.	Females.	Total.
Impeyan	2	2	4
Satyra Tragopan	1	1	2
Temminck Tragopan	1	1	2
Cabot Tragopan	3	1	4
Siamese Fire-Back	3	2	5
Manchurian Eared	1	.	1
Black-Crested Nepal	1	1	2
Black-Backed Pheasant	1	1	2
Anderson	1	1	2
Lineated	.	1	1
Silver	3	6	9
Swinhoe	1	1	2
English	2	3	5
Ring-Necked	3	3	6
Versicolor	3	3	6
Soemmering	2	1	3
Reeves	5	4	9
Elliot	1	1	2
Golden	5	4	9
Amherst	3	4	7
Red Jungle Fowl	5	3	8
Peacock Pheasant	2	1	3
Vulturine Guinea Fowl	1	1	2
Capercaille	1	.	1
Black Cock	2	1	3
Ruffed Grouse	1	.	1
European Partridge	.	.	7

In view of the large number of foreign birds now in our collection, and the practical impossibility of longer adhering to the classification of the American Ornithologists' Union, which ignores all birds outside of North America, a radical change in our avian nomenclature is imperatively necessary.

To meet the demands of the situation, we are forced to adopt a scheme of classification which comprehends the birds of the world. As being the most modern and rational classification, we have decided to adopt that of the British Museum, as it appears in the "Handlist of Birds" by R. Bowdler Sharpe. This explanation is necessary to account for the differences in the arrangement and nomenclature of our list of the Orders of birds in our collection, from those of previous years.

A full statement of the birds on hand shows a gratifying array of Orders, and marks a long step in advance.

LIST OF BIRDS ON HAND ON DECEMBER 31, 1905.

Orders.		Species.	Specimens.
Rheiformes,	Rheas	1	1
Struthioniformes,	Ostriches	2	3
Casuariformes,	Emeus and Cassowaries.	4	7
Tinamiformes,	Tinamou	1	1
Galliformes,	Quail and Pheasants	46	177
Columbiformes,	Pigeons and Doves	22	96
Ralliformes,	Coots and Gallinules	6	18
Podicipedidiformes,	Grebes	1	1
Lariformes,	Gulls and Terns	7	40
Charadriiformes,	Plovers and Sandpipers.	8	18
Gruiformes,	Cranes, Seriema	5	10
Ardeiformes,	Ibises, Storks, and Herons	15	55
Palamedeiformes,	Screamers	1	2
Phoenicopteriformes,	Flamingoes	2	7
Anseriformes,	Swans, Geese, and Ducks	38	326
Pelecaniformes,	Cormorants and Pelicans	8	34
Cathartidiformes,	New-World Vultures	5	12
Accipitriformes,	Hawks and Eagles; Old-World Vultures	12	35
Strigiformes,	Owls	10	28
Psittaciformes,	Parrots, Macaws, and Cockatoos	34	88

Orders.		Species.	Specimens.
Coraciiformes,	Kingfishers and Hornbills	2	3
Trogones,	Trogons	7	4
Coccyges,	Cuckoos	1	1
Scansores,	Toucans	3	3
Piciformes,	Woodpeckers	2	9
Passeriformes,	Thrushes, Sparrows, and all Perching Birds	117	576
26 Orders of Birds		355	1,555

DEPARTMENT OF REPTILES.

Raymond L. Ditmars, Curator.

The close of 1905 finds the collection in the Reptile House remarkably full, and well stocked with important representative species. The collection of poisonous snakes has strengthened beyond our expectations. The series of rattlesnakes contains about sixty specimens, and to the collection of cobras,* eight specimens, representing two additional species, have been added. Through the Curator's efforts to procure specimens of the desert tortoises, from the Southwest, to exhibit in the Tortoise House, a number of desert lizards were received. During the summer these were shown in a special cage outside the Reptile House, and later were transferred to the high temperature of the Tortoise Room, in the eastern end of the building.

The series of local reptiles has been much elaborated. Large descriptive labels have been printed, framed, and placed over the cages. These labels give a condensed history of each species represented, and the exhibit is thus made more useful and instructive. Across the hall from the local reptiles are the batrachians found in this vicinity, arranged in the same fashion.

A new and important feature is the grouping of the strictly aquatic amphibians under a large general label. Four commodious aquaria hold a representative lot of these creatures. Two of the tanks are supplied with running water, which is an absolute requirement for some of the species. In connection with the exhibit of amphibians there is shown a fine preparation illustrating the transformation of the frog. Brought together in this fashion, from different parts of the building, the batrachian collection is at once rendered more noteworthy and atractive.

* Described in the Ninth Annual Report, for 1904.

Owing to the rapid growth of the alligators that hatched here from the eggs collected by the Curator and Keeper Snyder in South Carolina four years ago, a section of the big tank has been partitioned off for them. From a length of eight inches and a weight of one and three-eighths ounces these reptiles have grown to a length of five feet, and an average weight of fifty pounds. This series of alligators is very important in affording an opportunity for accurate observations of the growth of the North American Alligator. From a small aquarium the specimens were first transferred to the large turtle tank, and, outgrowing this, they have at last been accorded the privilege of joining the big saurians in the alligator pool.

A small feature in the Reptile House, yet attracting considerable interest, are several cases of poisonous "insects," such as spiders, centipedes, and scorpions. Descriptive labels explain away certain superstitious ideas, and cite the actual habits, besides giving remedies for bites and stings.

In addition to the maps and charts, a number of photographs, illustrating structural characteristics of the specimens, are now exhibited.

The most important improvement of the year in the reptile department was the construction of the outdoor yards at the eastern end of the Reptile House. The enclosures communicate directly with the interior runways of the Tortoise House. Each yard has been floored with sand and provided with a concrete pool. These enclosures have been specially designed for the large tortoises—several species of which are now on hand—and for iguanas, monitors, mastigures, and other large lizards. The temperature of the Tortoise Room is maintained at 80° F., and the floor space that it affords, covered with warm sand and abundantly lighted, has proven of great benefit to all its reptilian habitants. Iguanas that have fared poorly in the smaller cages of the main exhibition hall have recovered their health and vigor to a remarkable degree when transferred to the desert temperature of the Tortoise Room. The principal difficulty experienced in keeping the large lizards in the new quarters lies in preventing them from leaping or climbing out of their enclosures.

Until a rather elaborate new arrangement of doors has been provided, it is not possible to admit the public to the Tortoise Room in winter, but this object will be attained very shortly.

REPTILES ON HAND ON DECEMBER 31, 1905.

	Species.	Specimens.
Chelonia	31	127
Crocodilia	3	46
Lacertilia	20	118
Ophidia	56	278
Amphibia	15	118
Total	125	687

The total census of the Zoological Park collections at the end of 1905 is as follows:

SUMMARY OF COLLECTIONS.

	Species.	Specimens.
Mammals	177	625
Birds	355	1,555
Reptiles	110	569
Amphibians	15	118
Total	657	2,867
Increase over 1904	221	1,065

GROUND IMPROVEMENTS UNDER THE DIRECTION OF ZOOLOGICAL PARK OFFICERS.

Hermann W. Merkel, Chief Forester and Chief Constructor.

Planting.—In this branch of our work the year 1905 will be memorable for two reasons—the great amount of planting done and a good growing season for newly planted stock. That our maximum effort should have been made in the year most auspicious in weather conditions is indeed cause for congratulation.

Previous to 1905 many causes had operated to postpone the extensive planting operations that had been planned for the southern front of the Zoological Park. The western boundary had previously been planted with deciduous trees, but even there the masses of conifers necessary to a perfect border plantation and wind-break were lacking. At last, however, funds for planting became available in the autumn of 1904.

During the winter the Chief Forester was sent to nearly all

the leading nurseries east of Chicago to personally inspect their stocks, make selections, and place orders for everything desired. By this method the stock secured was particularly fine, and it was also specially adapted to our purpose. In the item of rhododendrons, for example, about 1,500 fine, large bushes were procured at the unusually low average rate of 70 cents each, delivered in New York. Five carloads of laurel were obtained at the rate of 20 cents per plant, which represents about one-half the usual market price for such stock.

The wellnigh complete exposure of the Park grounds along their southern front called for energetic measures. The poverty of the soil on the site of the proposed border plantation required the purchase of about 2,000 cubic yards of good top soil and about 700 loads of manure. In addition to this, a great amount of underdraining was necessary.

By the time the first carloads of evergreens arrived the ground was in perfect readiness, and the planting forthwith began. All these operations were directed by expert foremen gardeners, and the laborers employed were all carefully selected for that work. By working extra hours the stock was planted almost as rapidly as it arrived, the majority of it going into the ground on the day of its receipt.

In these border plantations about 5,000 large conifers were used, of which about 750 were white pine, with about the same number of hemlocks. The remainder were white balsam, blue Norway spruce, Nordmann's silver fir, Colorado fir, red and white cedar, Austrian pine, Scotch pine, and pitch pine. In smaller quantities there were numerous other varieties. All these were planted thickly for immediate effect, and about one-half of them will be available for transplanting in the near future.

In places this mass of evergreens was fronted by groups of deciduous shrubs. Of the latter there were planted such species as arrow-wood, hobble bush, high-bush huckleberry, snow berry, June berry, witch-hazel, several varieties of sumach, leather wood, bush honeysuckle, red-twigged dogwood, the cornels, chokeberry, and pepper bush, to the total number of about 12,000.

On the western boundary, fronting the Southern Boulevard, the fences were moved in from 20 to 50 feet, to afford additional room for boundary planting. The 30-foot strip originally fenced off was found to be too narrow.

In accordance with the plans of the architects, Baird Court was planted with the best specimens procurable of the large-leaved European linden. The north bank of Cope Lake received a quan-

tity of top soil, and was planted with about a thousand shrubs of native species.

The whole centre and southern half of Audubon Court—bounded by the Reptile House, Mountain Sheep Hill, the Antelope House, and Ostrich House—was carefully worked over, graded, seeded, and sodded as necessary. The existing group of trees and bushes occupying the centre of the Court was considerably enlarged, and the new area was planted with rhododendrons, azaleas, kalmias, and a few fancy evergreens.

The existing grove in front of the Reptile House was extended southward and westward by the addition of dogwood, hornbeam, hop tree, and other species.

Along Beaver Valley Walk the planting done was particularly successful. Owing to the excellent shelter, and also shade, it was possible to introduce several large masses of broad-leaved evergreen shrubs. The stock secured for this area proved to be excellent, and consisted chiefly of 1,700 rhododendrons, representing three native species, and about 2,000 kalmias. These large masses were bordered with leucöthe, yellow root, galyx, etc., liberally interspersed with *Lilium canadensis, philadelphica,* and *superbum.* The hillside east of the Restaurant was covered with mountain laurel, while the low grounds were partly filled with magnolias. In addition to this several thousand of such attractive perennials as wake-robin, blood-root, and lobelias, and about five hundred ferns were used there. We expect to carry this scheme along the sides of the Jungle Walk, and to have this whole section teeming with flowers from early spring to late fall.

The condition of all our plantings is entirely satisfactory, but it was only by a great amount of mulching and watering that the newly planted stock was carried through one extremely threatening period. During two weeks in May and the entire month of June we had hardly any rainfall, and to save the new plantings three gangs of men were continuously kept at watering, often in relays, and working all night. Through this and through careful mulching, for which purpose we fortunately had on hand an ample supply of manure, the loss in the entire planting for the year amounted to only *one and one-tenth per cent.* In view of the fact that in large plantings of conifers the most conservative nurserymen warned us to expect a loss of ten per cent, the record named above speaks highly for the Chief Forester and his force.

Excavating and Filling.—A tree-trench 4 feet deep and 16 feet wide, extending from the north end of the Lion House to the

south end of the new Bird House, was excavated and filled with good soil from the bed of Lake Agassiz, as also was the space for the northern grass plat.

In order to remove from the Buffalo Range the poisonous grasses and infected earth which in previous years had so seriously affected the buffalo herd, the top soil was removed from the whole of that area, and utilized in making new ground for plantings at the New Boston Road Entrance. In the spring of 1906 that range will be seeded with red-top grass, which it is believed will not affect the buffaloes adversely.

At the eastern end of the new bridge across the Bronx River, on Pelham Avenue, the southern sidewalk space was left by the bridge contractor as a chasm, about 12 feet wide, 14 feet deep, and 100 feet long. This space was filled with earth from Lake Agassiz, shaped into a proper embankment, and finally the side of the embankment was covered with top soil and seeded.

Owing to the presence of filaria in the bottom of the Elk Pond, the water from the bottom of which could not be drained off, about 1,700 yards of earth, stones, etc., were hauled and deposited there to raise the level of the bottom high enough to drain the pond and disinfect it.

The site of the yards to surround the new house for Small Deer, and the surrounding walk, was carefully graded, and a great quantity of earth filling was hauled in to fill the hollow on the western side of the slope. This was not completed during 1905.

The entrance plaza for the new Boston Road Entrance was unavoidably located on a spot which was about ten feet below the level of the adjacent streets. Part of this hollow was filled with about 3,000 yards of top soil, as a basis for planting operations. The remaining space was filled with other materials, and graded up as near as practicable to the lines of the north retaining wall, and the macadam surface that remains to be added. One hundred cubic yards of specially selected stone, for the north retaining wall of this plaza, were purchased on the site of the city's Grand Concourse, near Jerome Avenue, and hauled to the site of the proposed improvement.

Lake Agassiz.—Very important work was done in Lake Agassiz and vicinity. First, the solid masonry core of the earth island between the two waterfalls, once overflowed by a heavy flood with great damage to the island, was raised three feet, effectually preventing similar occurrences in the future. The whole surface of the island was raised about four feet by de-

positing thereon earth which was excavated near by, in Lake Agassiz.

The work of deepening the lake, begun last year, was completed in a satisfactory manner. A channel was dug to conduct a portion of the main current of the stream around the southern side of the island near the Concourse, and correct the stagnant condition of a large water area that long had needed this remedy. A small wing dam was built to make this improvement effective and permanent. The banks of Lake Agassiz were carefully graded, with a view to restoring as far as possible the appearance of natural conditions. In a few places sandy shores were made; but the amount of sand available for this purpose was much too limited for a perfect effect.

Henceforth, the mass of aquatic vegetation which previously grew up every summer and choked the water area of Lake Agassiz will be seen no more. It is hoped that in 1906 funds will be available for the proper planting of this region, which when done will complete the restoration of what is unquestionably the most beautiful landscape in the Park.

Fence North of Lake Agassiz.—The outbreak of sheep-killing dogs, which occurred in the month of July, forced upon the Society the necessity of immediately fencing the northern shore of Lake Agassiz, to prevent dogs from swimming the lake and river, and thereby entering the Park. To meet this imperative necessity for protection about 2,500 feet of Page wire fence was erected on steel posts, and the usual run of dry rubble pavement was laid inside, close along the fence, to prevent dogs from digging under. Two floodgates and barriers, of iron wire and wood, are, with the approval of the Park Department, now being erected, to swing underneath the two bridges to prevent the ingress of dogs over the ice in winter. As soon as these gates are in place a collection of water fowl will be placed on Lake Agassiz, in accordance with the Society's original plan.

Water Supply to Beaver Pond.—In dry seasons the supply of water to the Beaver Pond always has been inadequate; and the brook which occasionally flows through the beech woods into Lake Agassiz has nearly always been dry. In order to thoroughly and permanently improve both those conditions, it was decided to establish below the waterfall an automatic pump, with water power from the lake, to pump lake water into the head of the Beaver Pond. Accordingly, a 12-inch hydraulic pumping engine was purchased, and will be put in operation early in the spring of 1906. Meanwhile, a pipe line consisting of 1,900

feet of 3-inch galvanized iron pipe was laid from the waterfall to the Beaver Pond under one edge of the new walk. This should greatly improve the condition of the Beaver Pond, and the constant overflow of water will render the dry brook a pleasing feature in the tract of thick forest, which for convenience has been named "The Jungle."

Additional Electric Conduit.—In order to carry wires for electric-lighting and telephones from Baird Court to the Aquatic Birds' House, it was necessary to construct about 600 feet of conduit, with two manholes. This completes the system of conduits connecting all the large central buildings of the Park, but does not equip the Antelope House and Small-Deer House.

New Sewers.—To provide for the use of the two new toilet houses erected in the southeastern portion of the Zoological Park, our force constructed about 1,000 feet of 6-inch sewer, and laid an equal length of 2-inch water pipe. Another line of sewer, about 600 feet in length, was laid from the new Feed Barn to the main line in Beaver Valley.

Concrete Work.—In the Sea Lion Pool, in the centre of Baird Court, an elaborate shelter structure, made to imitate the formation of granite rock, was finished in September. In addition to this, two islands of rock and concrete were built in the pool. At the two toilet buildings referred to above, concrete retaining walls were built to protect the structure from the wash of storm water down the steep hill which rises toward the east. The service yard at the Rocking-Stone Restaurant was paved with concrete, and a concrete floor was laid in the "Menagerie," or winter store-house for outdoor animals that require heat in winter. A concrete gutter was laid around the Raccoon's Tree and in front of the new Bear Dens. New floors of concrete were laid in the Elk Barn, Red Deer Barn, and Moose Barn.

New Fences.—The past year has witnessed an extensive remodelling of boundaries on the south and west, not only along the streets, but in the ruminant ranges also. Primarily this work was rendered necessary by the "grading and regulating" of 182d Street, our southern boundary, and the Southern Boulevard, along the west. In some places the grades of these streets were raised from four to eight feet, and through this work our old boundary fences, already badly rusted, were practically destroyed. The building of the two new walks leading to the new Boston Road Entrance involved a complete remodelling of the Buffalo Range; and the inward extension of the western border plantation involved the rebuilding of those fences also. It

should also be stated that owing to the extreme saline quality of the atmosphere of Bronx Park, the light wire fences erected in 1899 were so badly rusted that the erection of new fences, of much heavier wire, and more heavily galvanized, was really imperative.

Accordingly our force completely reconstructed, on very substantial posts of T-shaped steel—far stronger and more durable than the original posts—13,650 feet of the following fences, all 88 inches high, of 25 bars of No. 9 hard steel wire, No. 7 wires at top and bottom, and with tie wires of No. 12 wire, one foot apart:

Southern boundary fence	2,200	feet.
Upper Buffalo Range	850	"
New Fallow Deer Range	2,300	"
Camel Range	500	"
Elk Range, White-Tailed Deer Range, Red-Deer Range	4,100	"
New Maral Deer Range	400	"
Along West Farms Road	800	"
North of Lake Agassiz	2,500	"
	13,650	"

The importance of this work can hardly be overestimated. These fences will last twice as long as those erected in 1899, and will be absolutely effective in keeping dogs out of the Park. Along the inside of each fence, close up to the wire, has been laid a permanent strip of rough paving, three feet wide, to serve two important purposes. It will prevent dogs of all sizes from digging under, and it affords a solid, never-muddy promenade for deer and other hoofed animals that love to walk to and fro close beside their fences.

The southern boundary fence, along 182d Street, was set on the top of the dry-rubble retaining wall which was built in improving the street—a work of much difficulty. This plan will be pursued along our western boundary.

During the coming year it is our intention to rebuild the western boundary fence, the fence along the Boston Road, the fence of the Axis Deer Range, and also that along Pelham Avenue.

New Walks.—In addition to the very extensive fence-build-

ing programme carried out in 1905, work of equal magnitude and importance was performed in the building of new walks and the thorough reconstruction of old walks. The most important items of this work must be mentioned.

From the new entrance at West Farms two new walks were constructed. One leads westward between the southern border plantation and the new Fallow Deer Range to the south door of the Antelope House. The other runs northward along the ridge forming the eastern edge of the buffaloes' plateau to the foot of the steps below the Lydig Memorial Arch. A third new line —known as the "Jungle Walk"—leads from a point near the lower end of the Beaver Pond, northward through the beautiful wooded valley, to the shore of Lake Agassiz. From thence it follows the south bank of the lake and river, past the falls, to the Bronxdale Entrance. This opens up a new section, and will soon render available for use the entrance on the Boston Road, near the bridge.

Owing to the density of the forest traversed by the greater portion of this walk, and the great damage to the trees that would have resulted from any attempt to lay Telford macadam, that portion of the walk was built of planks that had been soaked in creosote, and set on red-cedar posts. This work was accomplished without once driving a team into the thick forest, and without jeopardizing the life of a single tree. This improvement consumed 36,000 feet of spruce lumber and 5,000 feet of red-cedar posts.

The portion of this walk which lies alongside the lake and river was constructed of macadam, for which it was necessary to build on the river side a massive retaining wall, and erect upon it an iron guard rail. On account of the failure of the Brown & Fleming Contracting Company to fulfil their contract for furnishing stone and screenings, the macadamized portion of this walk, and the surfaces of other walks also, could not be finished during the year.

The total area of new walks built during the year 1905 was 66,050 square feet, or an average of 4,128 lineal feet of walk, 16 feet wide. The lines were as follows:

Jungle Walk,—Beaver Pond to Northeast Entrance.
Buffalo Ridge Walk,—West Farms Entrance to Lydig Arch Steps.
Grant's Walk,—West Farms Entrance to Antelope House.
Asiatic Deer Walk,—Aquatic Bird House, westward.

Axis of Audubon Court to Antelope House.
From Wolf and Fox Dens through Shelter Pavilion.

To the above should be added the Telford macadam paving, with tar surface, constructed on Baird Court, from the cross axis northward to the line of the contract work on the northern wall.

Reconstruction of Walks.—The rebuilding of the cheaply made walks that were constructed by a contractor in 1899 was very nearly brought to a finish. All these old walks have been torn up, regraded, provided with side drainage, gutters, and catch-basins, and rebuilt in the most substantial and permanent manner. The total area of the walks thus rebuilt amounts to 55,400 square feet, the drainage of which required 3,100 feet of vitrified sewer pipe.

Tar Surface.—The new process worked out in 1904 by Mr. Merkel for coating the surface of Telford macadam with tar proved so satisfactory that it was employed to the utmost extent on the walks made last year. The total area of walks made in 1905 was so great that it was impossible to treat all of it with tar, but, nevertheless, two tarring outfits were kept constantly at work, and a considerable area was covered. It is our intention to continue this process until nearly all our macadam walks have by it been rendered permanently dry, smooth, and free from quantities of dust.

Already our process is being studied by the officers of other parks, with a view to adopting it.

Guard Rails and Wires.—The work of erecting permanent guard wires along all walks was continued. During the year 15,650 lineal feet (three miles) were erected. In addition to this nearly a mile of wooden railing, chiefly rustic red cedar, was erected along the Boston Road, the eastern side of Baird Court, and along the walk east of the Bronx.

Drinking Fountain.—To meet the wants of the crowds of visitors that now frequent that portion of the Zoological Park which is situated east of Bronx Lake, a bronze drinking fountain was erected near De Lancey's Pine. This work was completed in time to be of use during the summer months; and in this connection it serves as a reminder that other drinking fountains must soon be erected in other portions of our grounds.

Tortoise Yards.—The eastern room of the Reptile House has at last been given up to the dry-land tortoises, iguanas, monitors, etc., as originally planned. At last the ground outside the build-

ing has been converted into open-air yards, covered with sand, and provided with bathing pools. In the latter part of the summer these yards were occupied by their reptilian inhabitants, and proved of great benefit to them. A small amount of additional work will render the Tortoise Room accessible to winter visitors from the main hall, for in winter the end doors must remain permanently closed. To save the roots of several large and valuable oaks, the walk along the eastern front of the Tortoise Yards was made of wood.

Miscellaneous Ground Improvements.—Under this head a great number of small items of work were performed. The most noteworthy was for the purpose of promoting both economy and speed in certain lines of our work, and had for its direct object the substitution of power and machinery for hand work.

In the Service Yard, in close proximity to the original plant of shops, a cheap wooden shed was erected to afford working space for machinery of various kinds driven by electric power. The floor space afforded amounts to 1,600 square feet, upon which have been installed about ten different machines, such as are in almost daily use in our work. It is the opinion of Mr. Merkel that the total cost of this installation will be saved in a single year. In addition to iron-working, and wood- and wire-working machinery, all our hay is cut by power in a separate room of this shed. To this shed the carpenter shop has been transferred.

CONTRACT WORK IN GROUND IMPROVEMENTS.

Conducted under the direction of the Park Department for the Borough of the Bronx. Martin Schenck, Chief Engineer; W. P. Hennessy, Ass't Engineer.

Two important contracts of 1904 were completed in 1905.

The Large Bird House.—This important structure, erected by the George L. Walker Company at a total cost of $118,931.75 (without the Glass Court), was completed and accepted in June, and opened to the public on July 4th. It was fully described in Zoological Society Bulletin No. 18.

The Pheasant Aviary.—This very attractive installation was completed by Conrad Hewitt at a total cost of $21,021.35 in September, 1905. Without delay it was partially filled with a good collection of pheasants, but it was too late in the year to introduce the pigeons and doves, and the shrubbery and vines that will abundantly adorn the interiors of the runways. This Aviary is 240 feet long, and contains 54 compartments for birds. The two end pavilions are provided with stoves, and their

cages are intended for birds that require moderate heat in cold weather.

Contracts Let in 1905.—The following is a list of the contracts let in 1905 and the amount of each, exclusive of architects' commissions and extras:

Baird Court (western wall, north wall, steps, and balustrades), John V. Schaefer Company	$67,000.00
Camel House, Peter Kiernan	2,800.00
Feed Barn, William H. Wright & Son	15,316.00
Glass Court (Bird House), George L. Walker Company	24,199.00
Small-Deer House, Guidone & Galardi	41,543.00
2 Toilet Buildings, east of Bronx, Guidone & Galardi	8,385.00
Public Comfort Building near West Farms, J. J. Buckley	19,200.00
Entrance Pavillion at West Farms, William Horne & Company	5,008.00
Steps at Bear Dens, John Fury	1,569.00
Furnishing Broken Stone and Screenings, Brown & Fleming Company	7,437.50
Cement, John P. Kane & Company	933.75
Sewer Pipe, August Bans	333.72

Of the above contracts, three were completed in 1905. These were the Camel House, the granite steps, and the two toilet buildings east of the Bronx River. The contract for the walls and steps of Baird Court is being pushed as rapidly as the weather will permit, and in all probability will be completed by June 1, 1906. The contract for the Small-Deer House was let so late in the year it was deemed inadvisable for work upon it to begin until the spring of 1906.

New Entrance.—In order to meet the demand of the greatly increased attendance to be expected from the new Subway terminus at West Farms, the Zoological Society decided to establish a new entrance at the intersection of the Boston Road and 182d Street. This undertaking—which is of great importance to the visiting public—came to the Society as a new necessity, and involved an important departure in the expenditure of funds. The purpose of this entrance is to afford the public a more direct approach into the centre of the Park from the new Subway terminus, and it rendered necessary the construction of two important lines of walk—as already described.

MAINTENANCE.

Hermann W. Merkel, Chief Forester; E. H. Costain, Assistant Forester and Captain-of-the-Watch.

Henceforth we may expect an increase in the cost of maintaining our many buildings in a proper condition. While all of them are yet comparatively new, it must be remembered that very few public buildings are subject to a strain of daily use as severe as that which falls upon the animal buildings in our Park. The high temperature necessary for the comfort of some of the living creatures, the wear and tear caused by the great multitude of visitors, the constant disinfecting and scrubbing of cages and floors, and the great humidity of the interiors generally, all tend to disintegrate even buildings of the highest class.

The "hurry" calls on the construction force, because of the fact that some beast is trying to get itself or others into trouble by destroying its "environment," or by attacking its nearest neighbors, have become more frequent than ever.

Last year the entire floor of the Reptile House became so deeply worn by the feet of visitors that it required a new surface of concrete. The replastering of the interior walls of the larger serpent cages was carried to completion, and the hot-water supply system was given a thorough overhauling. The entire hardwood finish in this building received several coats of varnish. The slate and also the glass roofs received a much-needed overhauling; and a new copper gutter, with leaders, was installed along the north side of the building.

At the Aquatic Bird House the hot-water heating boiler was taken apart, and four old sections replaced with new ones. The copper roof, which had become very leaky, was repaired, and new leaders were supplied. The outside cages of this building received a thorough overhauling. The landscape background of the inside cage was very successfully repainted by Mr. E. A. Costain, and the entire interior and exterior of this building was overhauled and repainted.

At the Lion House the cage gutters were relined with sheet lead sunk into the cage flooring, and steel plates were put in place at the feeding doors. Some repairs were also made to the cage floors. The entire cage-work, inside and out, was scraped free from rust and given two coats of paint. The studio, feed-room, women's rest room, and the artists' room were all painted and varnished. Extra heating pipes were supplied in the toilet

rooms in the basement, and the plumbing in these rooms was overhauled.

At the Primates' House extensive repairs were made to the cage gutters; and the entire cage-work was repaired and painted. The plastered ceiling, which had become very unsightly, and all woodwork in this building, were painted or varnished. One of the large ape cages was supplied with a new barred front, replacing the wire-netting front which had become too weak for the strength and intelligence of the chimpanzee within.

The repairs necessary at the Antelope House were fewer and of less importance than at any other of the large buildings; but the entire yard fences received two coats of paint.

At the Restaurant the usual number of repairs were necessary to the plumbing. The kitchen, both pavilions, three rooms in the upper story, and the toilets were painted and varnished. A room for the manufacture of ice-cream and syrups was fitted up in the cellar of the Service Building, and a great many minor changes and repairs were made. All the entrance pavilions received their annual cleaning and varnishing.

Of the outside dens and aviaries, the Bear Dens received the most attention. The lower portions of all the partitions of the four older dens were removed, and replaced with strong, close, bar panels, and one great source of anxiety was thereby eliminated. All the Bear Dens, new and old, were scraped free from rust, and given three coats of paint. A new and stronger partition was erected in the Puma cages. The partition fences of the Ducks' Aviary were strengthened and repaired. Other installation fences which received a thorough scraping and painting were as follows:

Mammal Pond Fence.
Prairie-Dog Village.
Ducks' Aviary.
Beaver Pond Fence.
Raccoon Tree.
Crocodile Pool.
Soda Pavilions.
Otter Pools.
Sea Lion Pools.
And nearly all the guard rails and wires.

The usual amounts of vegetables and live-stock were raised at the Nursery. The quantities raised at the Farm were rather in excess of those of any previous year. The totals were as follows:

GROWN AT THE FARM.

25 Tons Carrots.
34 Tons Other Root Crops.
35 Tons Hay.
50 Barrels Potatoes.
111 Bushels of Field Corn.
1,600 Ears of Sweet Corn.
And a great quantity of millet.
5,000 Heads of Cabbage.

PRODUCED AT THE NURSERY.

781 Guinea-pigs.
439 Rabbits.
475 Rats and Mice.
150 Pigeons.
5 Colonies of Bees.
3,100 Chickens.
910 dozen Eggs.
10,000 Mealworms.
450 pounds Honey.
In addition to this about 30 colonies of bees were presented by the Park Department.

The chief items of vegetables raised at the Nursery were 23 tons of carrots, mangels, beets, and other root crops; about 8,000 heads of lettuce, 15,000 roots of celery, 63 bushels of tomatoes, and a great variety of other vegetables.

Besides storing and recuperating numerous large plants, the greenhouses produced about 11,500 bedding plants, ferns, and various flowering or ornamental greenhouse plants. Besides this, 2,500 trees and shrubs and great quantities of perennials were raised.

Tent Caterpillars.—In 1905 the tent caterpillars became very troublesome. They multiplied to an alarming extent, and without delay a force was equipped for removing their nests, or "tents," and destroying them. The total number of nests destroyed was 40,300.

Large Forest Trees.—Our efforts to prolong the lives of the large forest trees of the Park have steadily progressed. All trees that are important, either on account of their size or their kind, have been inspected, and as many as possible have received the attention that their condition demanded. But the number in need of attention has constantly been so great that it has been impossible to provide the very considerable sum that needs to be expended each year upon the work of tree preservation.

DEPARTMENT OF ADMINISTRATION.

H. Raymond Mitchell, Chief Clerk; William I. Mitchell, Assistant.

During the year 1905 the work of the Chief Clerk increased in direct proportion to the general development of the Park. The volume of business done by the privileges, and the profits realized therefrom, was the greatest of any year thus far, and the amount turned into the Animal Fund was highly gratifying. With the increased facilities which the Society proposes to furnish this department, its operations will be further increased.

During the year 1905, several much needed improvements were made in the office of the Chief Clerk, which materially lessen the labor of handling the ever-increasing volume of clerical work.

Our single-wire telephone connection with the City became so overtaxed as to render it impossible to secure reasonably prompt service. Early in the year, therefore, a contract was made with the New York Telephone Company for two trunk wires, a switch-board, and five extensions. A telephone operator was engaged to handle this switch-board, and also that of the 22 stations on our own Park system, all of which has resulted in placing our telephone service on a more satisfactory basis.

Rocking Stone Restaurant.—The season just closed has been the most successful in the history of the restaurant. Increased business made it possible to inaugurate the complete checking system which had long been contemplated. The net profits for the season amounted to $1,616.09.

Soda Water.—Heretofore the ice-cream used in connection with this privilege, and also the supply to the restaurant, had been purchased from outside parties, but early in 1905 a complete plant for the manufacture of ice-cream was installed in the basement of the Service Building, at a total cost of about $1,000. This experiment has proven highly satisfactory, and a saving was made for the season sufficient to cover the entire cost of the plant. The total net profits for the year amounted to nearly $3,000.

Riding Animals.—Such additions were made in the riding animal equipment as their popularity demanded. In 1904 the profits of this privilege for the season were $766.52, while for the past season they amounted to $1,433.12.

Souvenir Postal Cards.—The method of handling souvenir postal cards was completely revised. Instead of selling them singly as heretofore, they were sold only in sets, costing 10 cents and 25 cents. This caused a large increase in sales. The net

revenue for the year was $760.77, as against $439.13 for the previous year.

Guide Book.—The "Guide to the Park" continues to maintain its uniformly large sale. The Giraffe Edition of 15,000, which was placed on sale in July, 1904, is now practically exhausted. The net profits for 1905 amounted to $1,119.47.

Souvenir Books.—A new edition of 3,000 copies of the small Book of Views was published in May, as well as a small edition of a larger book to sell at 50 cents and $1.00. The profits realized on the above for the year amounted to $260.46.

Gate Receipts.—The following statement of gate receipts by years since the opening of the Park is submitted as an interesting exhibit of increasing attendance on closed days:

Year.	Gate Receipts.
1900	$1,869.35
1901	2,998.80
1902	4,256.50
1903	5,912.95
1904	5,421.90
1905	6,849.00

Boat House.—It had been hoped that the contract for the erection of the Boat House would be let sufficiently early in 1905 to have the building for use this season; but, unfortunately, numerous delays have been encountered. It is now confidently expected that work on the building will begin early in 1906, and be completed some time during the summer of 1906. When properly developed the boating privilege will, we feel certain, prove to be one of our greatest revenue-producers for the Animal Fund, as well as an important source of pleasure and recreation for visitors.

Feed Barn.—From the very beginning one of the urgent needs of this department has been a barn in which large quantities of hoofed-animal food could be stored without loss. With the facilities which will be afforded by the new Feed Barn now under construction, it will often be possible to take advantage of market conditions in the purchase of food supplies with considerable saving to our Maintenance Account.

CIVIL ENGINEERING.

George M. Beerbower, Civil Engineer.

As may readily be inferred from the great amount of construction work performed in the Park during the past year, the Soci-

ety's Civil Engineer has been unusually active. In addition to his routine duties of surveying and platting building sites, new walks, fence lines, and other improvements, Mr. Beerbower designed and prepared complete plans and specifications for three items of contract work. These were the Feed Barn, situated near the Service Building, two Public Comfort Buildings on the eastern side of Bronx Lake, and the granite steps, with bronze guard rails, near the Bear Dens. The Public Comfort Buildings and the granite steps were completed in December, and accepted for use. The brick walls of the Feed Barn are now up to the third story, and it is possible that the building will be completed by June 1, 1906.

The entrance turnstiles of the Zoological Park always have been seriously lacking in mechanical perfection, and always have been unsatisfactory. To remedy this condition, at least for the new Boston Road Entrance, Mr. Beerbower invented a turnstile which it is believed will give satisfactory results, and eliminate all the objectionable features of the machines now in use.

PHOTOGRAPHY AND PUBLICATIONS.

Elwin R. Sanborn, Photographer and Assistant Editor.

The work of photographing and preserving permanent records of the important mammals, birds, and reptiles of the Zoological Park has been diligently pursued. The Society's collection of negatives of wild-animal subjects is probably unsurpassed, and the value of this material is now recognized by many publishers. The Society permits the use of its photographs in books and periodicals upon payment of a nominal price for the right of reproduction, and the number called for is rapidly increasing. The system under which animal photographs now go out from the Park generally insures the publication of pictures which are a credit to the Society, and to the animals depicted.

In addition to his regular duties in the Park Mr. Sanborn has spent some time in photographing at the Aquarium, and has secured there some excellent results in the photographing of fishes.

In order to improve the old method of procuring photographic prints, and eliminate the risk involved in sending valuable negatives down town, Mr. Paul Hedrick was permanently engaged by the Society to assist Mr. Sanborn with the numerous details of his department. It should be noted that the entire cost of the department of photography and publications is borne by the Zoological Society from its income account.

ACKNOWLEDGMENTS.

It is both a duty and a pleasure to acknowledge once more the cordial and helpful coöperation of the chief officers of the Park Department for Bronx Borough in all the affairs of the Zoological Park in which it was possible for them to render assistance. The many important matters to be acted upon by the Park Commissioner, by Chief-Engineer Schenck, Assistant-Engineer Hennessy, and Chief Clerk Ackerman always received the most prompt and careful attention, and by those officers the interests of the Zoological Park were promoted to the utmost extent.

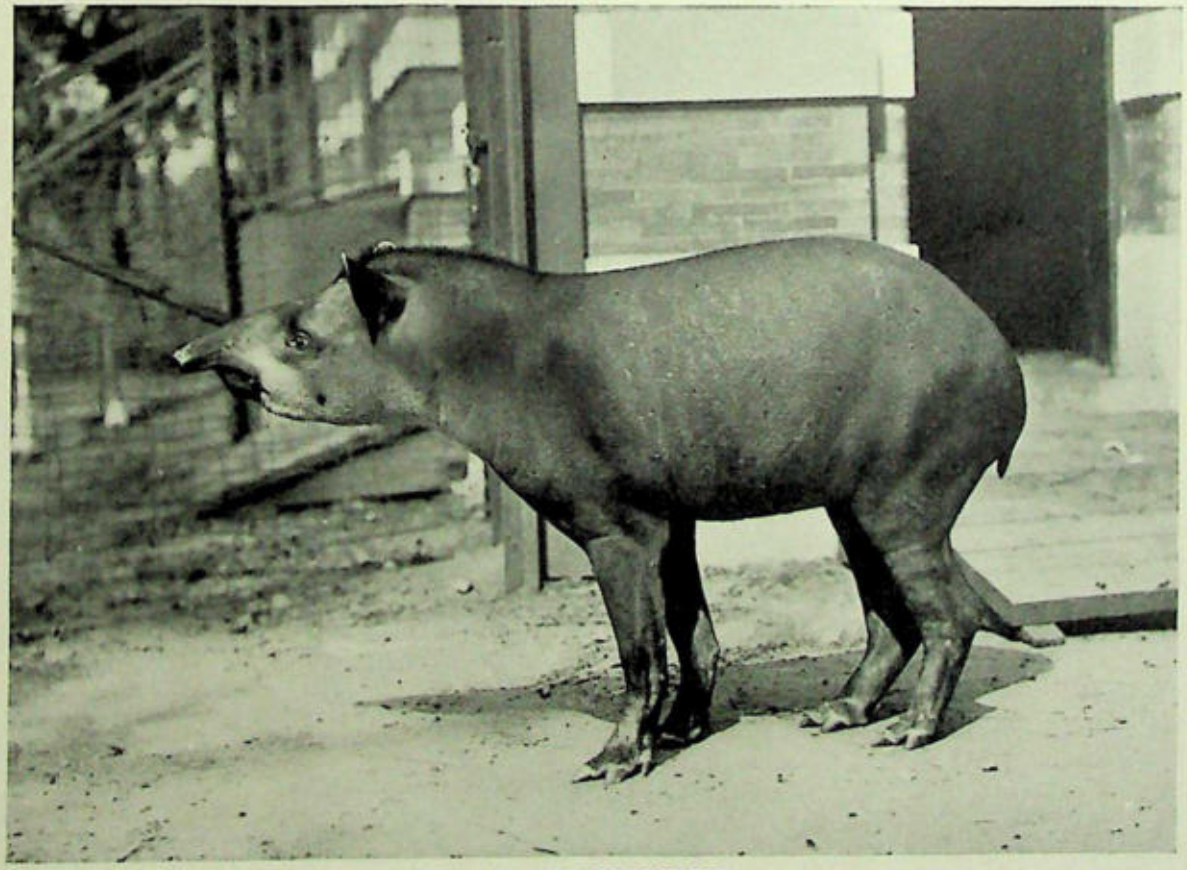
To each of the Zoological Park officers, and to the more than one hundred other members of the Zoological Park force, the director feels deeply indebted for the interest which they have taken in their individual work, and in promoting the interest of the Park as a whole. Any success which thus far has been attained in meeting the expectations of the Zoological Society, the Officers of the City of New York, and the general public has been due to the interest which each officer has manifested in his work, and the spirit of right-doing which he has inspired in those under him. Although the discipline of the force as a whole must necessarily be strict in order to attain a high degree of general excellence, everything that it is possible to give in return for faithful services is freely offered.

The merit system is rigidly maintained, and, as it stands to-day, the Zoological Park force is the result of the two great natural laws of special selection and the survival of the fittest.

Respectfully submitted,

WILLIAM T. HORNADAY,
Director.

January 1, 1906.



SOUTH AMERICAN TAPIR

UNGULATES IN THE ZOOLOGICAL PARK.

By WILLIAM T. HORNADAY.

THE forming of a collection which shall fairly represent the hoofed animals of the world is, necessarily, a work of years. It is now seven years since the Zoological Society entered upon this task, and during that period the work of providing installations and procuring living specimens has been pursued with unflagging industry. The story of our successes and failures is too long for recital here, and may well occupy a special volume, which might be helpful as well as entertaining.

It should be stated, however, that almost without exception thus far our only failures with hoofed animals have been caused by our own native species. Regarding their successful transplantation, much remains to be discovered. Although for a time we have confessed ourselves beaten by the moose, caribou, and black-tailed deer, we shall presently renew our experiments, with less of construction work to occupy our time and thoughts, and with more conditions in our favor.

In no feature of development has the Zoological Society been more liberal than in the purchase of hoofed animals for our Ungulate collections. The majority of our smaller specimens have been purchased from the general Animal Fund of the Society, but nearly all the largest and rarest specimens have been specially presented by individual members of the Society. In the accompanying lists the most important gifts are credited to their sources.

It is only under exceptional circumstances that we consider it either justifiable or interesting to publish lists of species. Now, however, the Society's Ungulate collections have reached a degree of such zoological importance and interest that it seems desirable to enumerate the species composing it various groups. If we are found to be somewhat lacking in certain Families, notably the wild cattle, the true buffaloes and bison, and in wild equines, it is only because we have as yet no special installations for those animals.

The wild equines and bovines which we do not at present pos-

sess are, nearly all of them, species which cannot live through our severe northern winters without good shelter buildings, and some heat.

In enumerating our species by groups they will be taken up without strict reference to their zoological sequence, and with no burden of technical names.

DEER.

		GIFT OF	
Wapiti; American Elk,	Wyoming.	W. C. Whitney....	10
	Idaho.	Knox Taylor	1
Tashkent Wapiti,	Asia.	The Duke of Bedford	1
Altai Wapiti,	Asia.	Mrs. F. F. Thompson	2
Maral Deer,	Europe.		2
Red Deer,	Europe.	William Rockefeller.	11
Fallow Deer,	Europe.	William Rockefeller.	28
Axis Deer,	India.		12
Sika Deer,	Japan.		10
Sambar,	India.		7
Equine Deer,	Malay Penin.		5
Molucca Deer,	Molucca Is.	The Duke of Bedford	2
Barasinga Deer,	India.	William Rockefeller.	6
Burmese Thameng,	Burma.	William Rockefeller.	3
Muntjac,	India.		1
Virginia Deer,	United States.	Austin Corbin, Pres.	7
Florida Deer,	Florida.		2
Nelson's Mexican Deer,	Mexico.	Mrs. C. W. Beebe..	2
Mule Deer,	Colorado.		2
American Moose,	Maine.		1

While our collection of deer already contains good representatives of nearly all of the most important cervine groups many additions must be made, and with as little delay as possible. Although we have for years exhibited caribou, and last year were in possession of two species of South American deer—one being the very curious *Cervus paludosus*—it is our misfortune to have none of those at this date. To our present stock of deer we expect to add about 20 foreign species. But it is not our purpose to multiply forms that closely resemble each other. Of the foreign species to be added, several are known to be anything but hardy in captivity. All the South American deer, the brockets, and all the members of the Genus *Rangifer* (reindeer and caribou) are difficult to acclimatize anywhere outside of their natural ranges.

It was a great pleasure to receive during the past year three fine specimens of the Burmese Thameng, or Eld's Deer (*Cervus eldi*), captured in Burma especially for us on an order from Mr. William Rockefeller. The male of this species bears the largest antlers in proportion to the size of the animal of any deer we know. Our two pairs of Barasinga Deer bred in 1905 and have reared two fine, vigorous fawns. A fawn was born to the pair of Altai Wapiti, but died almost immediately.

In the autumn of 1905 the Duke of Bedford presented to the Society a splendid, large-sized, full-grown male Tashkent Wapiti from his matchless collection at Woburn Park, and it arrived in fine condition. It is shown beside its near relative, the Altai Wapiti. We greatly desire representatives of the deer found on the Philippine Islands, but the long-existing embargo on the importation of any Philippine mammals has prevented the importation of even one specimen.

During the fall and winter months our deer are a source of constant anxiety and no little vexation. As a rule, the does harass the stags so long as the antlers of the latter are in velvet; but as soon as the new antlers are ready for use the tables are quickly turned. Then the females must be protected from the males, and males that are particularly aggressive require to be isolated.

ANTELOPE.

		GIFT OF	
Eland, male,	Africa.	George F. Baker.....	2
female,	Africa.	C. Ledyard Blair.....	
Baker's Roan Antelope,	Africa.	George C. Clark.....	2
		Mrs. Frederic Ferris Thompson	
Leucoryx Antelope,	Africa.	Mrs. Frederic Ferris Thompson,	3
		Charles T. Barney,	
Addax Antelope,	Africa.	Mrs. Frederic Ferris Thompson	1
Kudu,	Africa.	C. Ledyard Blair....	1
Beatrix Antelope,	Arabia.	Mrs. Frederic Ferris Thompson	1
Sing-Sing Antelope,		Mrs. F. F. Thompson	1
White-Bearded Gnu,	Africa.		2
White-Tailed Gnu,	Africa.		1
Reedbuck,	Africa.		1

Indian Antelope,	India.	3
Nilgai,	India.	2
Four-Horned Antelope,	India.	1
Dorcas Gazelle,	Arabia.	2
Indian Gazelle,	India.	1
Prong-Horned Antelope,	Colorado.	2

As a representative collection, standing for the antelopes of the world, the series enumerated above is one which requires neither apology nor explanation. While it is our intention to add, as soon as practicable, specimens of the Sable Antelope and some of the Hartebeests, the crowded condition of the Antelope House will not permit of this until the completion of the Small-Deer House enables us to remove all the gazelles and very small antelopes. As our collection stands to-day, it is believed to be equal to the best of such collections that are to be found elsewhere on exhibition.

In this series a notable accession has recently arrived, a gift from a member of the Board of Managers, Mr. C. Ledyard Blair. A fine female Eland, about two years old, arrived in December from South Africa.

Among the African antelopes generally the death-rate has been very low. To the pair of Leucoryx antelopes a fine fawn was born on December 29, 1905, and it has thriven most satisfactorily. Other births in the Antelope House are expected very shortly. The spacious yards attached to the Antelope House are of great benefit to the animals, and in mild weather are in constant use.

WILD SHEEP AND GOATS, AND THEIR ALLIES.

		GIFT OF	
White Mountain Goat,	British Columbia,	John M. Phillips,	5
Chamois,	Europe.		1
Suleiman Markhor,	India.		2
Persian Wild Goat,	S. Europe.		3
Himalayan Tahr,	India.		3
Rocky Mountain Sheep,	British Columbia.		1
Mouflon,	Sardinia.	Maurice Egerton	3
Punjab Wild Sheep,	India.		3
Aoudad; Barbary Sheep,	Africa.		2

This very interesting collection is maintained alive and in health solely by reason of the fact that we constantly hold ourselves in

readiness to make promptly any change in "environment" which the condition of any animal may seem to demand. A hard-and-fast rule to maintain this collection fixedly in any one place, either outdoors or indoors, would result in numerous fatalities. The individual whims of the animals are met with unlimited patience and effort on the part of all who are concerned in their care. Some of these animals can live throughout the winter on Mountain Sheep Hill, but others require housing indoors during the period of cold weather. The only fixed rule is to leave each animal out until it is plainly evident that it needs to be taken indoors. For example, in December one Markhor suffered so constantly from the cold it required to be taken in for the winter, but the other is living out in perfect comfort. Some of the Punjab Mountain sheep can live out; others cannot. Our Mountain Goats did not do well on Mountain Sheep Hill, so we have quartered them in the old Prong-Horned Antelope corral, near the Southwest Entrance.

Attention is specially called to the lusty little flock of White Mountain Goats. We believe that our present number (five) is the largest ever assembled anywhere for exhibition.

MISCELLANEOUS UNGULATES.

		GIFT OF	
Giraffe,	North Africa.	Samuel Thorne...	2
American Bison,	United States.	Wm. C. Whitney.	32
European Bison,	S.-E. Germany.	Norman James, Charles Sheldon, and Dr. Leonard Sanford.	2
Anoa: Pygmy Buffalo,	Celebes Islands.		2
Bactrian Camel,	Asia.	Capt. John S. Barnes	2
Llama,	South America.	Robert S. Brewster	4
Vicunia,	South America.	Robert S. Brewster	3
Guanaco,	South America.	Robert S. Brewster	1
Alpaca,	South America.	Robert S. Brewster	2
Grant's Zebra,	Africa.		2
Chapman's Zebra,	Africa.		2
Persian Wild Ass,	Persia.		1

		GIFT OF	
Prjevalsky Wild Horse,	Mongolia.		2
Red River-Hog,	Africa.		1
Collared Peccary,	Texas.		1
Indian Elephant,	India.	Colonel Oliver H. Payne	1
West African Elephant,	Africa.	Chas. T. Barney.	1
American Tapir,	South America.		1

SUMMARY BY GROUPS.

Deer	19	species.	116	specimens.
Antelopes	16	"	26	"
Wild Sheep, Goats, etc..	9	"	23	"
Giraffes	1	"	2	"
Bison, etc.	3	"	36	"
Camels and Cameloids...	5	"	12	"
Wild Equines	4	"	7	"
Elephants and Tapirs ..	3	"	3	"
Wild Swine	2	"	2	"
	62	"	227	"

Among the additions to the Ungulate collection during 1905 the West African Elephant (*Elephas cyclotis*) unquestionably should stand first. Never before has a specimen of that species been seen in America, either alive or dead, and, strange to say, it is only a trifle less rare in Europe. The life history of this sharply defined species remains to be discovered. It is not yet definitely known what maximum size it attains, and its geographic range is partly a matter of speculation.

This interesting and valuable animal came to the Society (as the gift of Mr. Charles T. Barney, Chairman of the Executive Committee) solely through the policy of always keeping our net spread for zoological prizes, and closing bargains on a moment's notice.

Our giraffes continue in perfect health and are growing rapidly. Since their arrival in November, 1903, neither has been ill for even one day. Unquestionably they enjoy life, and take a keen interest in everything that transpires in their small world. Since their arrival the male has grown 2 feet 11 inches, and the female 1 foot 11 inches. On November 4, 1905, the male was 13 feet 6 inches high, and the female 12 feet. It may fairly be expected that the pair will breed shortly.

Our herds of bison and elk are in the best condition they ever were; and this is due solely to the fact that for the past 18 months they have been entirely prohibited from grazing on the grass of their large ranges. It is now settled beyond doubt that to all our American hoofed animals the old grasses growing in the ranges are of as deadly effect as if they were really poisonous.

At last the whole of the Llama House is occupied by the collection of cameloids presented by Mr. Robert S. Brewster, and that collection is now at its best. Two llamas and a vicunia were born in 1905, and have developed well.

Our fine three-year-old Moose is quartered in the corral adjoining the Llama House on the north.

An installation for wild horses, asses, and zebras is greatly needed, and no doubt will be provided at an early date. Another is needed for the tropical buffaloes, bison, and wild cattle which should be added to our collection; and this, also, will in all probability be provided in 1907.



SPRAYING A TREE INFECTED WITH FUNGUS.
The tree has been extensively pruned.



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The tree has been extensively pruned.

A DEADLY FUNGUS ON THE AMERICAN CHESTNUT.

By HERMANN W. MERKEL,
CHIEF FORESTER AND CONSTRUCTOR.

DURING the past year an epidemic of a fungus disease has occurred throughout the parks of this Borough, which, but for the fact that it was confined to a single species of tree, might have overshadowed in deadliness and rapid spread all the other enemies of tree life.

This disease was first noticed in the New York Zoological Park, in a few scattered cases which occurred during the summer of 1904. Since that time, however, it has spread to such an extent that to-day it is no exaggeration to say that 98 per cent of all the chestnut trees in the parks of this Borough are infected. The spread of this disease is so sudden that unless some radical measures are taken, or a natural enemy of this fungus develops, it is safe to predict that not a live specimen of the American Chestnut (*Castanea dentata*) will be found two years hence in the neighborhood of the Zoological Park.

This fungus attacks the live and apparently sound bark of twigs, branches, and limbs. The age and thickness of the bark present no obstacle, nor does the fungus seem to have any preference for susceptible points, such as crotches and eyes.

To the casual observer the first visible sign that the disease has fastened itself upon the tree is the wilting of a portion of foliage for no apparent reason. This may occur at any time during the growing season. Upon closer examination there will be found a ring of dry bark completely encircling the base of the wilted member, and in a short time the spore bearers of the fungus will be scattered thickly over the entire surface of the dry bark. These spore bearers are about the size of a pinhead, and at first are of the color of raw sienna, turning a dark umber with age. The width of this wilted ring on the bark may be anywhere from 1 inch on a small branch to 3 or 4 feet on a larger limb.

As far as may be inferred from the many cases under obser-

vation, the field of the disease fails to enlarge appreciably after the flow of sap ceases in the portion above the point of attack.



A HEALTHY SPECIMEN OF THE CHESTNUT.
This is the tree which the foresters are spraying.

The spore bearers do not appear upon any bark except that which was affected at the time of the death of the member.

In one case which was under close observation from the time that the first dry speck appeared until the ringing and killing

off of the branch, it took 21 days for the fungus to do its deadly work. This case was on a branch about 4 inches in circumference.



CHESTNUT TREE SHOWN ON OPPOSITE PAGE.
The light spots on the foliage indicate the appearance of Fungus.

Apparently the physical condition of the tree has no bearing upon the ability of the fungus to attack it. The disease was noticed with equal frequency upon young specimens in the nursery, upon sprouts that had sprung from stumps of trees cut

down the previous year, upon young and vigorous trees 30 to 40 feet high, standing in deep rich soil, and also upon the few survivors of the primeval forest with trunks 10 to 12 feet in circum-



ALL THAT REMAINS OF A ONCE FINE TREE

ference. A vigorous tree upon which branches and limbs have been attacked and killed early in the season will often throw out new branches from adventitious buds immediately below the dead portion, which, in spite of their great vigor, will be soon attacked

and killed. This, and the fact that all stages of the disease may be observed at any given time during the growing season, and also some experiments made by Dr. Murrill, of the New York Botanical Gardens, with cultures made from material furnished by us, would show that no period of rest is necessary, but that the spores are able to begin a new cycle of growth immediately upon ripening. This of course tends to increase the virulence of the disease.

Early last June this disease was noticed on so many widely scattered trees of all sizes that specimen branches and an appeal for information were sent to the United States Department of Agriculture at Washington. The mycologist of the Bureau of Plant Industry—Mrs. Flora W. Patterson—identified this specimen as being a fungus of the Genus *Cytospora*, and stated that no species of this genus had been reported as being injurious to chestnuts, and apparently the fungus was a true parasite. From the specimen received it would seem that no mechanical injury to the bark was necessary to enable the fungus to gain admittance to the live plant cells of the branch. The cutting out and immediate burning of all affected branches and limbs, and the spraying of all the trees with Bordeaux Mixture, were recommended.

The sum of $2,000 was therefore asked for with which to begin operations, and upon its appropriation a force of experienced tree pruners was immediately set to work. From the start it was realized that work of some magnitude was at hand, and operations were therefore pushed with the utmost energy. The number of trees out of which all diseased material was cut was 438. Of a number of these trees only the bare trunk remains, it being necessary to cut away everything else.

In the meantime steps were taken to procure a power-spraying machine, and after much consideration the Niagara Gas Spraying Company's outfit was decided upon as being the lightest, most effective, and most simple machine on the market. Its cost is $175.

This machine consists of a 150-gallon tank and an 8-foot tower, both of steel, mounted on a platform truck which is provided with wide wheels. The power for spraying is derived from a series of steel tubes containing commercial carbonic-acid gas under a pressure of about 1,200 pounds to the square inch. Through suitable fittings these tubes are connected with the tank containing the spraying liquid, and the supply is governed by a valve wherewith to regulate the pressure upon the liquid. Usually the pressure is about 125 pounds to the square inch. Before

entering the leads of hose, of which any reasonable number may be attached, the spraying mixture runs through a fine brass sieve, which removes all insoluble matter which might clog the nozzles. By the turn of a valve stem this sieve may instantly be cleaned of all matter deposited thereon.

From the fact that there is no heavy engine to be transported from place to place, and from the absolute simplicity of this outfit, which has but few working parts, and practically nothing to get out of order, many trees in a dense forest, otherwise inaccessible, can be reached.

By some simple experiments it was found that a very strong solution of copper sulphate could be used without injury to the foliage. It was therefore determined to use what is commonly called "potato strength," or 4 pounds of copper sulphate to 10 gallons of water. The acidity or non-acidity of the mixture was always determined by the simple ferrocyanide of potash test. A stock solution of this was always kept on hand, so that no time would be lost in recharging the tank on the spraying machine.

It was found that on an average a 150-gallon tank would spray three large trees. Later on, however, as the men became more proficient in handling the nozzles, this number was increased. On account of the size of the trees only two leads of hose were used. It was found necessary to have but two men to do the spraying, one to go to the highest portion of the tree and one to work upon the lower portion, either from the tower of the outfit or from short ladders. The driver helped in moving the ladders, agitated the mixture, and regulated the gas pressure in the tank. With this number of men it was possible to spray an average of four trees per day.

The spraying of very large forest trees is of course vastly more expensive and is a slower and more dangerous task than spraying ordinary orchard trees, which in nearly all cases could be reached from the ground or from the tower platform. One great advantage of the Bordeaux Mixture over the copper sulphate solution is that in spraying large trees whereon a limb may be easily overlooked, its pale blue color shows exactly what part has been sprayed.

It was impossible to go over our trees more than once during the past season. Just how far we have checked the progress of the disease is a matter of conjecture until the growing season reveals the facts. Considering, however, the ease with which the spores may be transferred by the action of the wind or by squirrels, birds, and insects from an affected tree to another

which may have been sprayed only a few weeks previously, it is much to be feared that no permanent results will be achieved except by concerted action on the part of all of the Park authorities in this Borough.

Dr. Murrill, the mycologist of the New York Botanical Gardens, will no doubt publish the results of his investigations into the life history of this fungus when they are complete. Information may also be expected from the mycologist of the Department of Agriculture at Washington. Upon the findings of these authorities further action may be based.



BLUE CRAB

REPORT OF THE DIRECTOR OF THE AQUARIUM TO THE BOARD OF MANAGERS

THE improvement and modernization of the Aquarium building and its equipment has been continued along the lines announced when the Society assumed control of the institution. During the year the work of constructing pipe galleries and installing new piping under the building was completed. Large filters for use in connection with the new system of stored sea-water were installed and a handsome iron vestibule was erected at the main entrance.

The installation of a new heating and ventilating plant has been commenced by the contractor.

The improvements which have been made to date from the special Improvement Fund have been carried on as steadily as could be done without inconvenience to visitors and without putting any of the lines of exhibition tanks out of use.

The actual operation of the new system of stored sea-water, toward which most of the improvements and alterations have been directed, has been reluctantly postponed owing to the neces-

sity of installing new boilers in the winter season and unavoidable delays connected with the lead-lining of iron pipes, which discolor the water.

It is expected, however, that the work of bringing the Aquarium up to date in equipment will soon be completed and the new water system be put in operation. Until this is done it will be impossible to exhibit the ocean forms of life, which the present obsolete brackish-water system renders impossible.

IMPROVEMENTS FROM THE MAINTENANCE FUND.

This fund has proved sufficient for the operating expenses of the Aquarium and has permitted of some minor improvements, among which may be mentioned alterations for the purpose of increasing light, the addition of numerous seats for the greater comfort of visitors, and the introduction of a bronze water heater to prevent the discoloration of water by iron rust. A moderate amount of painting and carpentry work and the introduction of large plants have increased the general attractiveness of the interior, which has been favorably commented upon by many visitors. No unfavorable comment has come to the notice of the Director.

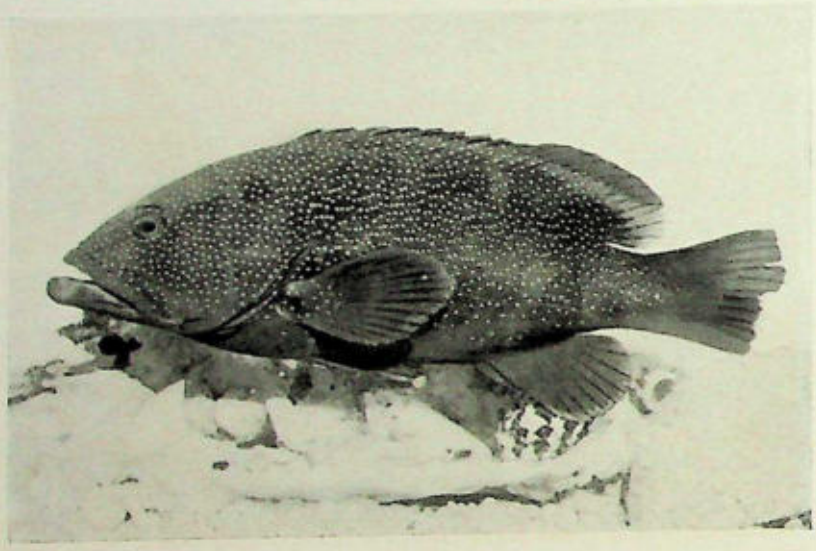
A new supply of rock has been secured for the purpose of placing additional rock-work backgrounds in the larger exhibition tanks.

The work of labelling the collections will soon be completed. The information presented on the labels has been pronounced by many visitors to be very full and satisfactory.

COLLECTIONS.

The exhibits in the Aquarium have not changed materially since last year. They have been varied to some extent, but as all tank space is constantly occupied, it is not possible to greatly increase the number and variety of specimens without rejecting good material. When fishes and other water animals are doing well in the limited space afforded by aquaria tanks, it is inadvisable to disturb the balance of conditions already giving good results.

The capture and transportation of fishes necessarily involve expense and loss of specimens. In the report for 1904 there was published a list of 213 different species of fishes and other aquatic vertebrates on exhibition during the year. About 150 of these are to be seen in the Aquarium at any time. The total number



CONEY

of specimens on exhibition on December 31, 1905, exclusive of invertebrates and young fishes in the hatchery troughs, was 2,435. No other aquarium maintains so large and varied a collection.

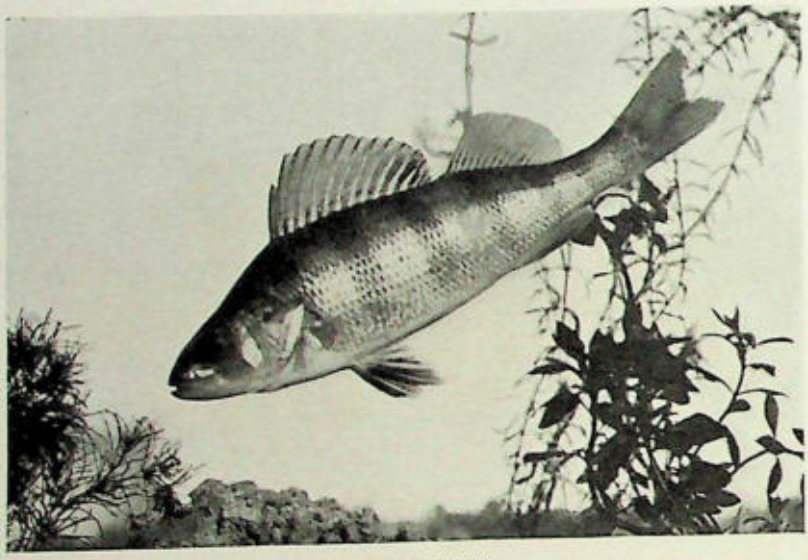
Exchanges of specimens were made during the year with the Aquarium in Detroit and the New England Fish and Game Association in Boston. Additions were made to the collection of tropical fishes from Bermuda.

The New York Forest, Fish, and Game Commission presented 15 albino lake trout. These were young specimens, all with the pink eyes peculiar to albinos.

Among the specimens received from Boston were 7 of the beautiful golden trout (*Salvelinus aureolus*) of Sunapee Lake, New Hampshire.

A green turtle, weighing 313 pounds, and a Florida crocodile 9 feet long were purchased and are doing well. The harp seals, harbor seals, and manatee were lost from pneumonia.

A porpoise—unfortunately injured in capture—was placed in the large central pool on August 4th, where it attracted a great deal of attention during the four days it lived in captivity. On June 26th a large green moray (*Lycodontis funebris*) from the Bermudas died after living in the Aquarium nearly six years. The specimen was 6 feet long and weighed 40 pounds. On November 11th a striped bass (*Roccus lineatus*) died after living in



YELLOW PERCH.

the Aquarium 11½ years. During this time it had grown from a length of 10 inches and a weight of ½ pound to 29¾ inches and a weight of 9¼ pounds. This fish was one of the very oldest residents of the Aquarium. On May 14, 1894, this specimen with 54 others of the same species was placed in one of the large floor pools, where 24 of the same lot still remain in good condition. It is hoped that these fine specimens will live to grow still larger. Another old resident, the large Mississippi catfish (*Leptops olivaris*), weighing 64 pounds, died April 25th, after living in the Aquarium five years. Its weight had increased about one-third in this time. These records are interesting as showing the growth and length of life of aquatic animals in captivity.

The Aquarium now has many species which have lived in the building from five to eleven years.

Specimens of aquatic animals lost during the year have been distributed to the American Museum of Natural History, the Museum of the Brooklyn Institute, the College of Physicians and Surgeons, and to the Laboratory of the University of Pennsylvania.

Excellent photographs have been made of most of the species living in the Aquarium. These are being published in the reports and bulletins of the Society, while many will be used to illustrate the Aquarium guide-book now in course of preparation.



ASTRANGIA AND *TUBULARIA*.

WORK OF THE COLLECTOR.

The Collector has brought in during the year over 100 different species of local fresh- and salt-water fishes and marine invertebrates, amounting to many thousands of specimens. Some of these were exchanged with other aquariums and great quantities of the smaller forms were used as food for the larger species on exhibition.

THE FISH HATCHERY.

The fish hatchery, which was added to the equipment of the Aquarium three years ago, was installed chiefly as an exhibit of the modern methods of fish-culture. It has proved not only interesting and instructive to visitors, but profitable to the Aquarium.

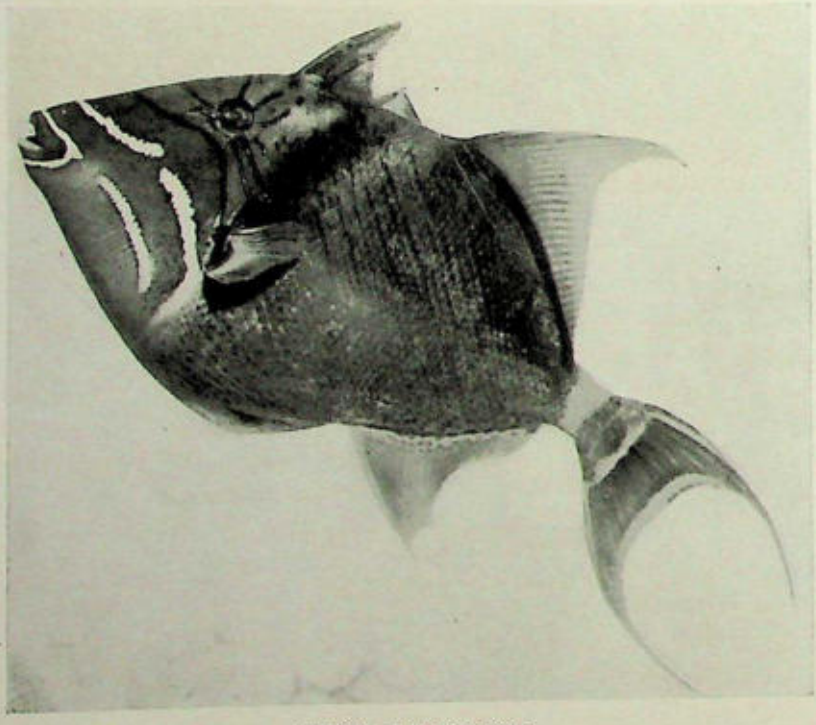
The eggs of fishes used in operating it have been supplied from the beginning by Government fish-cultural stations in different parts of the country, and the young fry turned out have been liberated in State waters through the coöperation of the New York Fish Commission.

A small proportion of each lot of young fishes has been reared in the Aquarium for exhibition, and the tanks now contain food and game fishes, varying in age from one to three years, which were hatched in the building from artificially fertilized eggs.

The hatchery is now kept in operation during the greater part of the year, being supplied in the summer season with the eggs of the Rocky Mountain trout, a species which spawns early in the summer.

The various species hatched to the present time are: Atlantic, landlocked, humpback, and quinnat salmon; brook, steelhead, brown, rainbow, lake, and black-spotted trout; whitefish, shad, pike-perch, and yellow perch.

In the January number of the New York Zoological Society *Bulletin* attention was called to the successful rearing in captivity



QUEEN TRIGGER FISH.

at the Aquarium of the whitefish, an important food fish, usually liberated from fish-cultural stations soon after hatching on account of the difficulty of supplying the young fry with *live* food. This trouble was overcome at the Aquarium by feeding with the larvæ of mosquitoes which were gathered with gauze nets from stagnant ponds in the vicinity of New York. There are now on exhibition numerous fine specimens of this species which have passed

the delicate stage and feed freely on the artificial foods usually supplied to young fishes.

The total output of the hatchery deposited in State waters during the year is approximately two millions.

THE AQUARIUM LABORATORY AND THE DIRECTOR'S OFFICE.

The facilities of the Aquarium laboratory and collections have been placed at the disposal of investigators from the city universities and elsewhere. Among those who availed themselves of opportunities for original work were Prof. T. H. Morgan, Prof. F. B. Summer, Prof. R. C. Osburn, Dr. T. H. Bean, Dr. G. Eisen, Mr. C. Moreira, Mr. L. F. Ayson, and several students. Mr. Ayson, Inspector of Fisheries of New Zealand, has been most successful in acclimatizing American food and game fishes in the waters of New Zealand, and has been charged with the establishment of a small aquarium in connection with an exposition to be held in Auckland. Dr. Eisen, of San Francisco, made a detailed study of the methods of the Aquarium, to be used in connection with his plans for the aquarium to be built in that city. Mr. Moreira was in search of similar information for the use of the aquarium in Rio de Janeiro.

The Director has given his personal attention to the rather extensive correspondence of the Aquarium, endeavoring to reply as satisfactorily as possible to the inquiries of the public in general. He has also made constant examination of the work of the contractors engaged in the improvement of the building.

AID TO SCHOOL TEACHERS.

Since the Aquarium came under the control of the Zoological Society its collections and facilities for natural history study have been placed very freely at the disposal of the teachers of biology in the city schools.

Acting upon the offer of living sea-shore animals from the abundant stock in the reserve tanks of the Aquarium many teachers called for specimens for class work. These have generally been kept alive in small aquaria in the school-houses. The interest aroused by such object lessons in natural history has extended until over 100 teachers have provided aquaria in which to keep the specimens procured. The Aquarium collector has no difficulty in supplying an abundance of small marine creatures for this purpose in connection with his regular collecting for the exhibition tanks. Mr. Spencer, of the Aquarium staff, has given

personal instruction to teachers in caring for small marine collections.

The total number of teachers and students visiting the Laboratory of the Aquarium during the year was over 4,000.

ATTENDANCE.

During the year 1905 the attendance at the Aquarium was 1,726,170 persons, an increase over that of 1904 amounting to 100,400. The daily average of visitors for the year was 4,729. The following table shows the attendance at the Aquarium in 1905 by months:

January ...	Total number visitors			79,849	Daily average		2,580
February ..	"	"	"	70,048	"	"	2,501
March	"	"	"	122,594	"	"	3,955
April	"	"	"	157,161	"	"	5,238
May	"	"	"	183,784	"	"	5,929
June	"	"	"	161,336	"	"	5,374
July	"	"	"	197,139	"	"	6,361
August	"	"	"	218,621	"	"	7,052
September .	"	"	"	181,846	"	"	6,030
October ...	"	"	"	159,561	"	"	5,147
November .	"	"	"	100,193	"	"	3,339
December .	"	"	"	93,938	"	"	3,030
Total				1,726,170			4,729

The total number of visitors to the Aquarium during the nine years that it has been open to the public is 14,996,759.

DENSITY RECORDS.

The daily records which have been kept at the Aquarium showing the density of the water with which the marine collections are supplied now extend over a period of three years.

Attention has previously been called to the disadvantage of maintaining ocean forms of life in highly brackish water. This drawback will disappear at an early date with the installation of stored sea-water, toward which end much of the improvement work going on in the Aquarium has been steadily directed.

The density records themselves have both practical and scientific values in showing what may be expected from month to

month in the character of the water-supply and in showing the endurance of different species of marine fishes and invertebrates under conditions of changing density.

The densities vary greatly, being affected by the floods of the Hudson River, southerly gales which increase the amount of sea-water in the Bay, and the ebb and flow of the tides, especially the very high and low tides of spring and fall.

RECORD OF MONTHLY MEAN TEMPERATURES AND SPECIFIC GRAVITIES AT THE NEW YORK AQUARIUM DURING THE YEARS 1903, 1904, AND 1905.

(From daily observations made by Mr. W. I. DeNyse.) *

Months.	1903.		1904.		1905.	
	Temp. water.	Specific gravity.	Temp. water.	Specific gravity.	Temp. water.	Specific gravity.
January ..	..	.....	34	1.014	35	1.013
February .	37	1.010	33	1.014	33	1.016
March ...	40	1.008	36	1.013	36	1.014
April	46	1.009	40	1.009	43	1.011
May	56	1.014	52	1.010	52	1.014
June	61	1.013	61	1.010	62	1.015
July	66	1.013	70	1.013	68	1.015
August. ..	68	1.013	71	1.014	71	1.016
September.	68	1.013	68	1.014	68	1.014
October ..	62	1.011	59	1.013	62	1.014
November.	52	1.014	51	1.013	51	1.015
December .	40	1.014	39	1.015	44	1.014

DR. MAYER'S BOOK.

This work, entitled "Sea-Shore Life," forms the first volume of what has been named "The New York Aquarium Nature Series." The manuscript and illustrations were presented to the Zoological Society by the author, with the suggestion that it be published as emanating from the New York Aquarium, and that the proceeds from its sale be applied to the improvement of that institution.

As this was in accord with the Society's plan to increase the usefulness of the Aquarium by developing its educational and scientific possibilities to some extent, the work was printed and

* Density observations were made with samples of water brought to a temperature of 60° Fahr.

placed on sale in the building. Its success as a popular work on the invertebrate animals of the New York coast and the adjacent coast region seems assured. After two months' experience, it may be safely stated that the sale of the book will not only return the cost of publication, but will eventually yield a profit for the purpose intended.

"Sea-Shore Life" is a work by a zoologist of the highest standing. Dr. Mayer is the Director of the Marine Biological Station of the Carnegie Institution at the Dry Tortugas, Florida. His familiarity with the marine life of our coast and his reputation among naturalists are well known.

It is a matter of congratulation that the Society is able to issue in connection with its scientific and educational work a volume of the excellent character of this one.

The publication of this book has been noted in scientific journals, and the comment upon it has been highly commendatory. It is not only so thoroughly trustworthy from the scientific point of view that it will serve the teacher and student, but is so pleasantly written that it will be an agreeable introduction to the animal life of the sea-shore for the use of the general reader.

Believing that the facilities of the Zoological Society for properly advertising a work of this description were too limited, a portion of the edition has been placed in the hands of Messrs. A. S. Barnes & Co., Publishers, in order that it might be introduced to the book trade generally.

It should be clearly stated that this work, notwithstanding its *general* character as a natural history of our sea-shore invertebrates, is none the less a guide book to the animals of that class which may be found in the Aquarium from time to time. With two similar volumes on our native aquatic vertebrates (the fishes and reptiles) the Aquarium would have not only complete guide books of the highest class, but a series of scientific books of general and permanent value.

ACKNOWLEDGMENTS.

The most substantial gift each year is that of the United States Fisheries Bureau, consisting of eggs of fishes for the operation of the Aquarium hatchery. The number received in 1905 was 2,092,000, representing 7 kinds of food and game fishes.

The Clyde Steamship Company, through Mr. Theo. G. Eger, General Manager, and the Florida East Coast Railway, through Mr. Beckwith, General Traffic Manager, very kindly furnished

free transportation for a large crocodile from Palm Beach to New York.

The Tuxedo Club furnished from the hatchery at Tuxedo Lake 1,000 eggs of the landlocked salmon—the only eggs of this species received during the year.

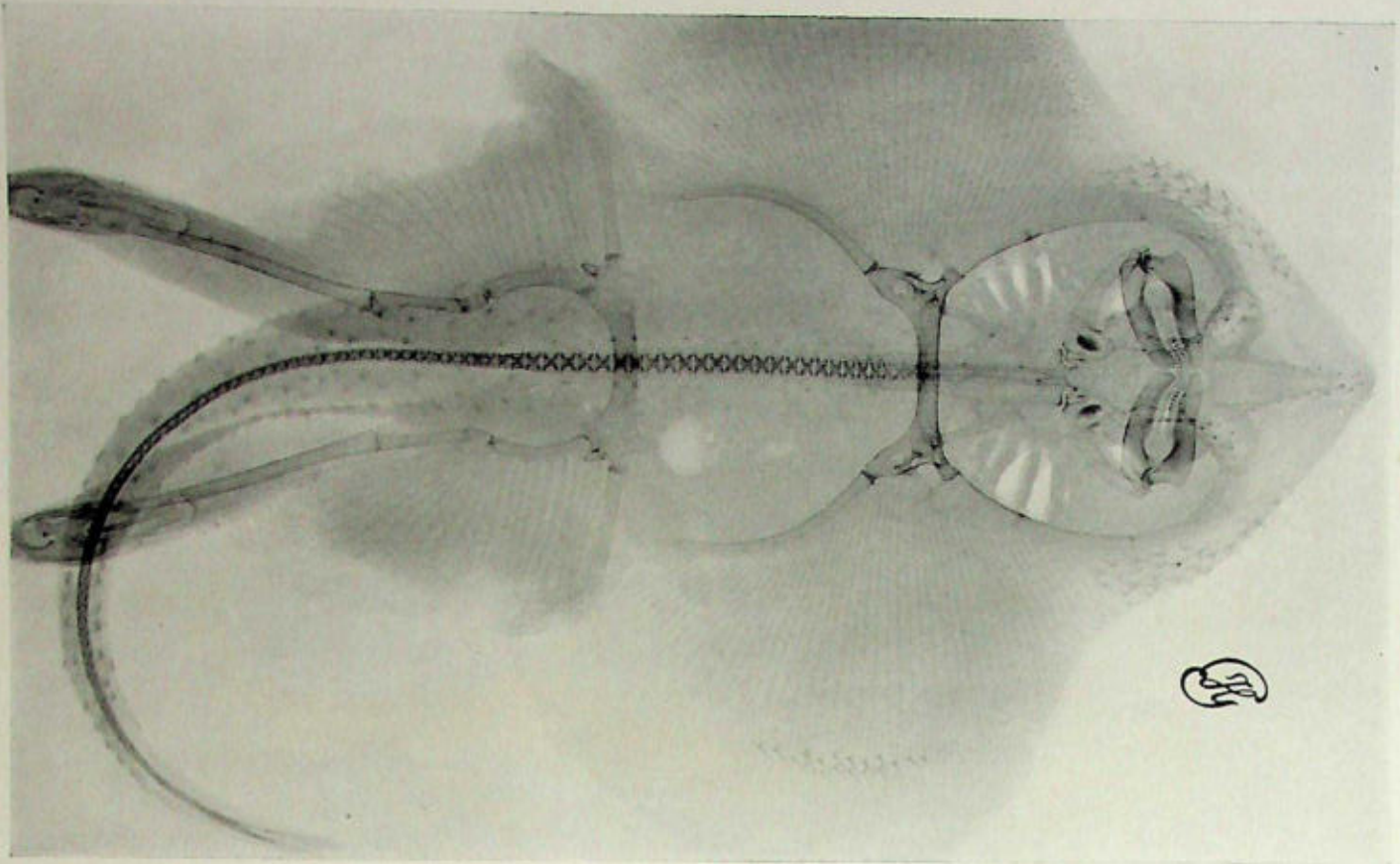
Messrs. A. Hoen & Co., of Baltimore, Md., presented 10 colored plates of fishes of the Bahama Islands. Messrs. Henry Holt & Co., of New York, G. E. Jennings, of New York, The J. B. Lyon Company, of Albany, and the Smithsonian Institution at Washington furnished electrotypes of fishes used in illustrating the new labels.

Dr. Henry G. Piffard presented a fine series of radiographs of fishes and other aquatic animals.

The valuable annual reports and bulletins of the United States Fisheries Bureau and the Smithsonian Institution were presented to the library.

Other donations of specimens are referred to in the appended list of gifts and purchases.

CHARLES H. TOWNSEND,
Director of the Aquarium.



SKATE, *RAIA ERINACEA*

REMARKS ON THE VALUE OF RADIOGRAPHS AS ZOOLOGICAL ILLUSTRATIONS.

By C. H. TOWNSEND.

ILLUSTRATED WITH RADIOGRAPHS BY DR. HENRY G. PIFFARD.

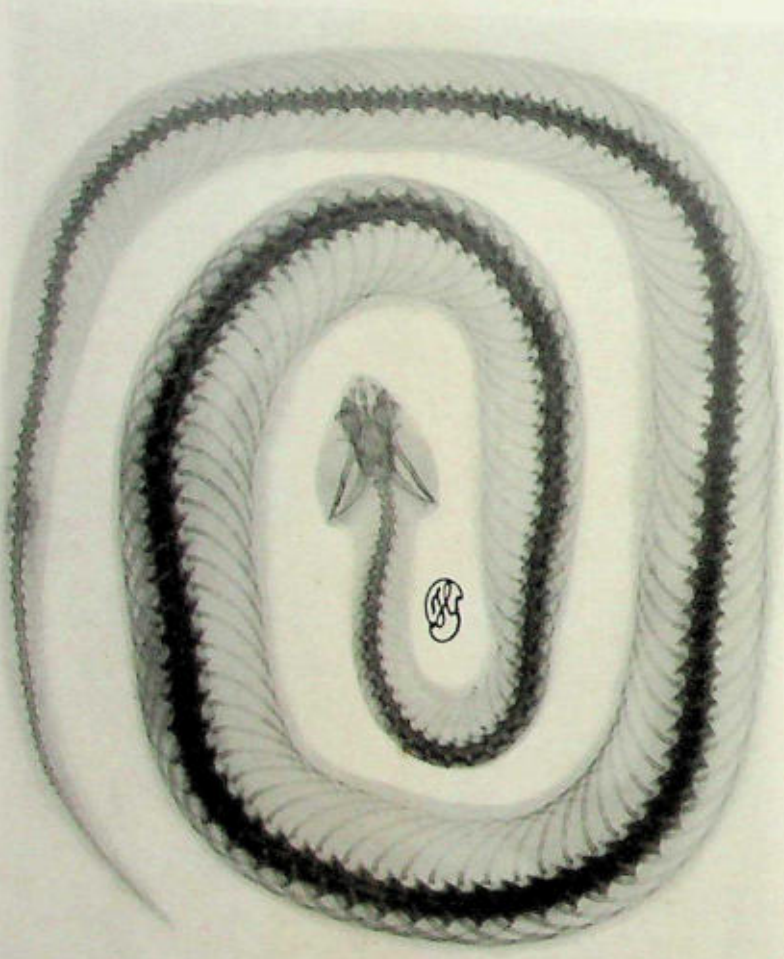


SEA HORSE.
HIPPOCAMPUS HUDSONIUS.

A FEW months ago the writer was presented with some X-ray photographs of sea-shells, made by Dr. Henry G. Piffard, of New York. The pictures revealed some points in the structure of shells so clearly that it seemed desirable to secure similar photographs of other animal forms. These Dr. Piffard very kindly offered to make, and a number of fishes, salamanders, and other aquatic vertebrates were supplied from the New York Aquarium.

The resulting radiographs were so admirably made and satisfactory from the natural history point of view that a few of them are presented herewith as suggestive of the value of a series of radiographs for purposes of zoological illustration.

The series at hand is not sufficiently large to afford much data for comparison, but many of the radiographs are of considerable value. Those of the fishes, for instance, would be useful in a general work

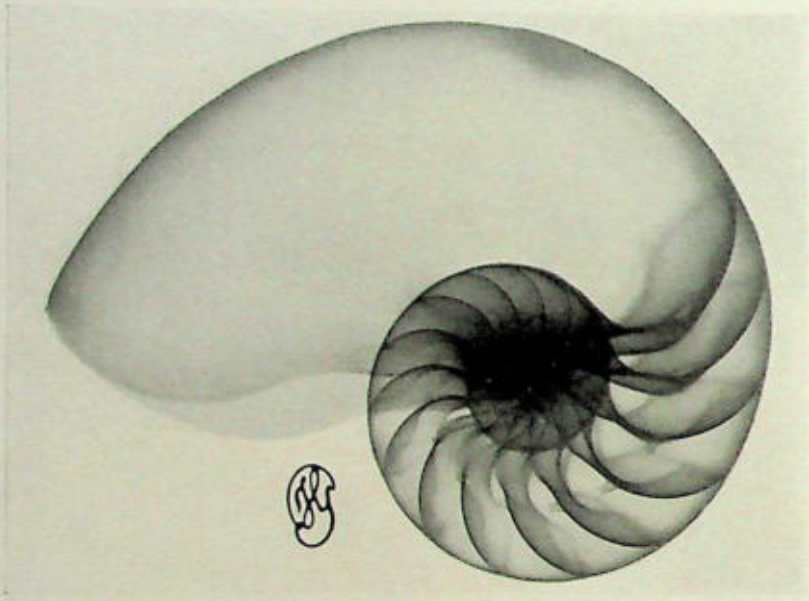


COPPERHEAD, *ANCISTRODON CONTORTRIX*

on ichthyology. It is often important to ascertain the number of vertebræ in fishes for purposes of classification, and these can usually be counted without difficulty in a radiograph. The natural curve of the backbone—seldom seen correctly in prepared skeletons of fishes—is well shown. The character of the caudal vertebræ showing the heterocercal or homocercal type of tail is seen very clearly. The radiograph is really a shadow picture made with the object laid flat upon the dry plate, the oste-



MUD PUPPY. *NECTURUS MACULATUS*



CHAMBERED NAUTILUS, *NAUTILUS POMPILIUS*

ology of the parts which lie closest to the plate showing the most clearly. It will be noticed in radiographs of fishes that the skull is not well defined, the numerous bones of the head making confused impressions. It is probable that by splitting off half of the head a clear impression could be secured.

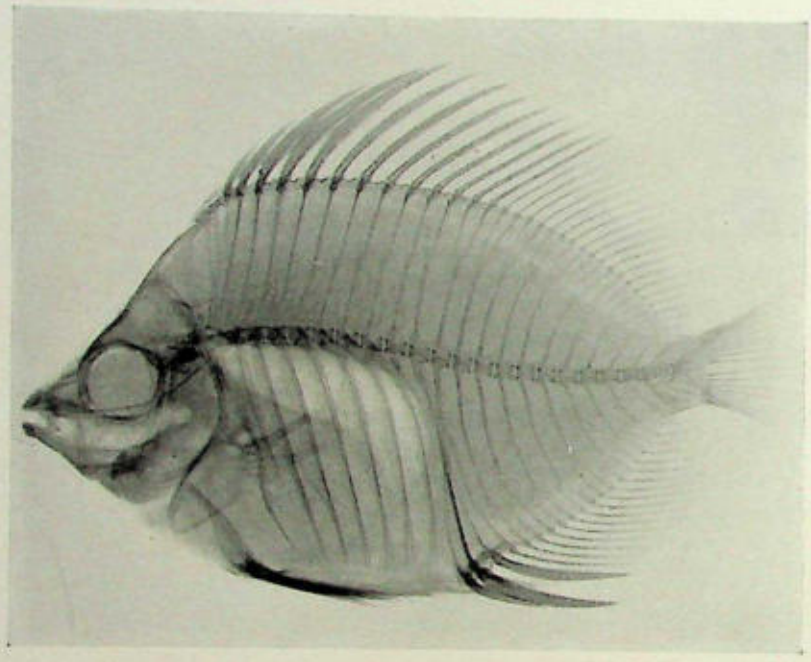
In salamanders the skull bones appear more distinctly, as well as the position of the atlas bone.

There are many characters, however, to be observed satisfactorily in the body aside from the skull, such as the relations of the shoulder and pelvic bones to the vertebræ, and the relations of the carpal and tarsal bones to each other, with their wide separations by cartilages. The phalanges are easily counted.

In the radiograph of *Salamandra* and *Diemyctylus* a more terrestrial habit seems to be indicated in the latter by the closer articulation and greater development of the bones, especially those of the limbs.

The radiograph of the butterfly fish (*Chaetodon ocellatus*) brings out the osteology remarkably well. The demarcation between the dorsal and anal spines and the soft rays is clear, and the interhæmal bones are distinct.

That of the trout (*Salvelinus fontinalis*) shows a very straight



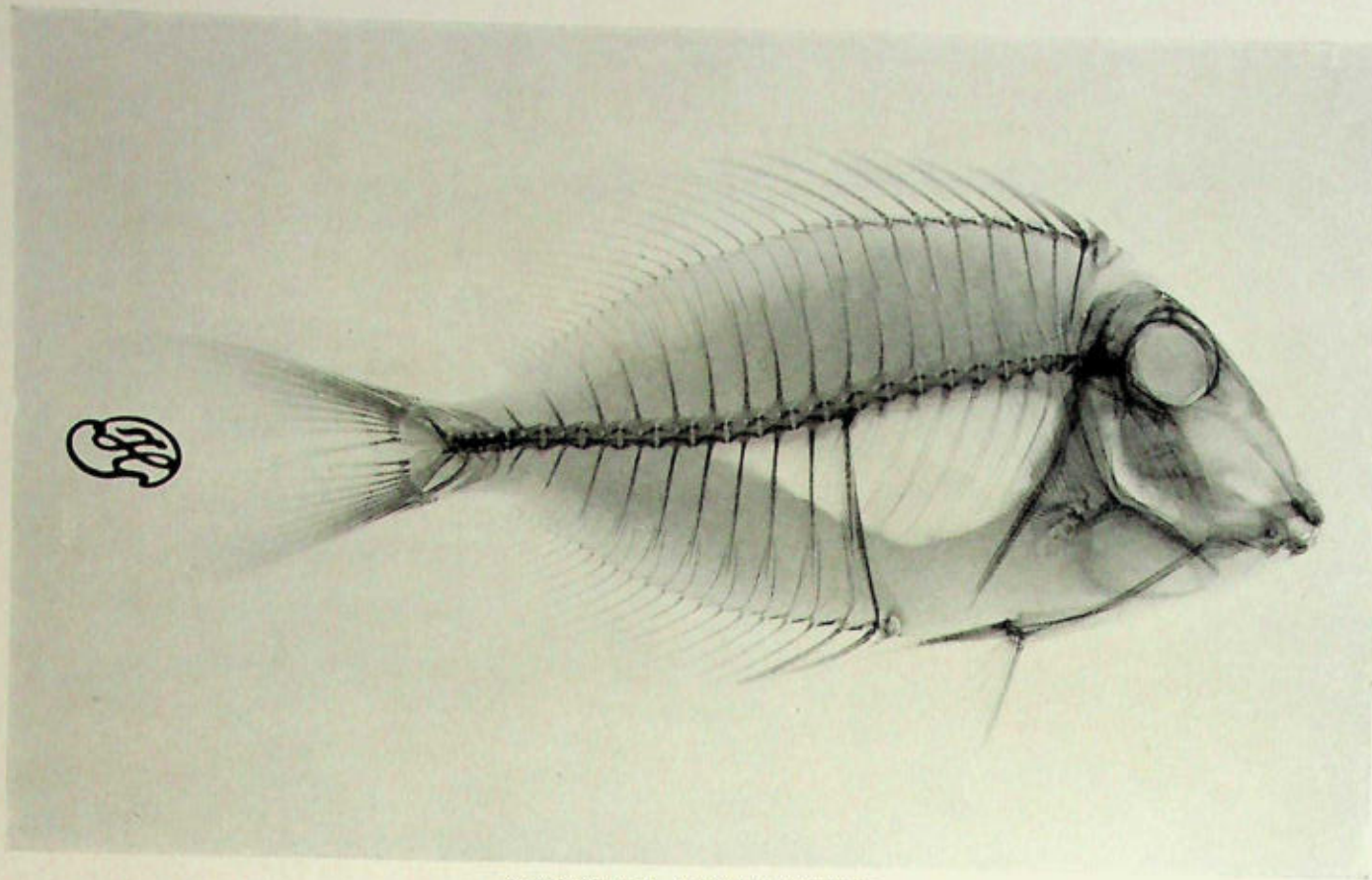
BUTTERFLY FISH, *CHAETODON OCELLATUS*.

backbone, the fish being laid in a natural position. The slightly heterocercal character of the tail is well defined. The connective-tissue bones, usually injured in prepared skeletons, are shown in their normal relations.

The radiograph of the skate (*Raia erinacea*) displays the cartilaginous skeleton to good advantage for examination. The attachment of the exterior spines to the pectoral rays and the shoulder and pelvic girdles, with the claspers attached to the latter, are easily observed.

The radiograph of the sea-horse (*Hippocampus hudsonius*) is a good presentation of the exoskeleton of fishes of its type, although made from a dried specimen. Had a fresh specimen been used the definition would have been sharper. This is the largest example of this species ever brought to the Aquarium, and it is shown natural size.

In the Nautilus the radiograph shows the septa which divide the air chambers and the connecting siphuncle. As an aid to conchologists it would often be valuable, as, for instance, in revealing the plates on the pillar in many of the *Fusidæ*.

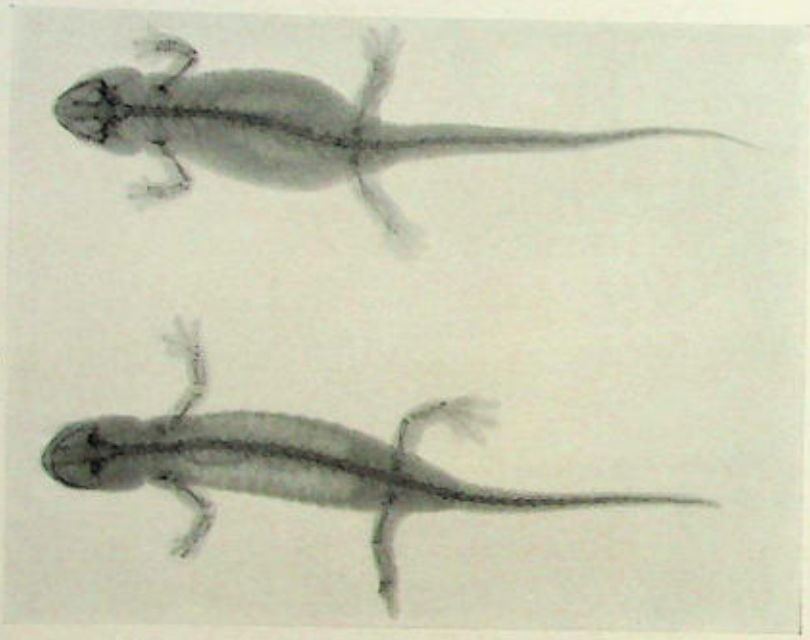


SURGEON FISH. *TEUTHIS HEPATUS*



BROOK TROUT. *SALVELINUS FONTINALIS.*

In the radiograph of *Necturus maculatus* the very slight ossification of the shoulder girdle and the attachment of the pelvic girdle to the vertebræ are apparent. A series of radiographs was used to excellent advantage by Dr. H. C. Bumpus in a study of skeletal variation in this species, the attachment of the pelvis to the nineteenth or twentieth vertebræ, either obliquely or abnormally, being readily distinguishable.



RED-BELLIED SALAMANDER, *DIEMYCTYLUS TOROSUS*
SPOTTED SALAMANDER, *SALAMANDRA MACULOSA*

In the radiograph of the copperhead (*Ancistrodon contortrix*) the vertebræ, corresponding in number approximately to the gastrosteges, are easily counted.

In general the importance of the radiograph for natural history purposes seems to have been neglected.

It shows at once, for instance, the relations of the skeletal framework to the exterior outline and to some of the soft parts, especially the swim-bladder, the natural positions of the bones of the skeleton, undistorted by the drying of the ligamentary attachments, which takes place in the mounted skeleton, and differences between closely related forms, where superficial characters are not well marked. The advantage of seeing bones in their natural relations and without art effect is apparent. The delicate parts are preserved, especially the connective-tissue bones.

Radiographs of reptiles, mammals, birds, etc., would undoubtedly be suggestive to the paleontologist in attempting to define the exterior outlines of extinct forms.

Many parts of the skeleton are seen clearly enough in the radiograph for purposes of study and drawing. In fact, the drawing of

the skeleton would be facilitated by more or less tracing from the radiograph and give greater exactness.

A fresh specimen makes a more distinct radiograph than one which has been preserved in alcohol, the tissues being less dense and not shrunken by the preservative.

In the radiographs of reptiles and batrachians sharper definition could have been secured by laying the specimens on the plates dorsal surface down, thus bringing the vertebræ closer to the dry plates.

The stages of regeneration of lost parts could doubtless be observed satisfactorily.

The radiograph has also the advantage of being life size and permitting of exact measurement. It may be reproduced by the ordinary methods of illustration applicable to a photograph. The labor and cost involved in the making of such a picture is of course less than by the usual methods of skeletonizing and drawing. The time saved is also important. It is not yet practicable to use living specimens in taking the pictures.

List of Gifts

TO THE ZOOLOGICAL SOCIETY.

(Complete from January 1, 1905, to January 1, 1906.)

ADAMS, SAMUEL, Topeka, Kan.:
6 specimens of Snakes from Argentina, South America.
ALBERTSON, WILBUR NICHOLAS, East Orange, N. J.:
Copperhead Snake.
ANDINA, MRS. B., Bedford Park, New York City:
Yellow-Fronted Amazon Parrot.
ANONYMOUS:
White-Fronted Amazon Parrot.
ANONYMOUS, New York City:
Yellow-Headed Amazon Parrot.
ARCHBOLD, MISS ANNE M., Tarrytown, N. Y.:
Angora Guinea Pig (7 specimens).
ATYBERGEN, FRANK, New York City:
Great Horned Owl.
BALDWIN, F. H., Brooklyn:
Flying Squirrel.
BALDWIN, TRUMAN H., New York City:
Alligator (2 specimens).
BALLOU, DONALD, Brooklyn:
Gray Squirrel (2 specimens).
BARBOUR, MRS. S. E., Eau Gallie, Indian River, Fla.:
Diamond Rattlesnake (2 specimens).
BARBOUR, THOMAS, Cambridge, Mass.:
Bahaman Amazon Parrot (5 specimens), Spotted Tortoises (100 specimens).
BARNES, CAPT. JOHN S., New York City:
Siberian Camel (2 specimens).
BARNEY, CHARLES T., New York City:
African Round-Eared Elephant.
BECKER, C. BATHGATE, Stamford, N. Y.:
Box Tortoises (7 specimens).
BEEBE, MRS. C. WILLIAM, New York City:
Mexican Deer, Laughing Gull (4 specimens), Dowitcher Snipe, Black Skimmer (10 young specimens), Tern (9 young specimens), Clapper Rail (2 specimens), Sanderling (2 specimens), Knot, Semipalmated Sandpiper, American Coot, Short-Eared Owl.
BENSON, MISS MAUDE E., New York City:
Florida Chameleon (6 specimens).
BERMPOHL, FRED., Brooklyn:
Florida Gallinule.
BLAIR, C. LEDYARD, New York City:
Female Eland (2 years old), Squirrel Monkey.
BLUE MOUNTAIN FOREST ASSOCIATION (*through Mr. Austin Corbin*), New York City:
Herd of 8 White-Tailed Deer.

BOAS, EMIL L., New York City:
Blue Fox (2 specimens).
BOUNNING, HENRY, New York City:
Alligator (2 young specimens).
BOWDISH, B. S., Demorest, N. J.:
Hog-Nosed Snake.
BOYD, JAMES, Fordham, New York City:
European Tortoise (2 specimens).
BRANDNER, H. A., Phoenix, Ariz.:
Gila Monster.
BRECHTEL, ERNEST C., New York City:
American Crow (2 specimens).
BREHMER, P. H., Rutland, Vt.:
Crow.
BROWN, HERBERT, Yuma, Ariz.:
Horned Rattlesnake or "Side-Winder," Mud Turtle (2 specimens), Bull Snake.
BYRNES, MRS. P., New York City:
Yellow-Throated Parrakeet.
CAESAR, MISS EMELIE, New York City:
White-Fronted Amazon Parrot.
CAPTAIN OF THE STEAMER "EL PASO," New York City:
Osprey.
CARPENTER, WARWICK S., New York City:
Horned Grebe (young specimen).
CHALMERS, MRS. JOHN, New York City:
Woodcock.
CLARK, JAMES, New York City:
Labrador Horned Owl.
CONNELL, MAURICE J., New York City:
Salamander (5 specimens).
CRANE, WILLIAM H., New York City:
Blainville's Horned Toad (5 specimens).
CRAWFORD, MRS. W. W., New York City:
Canary (male).
CROCKETT, MRS. M. M., New York City:
Troupial.
CURRY, ARTHUR, New York City:
Wilson Snipe.
CUTLER, MRS. COLMAN WARD, Yonkers, N. Y.:
Bullfinch.
DALE, GEORGE L., Wallingford, Vt.:
Red-Tailed Hawk (2 young specimens).
DAVIS, WILLIAM T., New Brighton, S. I., N. Y.:
Cope's Frog.
DECKER, GEORGE M., Clyde S. S. Co. (*through Mr. William Esling*), New York City:
Iguana (7 specimens), American Flamingo.
DE VOY, J., Jersey City, N. J.:
Monkey.
DIMOCK, A. W., Miami, Fla.:
Brown Pelican (12 young specimens).
DOVE, ADAM, New York City:
The following specimens were collected by Mr. Dove and Mr. Pearsall in the vicinity of Forestine, Sullivan County, N. Y.: 3 Timber Rattlesnakes, 36 Storer's Snakes, 56 Garter Snakes, 10 Water Snakes, 3 Black Snakes, 35 Milk Snakes, 13 Ring-Necked Snakes; 8 Ribbon Snakes, 9 Green Snakes, 1 Hog-Nosed Snake. Total, 174 specimens.

DUKE OF BEDFORD, Woburn, England:
Tashkent Wapiti.
DURBIN, THOMAS, New York City:
2 Rose-Breasted Grosbeaks, 2 Baltimore Orioles, 2 Orchard Orioles, 2 Scarlet Tanagers, 1 Chipping Sparrow, 1 Water Thrush, 5 Catbirds, 4 Grosbeaks, 2 Maryland Yellow-Throats, 3 Song Sparrows; 1 White-Throated Sparrow, 1 Northern Shrike.
DUTCHER, WILLIAM, New York City:
Weaver Bird.
EDWARDS, J. S., New York City:
Barn Owl.
ELIASON, CARL, Hollandale, Fla.:
Green Snake (2 specimens), Young Water Moccasin.
ELLGATH, H., New York City:
Horned Lizard (2 specimens).
ESTWICK, MRS. SUSAN E., Bayonne, N. J.:
Levaillant's Amazon Parrot.
FARNHAM, MRS. SALLY JAMES, New York City:
Eagle.
FLICK, A. A., New York City:
Alligator (young specimen).
FLOYD, WEBB, New York City:
Screech Owl (5 young specimens).
FOLDVARY, PAUL D., New York City:
Wood Turtle, Snapping Turtle.
FOOT, MISS IRENE, New Rochelle, N. Y.:
Cavy (6 specimens).
FORD, H. W., New York City:
Florida Fox Squirrel.
FRICKE, LOUIS, Hoboken, N. J.
Red Fox (2 specimens).
GARDINER, PRESCOTT, Ridgewood, N. J.:
Yellow-Faced Parrakeet (2 specimens).
GIRARDIN, MISS EMILIE, New York City:
Alligator.
GOLDMANN BROTHERS, New York City:
European Squirrel.
HARRISON, JOHN J., New York City:
Red-Tailed Hawk.
HAYLETT, MISS, New York City:
American Robin.
HEFLICH, H., New York City:
Marmoset.
HOFFMAN, EMEL, VERA, AND RUDOLPH, New York City
Alligator (3 specimens).
HUNTER, LEANDER, Chappaqua, N. Y.:
American Bittern.
HUNTER, WALLACE, Bedford Park, New York City:
Skylark.
HURTIN, JESSE, East Patchogue, L. I., N. Y.:
Red-Shouldered Hawk.
IDEN, MRS. I. B., Mount Vernon, N. Y.:
Yellow-Headed Amazon Parrot.
IRWIN, MISS MAY, New York City:
Marmoset.
JENNINGS, E. R., New York City:
Painted Turtle.
JOB, HERBERT K., Kent, Conn.:
Ruffed Grouse.

KAHN, A., New York City:
Alligator.
KELLER, ERNEST F., New York City:
Painted Turtle (2 young specimens), Snapping Turtle.
KING, MR., Department of Zoology, Columbia University, New York City:
Gila Monster.
KUBLER, GUSTAV A., New York City:
Water Snake, Hog-Nosed Snake.
LANDERDALE, DR. J. V., Brooklyn:
Gray Squirrel.
LEHMKUHL, CHARLES, New York City:
Snapping Turtle.
LINEWEAVER, I. S., Westchester, New York City:
Red-Shouldered Hawk (3 specimens).
LONERGAN, MARY J., New York City:
American Robin.
LORING, J. ALDEN, Port Washington, N. Y.:
Night Heron (3 specimens).
MCDOWELL, THEODORE, Whitehouse, N. J.:
Barn Owl.
MADISON, ROBERT, Newark, N. J.:
Roseate Cockatoo.
MAHR, M. D., GEORGE J., Brooklyn:
Swift.
MARCA, RAFFAELLO DE LA, New York City:
Gannet.
METCALF, FRANCIS, New York City:
1 Timber Rattlesnake (black phase), 2 Timber Rattlesnakes, 8 Banded Rattlesnakes.
MILLER, C. F., East Orange, N. J.:
10 Muhlenberg's Turtles, 4 Wood Turtles, 1 Spotted Turtle, 15 Water Snakes, 10 Garter Snakes, 45 Painted Turtles, 18 Musk Turtles, 5 Snapping Turtles, 9 Box Turtles, 2 Pine Snakes, 1 Black Snake, 24 Tree Toads, 3 Salamanders, 1 Newt, 1 Bull Frog, 18 Water Snakes.
MILLIKEN, C. H., Brooklyn:
Sicilian Tortoise.
MINER, CHESTER C., Englewood, N. J.:
Red-Tailed Hawk.
MITCHELL, MISS, Larchmont, N. Y.:
Horned Toad.
MOLE, R. R., Port-of-Spain, Trinidad, B. W. I.:
Rainbow Boa, Boddaert's Coluber, Tree Boa 2 specimens), Coral Snake.
NORTON, GEORGE F., New York City:
White-Faced Sapajou.
NUMMENKAMP, WILLIAM, New York City:
Woodcock.
NUSSBICKEL, FREDERICK C., New York City:
Water Snake.
OLHEIT, JR., CHARLES, New York City:
Alligator (2 specimens).
OLMSTEAD, J., New York City:
White-Headed Amazon Parrot.
O'REILLY, G. R., Fulton, Duval County, Fla.:
Rainbow Snake.
OSBORNE, MISS EDITH, Crawford, N. J.:
Cotton-Headed Marmoset.

PAGE-BROWN, MISS AGNES AND MISS LUCY, New York City:
American Robin.
PATON, CAPT., Steamer "Turkistan," New York City:
Short-Eared Owl.
PEARCE, MISS MAUD, Yonkers, N. Y.:
Alligator.
PEARSALL, MORRIS, New York City:
The following specimens were collected by Mr. Pearsall and Mr. Dove in the vicinity of Forestine, Sullivan County, N. Y.: 3 Timber Rattlesnakes, 36 Storer's Snakes, 56 Garter Snakes, 10 Water Snakes, 3 Black Snakes, 35 Milk Snakes, 13 Ring-Necked Snakes, 8 Ribbon Snakes, 9 Green Snakes, 1 Hog-Nosed Snake. Total, 174 specimens.
PEARY, MRS. JOSEPHINE D., Eagle Island, South Harpswell, Me.:
Eskimo Dog and 5 Pups.
PERKINS, RUSSELL, Golden Hill Farm, Pomfret Center, Conn.:
Ring-Tailed Monkey.
PERRET, MRS. U. F., New York City:
Macaque Monkey.
PETERSEIN, WALTER, New York City:
Box Tortoise.
PHELAN, JAMES, Department of Parks, Bronx Borough, New York City:
Spotted Salamander.
PHELPS, LE ROY M., Glens Falls, N. Y.:
Hog-Nosed Snake.
PHILLIPS, JOHN M., Pittsburg, Pa.:
Male Mountain Goat.
PRIME, DAVID J., Ellicottville, N. Y.:
Red-Tailed Hawk.
RAGOT, CHARLES, New York City:
Green Snake, Ribbon Snake, Newt (2 specimens), Black Salamander.
RESSLER, A. J., New York City:
Red Newt (3 specimens), Salamander (2 specimens).
ROCKEFELLER, WILLIAM, New York City:
Thameng, or Burmese Deer (1 male and 2 females).
ROOS, HERMAN, Yonkers, N. Y.:
Frog (2 specimens).
ROSSELL, SPENCER, New York City:
Chipmunk.
ROUCLERE, HARRY, Ridgewood, N. J.:
Capuchin Monkey.
ROWE, JULIUS, Owego, Tioga Co., N. Y.:
Wood Turtle (albino).
RUCH, MRS. C. B., New York City:
Cuban Parrot.
RÜTHLING, HENRY HUGO, New York City:
1 Green Snake, 1 Ring-Necked Snake, 1 Storer's Snake.
SCHAEFFER, F., New York City:
Tree Boa.
SCHIEFFELIN, MISS MARGARET LOUISA, New York City:
1 Pair of Angora Guinea-pigs and 3 young.
SCHIOTT, JULIUS, Director, Zoologisk Have, Copenhagen, Denmark (*through Dr. Axel Hellrung*):
2 Eider Ducks, 3 Redshank, 2 Chaffinch, 2 European Avocets, 2 European Goldfinches, 1 Linnet, 1 Twite, 1 Greenfinch.
SCHLEININGER, FRANK, New York City:
Alligator (young specimen).
SEASE, GEORGE R., Westchester, New York City:
South American Wild Dog.

SELESKY, E., Brooklyn:
Alligator (young specimen).
SETON, ERNEST THOMPSON, Cos Cob, Conn.:
Canada Goose.
SHEARER, MRS. KATE, New York City:
Cut-Throat Finch (2 specimens).
SHEFFIELD, JOHN, New York City:
Alligator.
SHELDON, MRS. P. T., Brooklyn:
Japanese Robin.
SIEGHORTNER, H. A., Yonkers, N. Y.:
Monkey.
SMITH, M. D., FRED. SUMNER, Chester, Conn.:
Gray-Spotted Salamander (3 specimens).
STANGE, H., Hamburg-American Line, New York City:
Rhinoceros Iguanas (4 specimens).
STARKE, A. G., New York City:
Alligator.
STEED, MRS. JESSIE, New York City:
Alligator, Turtle.
STEFFENS, O., East Creek, N. J.
Holboell Grebe.
STREETER, D. D., Medicine Bow, Wyo.:
Male Green-Winged Teal, Golden Eagle (2 specimens), Horned Toad (4 specimens), Rattlesnake, Garter Snake.
STREETER, D. D., JR., Brooklyn:
A collection of reptiles from Wyoming, comprising the following: Several dozen Horned Toads, Swifts, Striped Snakes, Rattlesnake, and a number of Batrachians
STUART, INGLIS, The Hill, Fort Myers, Fla.:
Coral Snake.
SWIFT, MRS. HELEN D., Brooklyn:
Red-Crested Cardinal.
TAYLOR, MISS AUGUSTA DE F., New York City:
Florida Chameleon (2 specimens).
TAYLOR, C. F., JR., Taylors'-on-Schroon, N. Y.:
Alligator.
TESINY, NICHOLAS, Bridgeport, Conn.:
Female Gray Fox.
THURBER, MRS., New York City:
Red-and-Blue Macaw.
TIMMERMANN, H. B., Brooklyn:
White-Crowned Polish Fowl (2 specimens).
TODD, J. H., New York City:
White-Crowned Pigeon (11 specimens)
UNGER, MRS. D., New York City:
Tovi Parrakeet (2 specimens).
VALENTINE, EDITH, New York City:
Fire Salamander, Spotted Salamander, Red-Backed Salamander (4 specimens), Sand Lizard, Chameleon.
VALENTINE, MYRA, New York City:
Troupial.
VAN INWEGEN, JACOB, Huguenot, N. Y.:
Rattlesnake.
WEHMEYER, HENRY, New York City:
Pin-Tailed Whydah Bird.
WELCH, J. L., Sebrie Park, Westchester, New York City:
Spotted Salamander.

WHAITES, ORRIN C., Hanover, N. J.:
Red-Tailed Hawk (2 specimens).
WHEALTON, LOUIS N., New York City:
Bobolink (4 male specimens).
WHITMAN, ESMOND, Katonah, N. Y.:
Green Monkey.
WILEY, W. MURDOCK, Salisbury, N. C.:
Hooded Sapajou.
WILLIAMSON, THOMAS M., Erie, Pa.:
Banded Rattlesnake (2 specimens).
WOOD, GILBERT C., New York City:
Texas Hog-Nosed Snake, Pacific Rattlesnake. Rattlesnake, King Snake.
WOOD, W. H. S., New York City:
Sharp-Shinned Hawk.
WYAT, MRS. TRESA C., New York City:
Blue-Fronted Amazon Parrot.
WYLIE, MRS. DONALD, New York City:
Yellow-Bellied Sapsucker.
YOUNG, MRS. PETER, New York City:
Yellow-Fronted Amazon Parrot.
ZIEGLER, ESTATE OF WILLIAM, New York City:
(Ziegler Polar Relief Expedition.) 3 Eskimo Dogs, 1 Arctic Fox, 2 Polar Bears, 8 Ivory Gulls.

Miscellaneous List.

BEEBE, MRS. C. WILLIAM, New York City:
70 Eggs of Clapper Rail, from the marshes of Virginia.
BROWNING, WILLIAM H., New York City:
12 Cocoanut Husks, prepared for use as nests.
CONKLIN, J. H., New York City:
6 Cocoanut Husks.
FLORENCE, E. D., Brooklyn:
1 Skull of a large Alligator, from Harris Lake, Lake County, Fla.
WHEALTON, LOUIS N., New York City:
3 Eggs of Greater Snow Goose.
WIEGMANN, DR. W. H., New York City:
The following birds' eggs: 5 Kingbird, 2 Phoebe, 1 Song Sparrow, 2 Whip-poor-will, 3 Field Sparrow, 4 Barn Swallow, 1 Robin, 6 Flicker.
Collected by MESSRS. CHARLES SNYDER and DE LOS HICOK, in the Taconic Mountains, New York, May 16, 1905:
15 Banded Rattlesnakes.

Gifts of Plants.

BALCOM, DR. IRVING S., Fordham, New York:
Two large Rubber Plants.
SCHNAUFER, H., West Farms, N. Y.:
Two 6-foot Cactus.

Gifts to the Library.

AMERICAN MUSEUM OF NATURAL HISTORY, New York City:
- Album of Philippine Types. Folkmar.
- Bulletin of the American Museum of Natural History, Vol. XX.
- The Andrew J. Stone Explorations in Arctic and Subarctic America.
- The Huntington California Expedition, Vol. XVII, Part 3, pp. 119–346. Dixon.
- The Huntington California Expedition, Vol. XVII, Part 4, November 1905—Anthropometry of Central California. Boas.

BOLTON, JOSEPH B., West Farms, New York City:
- The Pictorial Museum of Animated Nature, Vol. I, Mammals-Birds.
- The Pictorial Museum of Animated Nature, Vol. II, Birds, Reptiles, etc.

BRESLAU ZOOLOGICAL SOCIETY:
- Literatur der Landes- und Volkskunde der Provinz Schlesien umfassend die Jahre 1900–1903. Nentwig.
- Zweiundachtzigster Jahres—Bericht der schlesischen Gesellschaft für vaterländische Cultur, Breslau, 1904.

BRITISH MUSEUM (THE TRUSTEES OF THE), London:
- A General Guide to the British Museum.
- A Guide to the Fossil Mammals and Birds.
- A Guide to the Fossil Mammals and Birds in the Department of Geology and Paleontology in the British Museum (Natural History).
- Blood-Sucking Flies, Ticks, etc., and How to Collect Them. Austen.
- First Report on Economic Zoology. Theobald.
- Guide to the Coral Gallery.
- Guide to the Gallery of Birds. Ogilvie-Grant.
- Handbook of Instructions for Collectors.
- Second Report on Economic Zoology. Theobald.

BROOKLYN INSTITUTE OF ARTS AND SCIENCES, Brooklyn:
- Orthoptera from Southwestern Texas, Vol. I, No. 4. Caudell.

GRANT, MADISON, New York City:
- La Faune Momifiee de l'Ancienne Egypte. Lortet and Gaillard.

KEHOE, MISS FLORENCE W., New York City:
- The Greater New York Charter, with Appendix, Second Edition.

LINNAEAN SOCIETY, New York City:
- Abstract of the Proceedings of the Linnaean Society, Nos. 15–16, 1902–1904.

ONEIDA COMMUNITY, LIMITED, Oneida, N. Y.:
- The North American Trapper, Vol. I, Nos. 8, 10, 11, and 12.
- The North American Trapper, Vol. II, Nos. 1, 2, and 3.

PHILADELPHIA ACADEMY OF SCIENCES, Philadelphia, Pa.:
- Proceedings of the Academy of Natural Sciences, Vol. LVI, Part 3.
- Proceedings of the Academy of Natural Sciences, Vol. LVII, Parts 1 and 2.

SHOOTING AND FISHING PUBLISHING CO., New York City:
- Shooting and Fishing, for 1905.

SMITHSONIAN INSTITUTION, Washington, D. C.:
- A Monograph on the Isopods of North America. Richardson. United States National Museum Bulletin No. 54.
- Annual Report of the Smithsonian Institution, 1903.
- Catalogue of the Type and Figured Specimens of Fossils, Minerals, Rocks, and Ores in the Department of Geology, United States National Museum, prepared under the direction of George P. Merrill, Head Curator of Geology, United States National Museum Bulletin No. 53, Part 1.

Proceedings of the United States National Museum, Vol. XXVII.
Proceedings of the United States National Museum, Vol. XXVIII.

STATE UNIVERSITY OF IOWA, Iowa City, Iowa:
Bulletin from the State University of Iowa, Vol. V., No. 4.

UNITED STATES DEPARTMENT OF AGRICULTURE (BUREAU OF SOILS), Washington, D. C.:
Field Operations of the Bureau of Soils, 1903, Fifth Report, United States Department of Agriculture. Whitney.
Maps for above.

Gifts to the Aquarium.

ALLABOCK, MISS LULU F., Lock Haven, Pa.:
Hellbender, Newts (5 specimens).

ASCHER, S., New York City:
Green Turtle.

BEEMAN, H. W., New Preston, Conn.
Black Bass (100 young specimens).

BISHOP, HENRY, Baltimore, Md.:
12 Japanese Fancy Goldfishes.

BRADLEY, THOMAS H., Brooklyn:
Goldfish (7 small specimens).

CACCIA, H., New York City:
2 Crabs from Cuba.

CARROLL, ARTHUR, New York City:
Painted Turtle, Spotted Turtle.

CHAPMAN, FRANKLIN A., New York City:
Blind Salamander from Texas.

CLAY, CLIFFORD, East Orange, N. J.:
Musk Turtle.

CLARK, MASTER BILLY, New York City:
Diamond Back Terrapin, Small Box Turtle, Young Painted Turtle.

CLYDE STEAMSHIP CO. (*through Gen. Mgr. Eger*) and FLORIDA EAST COAST RAILWAY (*through Gen. Traffic Mgr. Beckwith*):
Free Transportation for large Crocodile from Florida to New York.

COLES, H. D., Brooklyn:
Small Alligator.

COHEN, MRS. S., Brooklyn:
Spotted Turtle, Wood Turtle.

COOK, MRS. D., Borough Park, West Brooklyn, N. Y.:
Box Tortoise.

CUGLEY, JOHN, Philadelphia, Pa.:
Fancy Japanese Goldfish (4 specimens).

DICKERSON, MISS MARY C., Providence, R. I.:
3 Yellow-Spotted Salamanders, 2 Red Salamanders, 1 Blotched Salamander, 18 Newts.

DYER, CAPT. FRANK E., Steamship "Berwind":
Tortoise from Curacoa.

GLECK, MISS ANNIE, South Norwalk, Conn.:
Small Alligator.

GUCK, OSMOND, Brooklyn:
Alligators (3 small specimens).

HARTLEY, HOWARD N., Syracuse, N. Y.:
Alligator.

HIBBERD, MRS. G. H., Bayonne, N. J.:
3 Painted Turtles, 2 Spotted Turtles.

KOOISTRA, MR., Brooklyn:
Land Tortoise.

La Grange, A., New York City:
Small Alligator.
Lockwood, Mr., New York City:
1 Musk Turtle, 1 Newt.
Lynch, Messrs, & Co., New York City:
Painted Turtles (12 specimens).
Markowitz, David, New York City:
Snapping Turtle.
Mischo, H. J., New York City:
Hermit Crabs from the Mediterranean (2 specimens).
New York Forest, Fish, and Game Commission (*through Mr. G. E. Winchester*), Saranac Inn, N. Y.:
15 Albino Lake Trout (15 specimens)
O'Connell, Mrs., New York City:
Alligator.
Ormsby, Kenneth Fiske, New York City:
Small Alligator.
Phohlman, Mrs. G. Blanche, New York City:
Large Bullfrog.
Poland, Dr. S. C.:
2 Wood Turtles, 3 Spotted Turtles.
Redfield, Edward, Closter, N. J.:
25 specimens of amphibians (1 species of Frog and 4 of Salamander), 2 Muhlenberg Turtles, 2 Spotted Turtles, 1 Wood Turtle.
Rierdan, Mrs. Jas. E., New York City:
Alligator.
Rhode, Amanda E., New York City:
Box Tortoise.
Salley, Thomas Pickens, Newport News, Va.:
Alligator.
Salvador, S., Fernandina, Fla.:
Terrapin (3 small specimens).
Sanwald, Louis, New York City:
Snapping Turtle.
Searing, George E., Towanda, Pa.:
Collection of Newts and Tadpoles.
Selby, Mrs. John C., Newark, N. J.:
Alligator.
Simpson, Chas., New York City:
Alligators (2 small specimens).
Smith, D. G., Fishery Commissioner for New Brunswick, N. S.:
33 Spotted Trout, 1 Atlantic Salmon.
Smith, R. H., New York City:
Wood Turtle.
Smith, Walter T., New York City:
Young Green Turtle.
Stachelrodt, Hugo, Brooklyn:
Alligators (2 specimens).
Stewart, Fred, Sparkill, N. Y.:
Small Alligator.
Thorne, Samuel, New York City:
Large Cycas Plant.
Townsend, C. H., New York City:
11 Painted Turtles, 1 Spotted Turtle.
Tucker, E. S., U. S. S. "Hancock":
Alligators (2 specimens).
Turner, Nathan A., Brooklyn:
Blue Lobster.

TUXEDO CLUB (*through Edwin C. Kent*), Tuxedo, N. Y.:
1,000 eggs of Steelhead Trout.
UNITED STATES BUREAU OF FISHERIES (*through George M. Bowers, Commissioner*), Washington, D. C.:
2,092,000 eggs of fishes, as follows: Lake Trout, 10,000; Rainbow Trout, 10,000; Brook Trout, 10,000; Blackspotted Trout, 50,000; Landlocked Salmon, 2,000; Whitefish, 10,000; Pike-perch, 2,000,000.
WINTERS, EUGENE, New York City:
Young Green Turtle.
WOLKENMUTH, JOHN, New York City:
2 Alligators (2 specimens).

Exchanges.

DETROIT AQUARIUM, Detroit, Mich.:
14 Pike, 2 Lake Sturgeon, 7 Channel Catfish, 16 Rock Bass, 17 Pike-perch, 4 Sauger, 7 Burbot, 5 Brook Sucker, 11 Mud Puppy, 2 Muskallunge, 28 Sunfish (2 species).
NEW ENGLAND FOREST, FISH, AND GAME ASSOCIATION, Boston, Mass.:
10 Brook Trout, 7 Golden Trout, 10 Brown Trout, 2 Rainbow Trout, 26 Pickerel, 3 Rock Bass, 6 Sucker, 5 Lake Trout, 5 Pike-perch.

Purchases.

STEAMER "ANGLER"—Collections from the fishing banks off the New Jersey Coast:
78 Dogfish, 23 Angler, 77 Muttonfish, 9 Puffer, 3 Hake, 105 Sea Raven, 31 Codfish, 4 Flounders, 50 Sea Robins, 138 Skate, 5 Sea Bass, 59 Prickly Skate, 1 Menhaden, 1 Sand Shark, 5 Anemones, 1 Sea Clam, 9 Horned Dogfish, 46 Sculpin, 1 Cunner, 1 Pilot Fish, 1 Eel, 3 Porgies, 2 Spider Crabs, 60 Jellyfish, 137 Blackfish, 2 Trigger Fish, 16 Bergall, 2 Sea Mussels, 4 Star Fish, 3 Conger Eels, 1 Sertularia, and numerous pieces of coral and sponge.
JACOB SCHNOOR—Collections from the pound nets at Port Monmouth, N. J.:
9 Drumfish, 14 Weakfish, 20 Menhaden, 1 Remora, 31 Winkles, 1 Fluke, 2 Blue Crabs, 3 Eels, 3 Anglers, 5 Dog Fish, 1 Skate, 2 Spiny Toadfish, 2 Small Angler, 6 Sculpin, 6 Blackfish.
TROPICAL FISHES—From Bermuda:
209 Angel Fish, 11 Blue Tang, 138 Common Surgeon, 20 Hog Fish, 2 Lady Fish, 85 Coneys, 3 Queen Trigger Fish, 6 Common Trigger Fish, 78 Squirrel Fish, 13 Spotted Moray, 2 Black Grunt, 2 Tiger Rockfish, 11 Salmon Rockfish, 61 Mud Parrotfish, 19 Green Parrotfish, 8 Red Finned Parrotfish, 2 Blue Parrotfish, 24 Four-eyes, 24 Yellow Tail, 1 Amber Fish, 99 Hinds, 37 Yellow Grunt, 4 Blue Grunt, 2 Cowfish, 2 Sea-horses, 1 Brown Moray, 16 Spot Snappers, 11 Spotted Moray, 39 Nassau Grouper, 15 Blue-striped Grunt, 39 Gray Snapper, 2 Margate, 9 Rockfish, 5 Butterfly Fish, 10 Sergeant Major, 5 Bream, 2 Red Grouper, 1 Naked Mollusk, 17 Striped Grunt, 1 Pigfish, 1 Octopus, 5 Trunk Fish, 10 Spiny Lobsters, 2 Brown Parrotfish, 1 Parrotfish.

Other Purchases.

1 Green Turtle, 2 Harp Seals, 4 Spotted Salamanders, 1 Box Tortoise, 6 Turtles, 4 Harbor Seals, 1 Porpoise, 2 Mexican Axoltls, 1 Bullfrog, 32 Sea-horses, 1 American Crocodile.

Gifts to the Aquarium Library.

BIEN, JULIUS & Co., New York City:
27 uncolored plates of deep-sea fishes.
48 uncolored plates of Hawaiian fishes.
CALIFORNIA FISH COMMISSION (*through A. T. Vogelsang*):
Report of California Fish Commission, 1903–1904.
EDWARDS, DR. C. L., Hartford, Conn.:
Pamphlets on Zoology.
EHRENBAUM, DR. E., Heligoland, Germany:
"Die Fischerei auf der Weltausstellung in St. Louis 1904."
FELT, DR. E. PORTER, Albany, N. Y.:
Aquatic Insects of New York.
May Flies and Midges.
HOEN, A., & Co., Baltimore, Md.:
10 colored plates of fishes of the Bahama Islands.
JOB, MESSRS., BROTHERS & Co., New York City:
Photographs and reports on Newfoundland Seal Fishery.
MEEHAN, W. E., Harrisburg, Pa.:
Annual Reports for 1898, 1900, 1902, and 1903 of Department of Fisheries.
MUSEUM OF THE BROOKLYN INSTITUTE, Brooklyn:
Memoirs and Bulletins.
NEW JERSEY AGRICULTURAL STATION (*through Dr. J. B. Smith*), New Brunswick, N. J.:
Report on Mosquitoes.
PIFFARD, DR. H. G., New York City:
Series of X-ray Photographs of fishes and other aquatic animals.
SMITHSONIAN INSTITUTION (*through Professor S. P. Langley, Secretary*), Washington, D. C.:
Reports and Bulletins for 1905.
TOWNSEND, C. H., New York City:
Fisheries of the United States. Townsend.
UNITED STATES BUREAU OF FISHERIES (*through Hon. Geo. M. Bowers, Commissioner*), Washington, D. C.:
Reports and Bulletins for 1905.

REPORT OF THE MEDICAL DEPARTMENT.

THE Medical Department of the New York Zoological Society consists of Dr. Harlow Brooks, Pathologist, and Dr. W. Reid Blair, Veterinarian. The next Annual Report of this Society will contain a history of the Department, and tabulated statements of results achieved during the five years of its existence, by the Pathologist.

The results achieved by the work of this department during the past year have been more gratifying than ever before, and we have every reason to believe that with our constantly increasing knowledge of the diseases of wild animals still greater benefits will accrue from our efforts in the future.

NUMBER OF SICK ANIMALS.

Compared with former years sick animals have been fewer in number, and generally the diseases met with were of a less serious nature. While no complete records are kept relative to the treatment of many of the trivial ailments, in the more important cases the sick reports are carefully recorded and filed, so that we have already collected considerable data concerning the diseases of wild animals in captivity, which is of much value both practically and scientifically.

Operative Diseases.—To those humanely interested in the care of animals it will be of special interest to learn that our surgical work has been carried on under anæsthesia wherever it was possible to do so; for in addition to the humane sentiments involved, the perfect control of the animals is an essential in aseptic or antiseptic surgery in securing the safety of the operator and his assistants.

Chloroform and Squibbs ether are the general anæsthetics used, but when the operation is a minor one, and the animal can be easily controlled, local anæsthesia is induced by cocaine injections.

Operative diseases have been comparatively few in number and unimportant. Of injuries caused by cage or corral mates we have had a considerable number. The most serious ones during the year were those affecting the Altai wapiti, serval, Eskimo dog, "Bridge"; Florida deer, and the Russian brown bear.

The Altai wapiti doe was so badly gored by her mate that 14 interrupted stitches, over an inch apart, were necessary to close the wounds in the abdominal muscles alone. That this animal's life was saved is due in a large measure to the excellent care taken of her by the keeper in charge.

The serval's injuries, consisting of a fractured foreleg and badly lacerated muscles and ligaments, were inflicted by the big male ocelot, occupying an adjoining cage, which in some unaccountable manner succeeded in drawing the slender leg of the serval into its own cage and viciously attacking it. Only the fortunate arrival of a keeper prevented the leg from being destroyed beyond repair. After the animal was moved to the hospital the muscles were sutured together, the wounds dressed, and the limb placed in plaster bandages. Within five weeks, recovery was complete, and the animal was returned to its cage.

The Florida deer was badly prodded in the neck and about the head by one of the young bucks in the same corral. These injuries responded to treatment, making a slow but complete recovery.

A most peculiar injury was that to the Russian brown bear, which was received in a tussle with one of the big hairy-eared bears. In some manner one of the Russian bear's upper canine teeth was driven completely through its own lip. The frantic efforts of the bear to release the lip were not successful, but only served more firmly to fix the tooth in the muscle and skin.

The injured bear was quickly driven into a shifting cage and transferred to one of the hospital cages, when he was securely bound to the bars. After considerable manipulation of the lip and cheek by means of long and strong forceps the lip was disengaged from the tooth, to the manifest relief of the animal.

The injuries to the Eskimo dog, "Bridge," were especially severe and painful, and were produced by "Bridge's" enemy, the black coyote, which occupies the adjoining den. The injury consisted of a badly crushed left forefoot and leg, which kept him in the hospital for several weeks.

Traumatic Pericarditis.—The most valuable animal lost during the year was a buffalo cow, which was killed by the penetration of the heart by a piece of hay baling-wire 5 inches in length, producing the fatal disease of traumatic pericarditis.

The anatomical arrangement of the pericardium and its relation to neighboring organs renders the bovine of all animals the most susceptible to pericarditis due to the introduction of foreign bodies. As a result of this anatomical arrangement any sharply

pointed object capable of passing through the reticulum or second stomach and the diaphragm in the median planes would be directed toward and would enter the pericardial cavity.

The causes leading to foreign-body pericarditis are strikingly connected with the manner in which bovines feed. They swallow their food quite rapidly, submitting it later on to a second mastication in the course of rumination. This method of feeding results in the animal bolting its food almost without mastication; hence the possibility of swallowing foreign bodies.

These indigestible bodies pass with the food into the rumen or first stomach, and accumulate in the deepest portions of this receptacle. Owing to physiological contractions the lower wall of the rumen rises to the level of the orifice of its communication with the reticulum, and thus passes much of the material accumulated within to this organ.

On account of the peculiar arrangement of the mucous membrane of the reticulum, which is divided into polyhedral cells by folds studded with papillæ and serrated at their edges, it offers a fine field for the lodgment of pointed substances, particularly pins, nails, and pieces of wire. The sharpness of one extremity of the foreign body insures its passing readily through the tissues, and as the point is the part that offers least resistance it continues gradually to penetrate.

Sometimes the foreign body becomes implanted in the lower wall of the reticulum, and may be expelled directly through the medium of an abscess, thus resulting in a permanent gastric fistula. More often, however, the foreign substance penetrates the anterior wall of the reticulum and gradually works its way toward the diaphragm, impelled by the movements of the reticulum and other digestive compartments. It perforates the muscle and passes into the thoracic cavity, entering either the pericardium or the pleural sacs. Death is the inevitable termination, and occurs as a consequence of cardiac and respiratory syncope.

Tuberculosis.—When a generally received opinion is made the subject of a careful investigation it not infrequently proves to be erroneous. This is particularly true of tuberculosis among monkeys. The general public holds the belief—and, strange to say, it is sometimes indorsed by ill-informed members of the medical profession—that the majority of all monkeys in zoological collections die from tuberculosis. After careful investigation of the diseases of wild animals in captivity, we fail to find any reasonable excuse for so widely spread an error. There has been too much theory and too little observation and record of facts in

treating wild animals, and it is mere speculation to say from what diseases they might or might not die.

The value of our quarantine system has been especially evident during the past year in the Primates collection. Of the 3 cases of tuberculosis occurring in our collection during this period, 2 of them died while under quarantine control, thus well supporting our contention that the average case of tuberculosis is contracted before the animal reaches the Park, either under the unfavorable conditions often found in quarters of animal dealers or under the still more unhygienic surroundings prevailing in transit.

Since 1902 tubercular diseases among our animals have played a very unimportant part in the death-rate. This is due to (1) the careful selection of the animals purchased; (2) the hygienic buildings in which they are quartered; (3) the rigorous exclusion of all animals known or suspected to be tubercular from the cages of the uninfected; and (4) at the first signs of the disease in any of the animals separating them from the healthy, the cages washed and thoroughly disinfected after the removal of such animals, and before healthy ones are placed in these compartments.

When we consider the high percentage of tubercular diseases prevalent among domestic ruminants throughout the country, we have good reason to feel proud of our record of so few cases of tuberculosis among the hoofed animals generally. The only case of this disease occurring in our animals, other than the Primates, during the past two years was that of a sambar deer, which was found to be infected while still in quarantine, and was consequently destroyed.

Broncho-pneumonia in Sea Lions.—Of all the conditions met with among the Park animals this one, at the present time, seems the most difficult of solution. Considering the number of sea lions lost each year, especially during the winter and early spring months, it would seem advisable to provide a heated structure for them during these months.

That case after case of broncho-pneumonia can exist without the individual showing any evidences whatever of illness up to within a few hours of death is truly remarkable. In fact, in most cases the animal feeds as usual up to the day of its death, and otherwise shows no indications of ill health.

While we have found embryonic *filaria* in the circulating blood of many of the cases, still we do not feel sure that there are not other infective agents in the causation of this disease.

Parasitic Diseases; Intestinal Parasites.—Owing to our frequent and systematic employment of parasiticides and vermifuges, it has been possible to reduce to a minimum the deaths formerly induced by intestinal parasites. With the exception of two California sea lions that died from parasitic gastritis soon after their arrival at the Park, the deaths from parasites were among such small mammals as foxes, porcupines, and marsupials.

Verminous Broncho-pneumonia in Elk.—Broncho-pneumonia, caused by bronchial *filaria*, has always been a most serious factor in the deaths occurring in the elk herd. That there have been no deaths among these animals during the past year can be attributed: (1) To the fact that they have been taken from the infected range and kept upon macadamized corrals, where their food supply has been under the absolute control of the keeper; (2) also to the important fact of *the cutting off of one cycle of the parasite's existence*; for, since parasites like bronchial *filaria* must pass a certain stage (embryonic) of their existence in water or wet ground, these conditions must be changed before we can hope to get rid of such parasitic invasions.

Gastro-enteritis.—While gastro-enteritis still continues to occupy much of our attention, we feel that, especially during the past year, we have made much progress with this disease. Among the mountain sheep, where it has been most troublesome, the etiological factors are well understood, and without improved facilities for the treatment of the disorder we have been able to greatly reduce the loss from this disease, and with the improvements planned in the near future will eventually reduce the deaths from this affection still more.

We have found that the percentage of mortality for this disease is about the same as in domestic animals. Some of the milder cases, when discovered early and treated, recover within four or five days, but in violent cases death occurs at an early date. More commonly, however, the disease continues for ten to fifteen days before terminating in recovery or death. Several cases were lost which had merged into a chronic form lasting for several months, finally ending in a condition of anæmia and marasmus.

Of the many intestinal antiseptics and astringents used in the treatment of this disorder among these particular animals, it has been our experience that a much greater amount of success has been gained by the use of liquid agents rather than powdered ones. In the case of powders mixed with the food, if rumination is suspended—which is usually the case with animals suffering from this disorder—the medicine lies in the multiplex stomach

and rarely reaches the seat of the disease; but when the agent is in liquid form, it more quickly passes through the stomach and exerts the influence of its full medicinal action.

Gastric and intestinal disorders, traceable to errors in diet, have been practically eliminated from the Primates collection. Treatment of these affections has also become more certain and beneficial.

Cage Paralysis.—This troublesome disease among the Primates, which we described quite fully in our last year's report, still occupies our attention. While no definite etiological factor can at this time be attributed to the causation of this disease, still we take pleasure in recording the fact that we are unquestionably meeting with good results in the treatment of the disorder. Fewer cases have been met with during the past year than formerly, and our treatment as outlined in last year's report has been closely followed.

Injuries.—The deaths caused by injuries during 1905 were few in number, and may all be classified as *unavoidable*. During July and August two particularly vicious attacks were made by dogs upon our deer. These dogs, which succeeded in entering some of our deer enclosures, killed or otherwise seriously injured seven of the smaller deer.

Quarantine.—Our quarantine system, whereby new arrivals are isolated for a short period, and carefully observed before being placed on exhibition, continues to give excellent results. No cases of distemper, tuberculosis, actinomycosis, or other contagious or infectious diseases have been introduced into our collections since the effective quarantine was established.

Respectfully submitted,

W. Reid Blair,
Veterinarian.

January 1, 1906.



CALIFORNIA NEWT, *DIEMYCTYLUS TOROSUS*.

OUR COLLECTION OF AMPHIBIANS.

By RAYMOND L. DITMARS,

CURATOR OF REPTILES.

IN preparing this article the writer has had two objects in view: (1) to present a *résumé* of the more important Amphibians or Batrachians exhibited in the Reptile House and (2) to introduce a new and entirely successful line of animal photography developed by Mr. Elwin R. Sanborn, the Zoological Society's official photographer. The photographing of Batrachians through the polished glass side of an aquarium tank is certainly the most efficient method of reproducing the color values and external anatomical details of these creatures. In justice to Mr. Sanborn, the writer wishes to state that he considers this review of the collection as but attendant to the illustrations.

It is unfortunate that so many of the Batrachians constitute such poor objects for purposes of exhibition. The terrestrial forms require constant and abundant moisture. They must be provided with moss or damp sand; but when their cages are thus furnished the greater number of them utilize the soil as a burrowing ground, venture forth only at night, and are never seen by the visitor. Cage after cage in the lobby of the Reptile House contains strikingly colored burrowing creatures that are occasionally exhumed by the keepers for examination by specially interested students. In these cages are many species of salamanders, burrowing toads, and tree-frogs that cling to the under sides of leaves in dense masses of foliage.

The most satisfactory forms for exhibition are the truly aquatic species and the frogs. The former may be displayed in aquaria and the latter in shallow tanks. The larvæ, or tadpoles, of all the species are lively and attractive. Our aquaria are now occupied by the American Congo "Snake" (*Amphiuma means*), the Siren (*Siren lacertina*), the Mud Puppy (*Necturus maculatus*), the Hellbender (*Cryptobranchus allegheniensis*), and the Japanese Salamander (*C. maximus*). The showy, larval form of the Tiger Salamander (*Amblystoma tigrinum*), often called the Axolotl, is also an aquarium exhibit. These aquatic forms are now grouped at the north end of the turtle crawl, and provided with large labels. The frogs are arranged in a separate series, and above

the tank of each species is a large printed label behind glass. In combination with each tank of frogs is a jar containing the tadpoles of the respective species. Thus exhibited, the Batrachians form an important feature in the collection of cold-blooded animals.

As our collection of Batrachians has stood during 1905, we find the following instructive series:

ORDER *URODELA*—THE TAILED BATRACHIANS.

Family *Salamandridæ*	*Salamandra maculosa*	Fire Salamander.
	Amblystoma opacum	Marbled "
	" *tigrinum*	Tiger "
	" *punctatum*	Spotted "
	Spelerpes ruber	Red "
	" *bilineatus*	Two-lined "
	Plethodon glutinosus	Slimy "
	" *cinereus*	Gray "
	Desmognathus fusca	Dusky "
	Diemyctylus torosus	Pacific Newt.
	" *viridescens*	Common "
	Diemyctylus viridescens var. miniatus	Red "
" *Amphiumidæ*	*Cryptobranchus alleghenensis*	Hellbender.
	Cryptobranchus maximus	Giant Salamander
	Amphiuma means	Congo "Snake."
" *Proteidæ*	*Necturus maculatus*	Mud Puppy.
" *Sirenidæ*	*Siren lacertina*	Siren.

ORDER *ECAUDATA*—THE FROGS AND TOADS.

Family *Ranidæ*	*Rana virescens*	Salt-Marsh Frog.
	" *palustris*	Leopard "
	" *temporaria*	European "
	" *draytoni*	Drayton's "
	" *virgatipes*	Brown "
	" *sylvatica*	Wood "
	" *clamata*	Common "
	" *catesbiana*	Bull "
" *Hylidæ*	*Acris gryllus*	Cricket Frog.
	Hyla pickeringii	"Peeper."
	" *versicolor*	Gray Tree Toad.
	" *regilla*	Pacific " "
	" *pulchrilineata*	Banded " "
" *Bufonidæ*	*Bufo lentiginosus americanus*	Common Toad.
	" *valliceps*	Crowned "
	" *campactilis*	Texas "
	" *alvarius*	Green "
" *Pelobatidæ*	*Scaphiopus holbrooki*	Spade-foot Toad.



CONGO "SNAKE," *AMPHIUMA MEANS*.

THE URODELA, OR TAILED AMPHIBIANS.

Specimens of the Congo "Snake" (*Amphiuma*) and the Giant Salamander (*Cryptobranchus*) have thrived for the past six years in the Reptile House in aquaria of stationary water. The Mud Puppy (*Necturus*), the Hellbender (*Crytobranchus*), and the Siren (*Siren*) do best in running water. Of these, the Mud Puppy imperatively requires clear, running water to aërate its feathery gills. The development of the larvæ of the salamanders and newts is indefinitely retarded by a steady flow of cold water, and hence under such conditions they make lasting and satisfactory exhibits of the phases they represent.

Our specimens of *Amphiuma* have displayed interesting habits. When collected they were dug out of the mud in a Florida swamp, and shipped north in pails of damp moss. Inasmuch as specimens that have for some time been burrowing in the mud above water-line show considerable distress if abruptly confined in the deep water of an aquarium, these examples were placed in a tank holding but an inch of water. Day by day the height of the water was slowly increased, and gradually they became accustomed to its pressure, and introduced it into the aërating passages. One of the specimens was persistently restless, keeping its snout above the surface. It explored all corners of the mesh covering with the strength and activity of a snake, and was rewarded in finding a weak spot. During a long drought in July this animal escaped. The writer instituted a thorough search, expecting to find a shrivelled carcass not far away; but nothing was discovered. Late in August, after a heavy thunderstorm, our lost specimen was found crawling across the service road. It was headed from the tool house, under which building it had prob-



MUD PUPPY, *NECTURUS MACULATUS*.
A permanently aquatic species.

ably been living. Though plump, and apparently well nourished, it had met with a peculiar accident. Its four diminutive limbs were missing, possibly worn off in a strenuous endeavor to burrow into stony soil.

That specimen was gradually introduced to an aquatic life, and finally placed in a large aquarium with several others of its kind. There it began to feed voraciously, and within four months' time had replaced the two pairs of limbs. The members of the second set were fully as long and perfect as the original appendages.

While greedy and carnivorous, these Congo "Snakes" seldom attack each other. They consume fair-sized frogs and fishes entire. The swallowing process is largely performed by suction. As the animal approaches the prey and opens its jaws to seize it the ill-fated creature appears to dart, of its own accord, into the batrachian's mouth. In six years the Congo "Snakes" have increased to about twice their length upon arrival at the Park. They are now of an unusual size for this species.

The Siren is another snake-like batrachian that has been induced to abandon its burrowing habits and live in an aquarium. Three 14-inch specimens, dug out of a swamp in Florida, were received at the Reptile House some months ago. They were readily introduced to deep water. Here, within a period of three weeks,



SIREN, *SIREN LACERTINA*



COMMON NEWT, *DIEMYCTYLUS VIRIDESCENS*.

the curious transformation of the gills took place. When first placed in the water their gill stalks were much aborted, appearing as mere stumps, with little or no traces of filaments. During the first week in water the animals often came to the surface for air. At the end of this time the gill stalks had become longer, and were well studded with short crimson filaments. The development of the gills increased until the filaments were as long and feathery as those of *Necturus*—the Mud Puppy.

The Siren is fond of small frogs, and consumes its prey in a manner that seems quite voracious for such a soft-bodied creature. When two individuals seize the same frog they spin in opposite directions, soon dismembering the animal.

Another observation relating to a transformation of the branchiæ of aquatic batrichians concerns the Mud Puppy (*Necturus maculatus*). Specimens received from cold lakes had very short gill stalks, and these were provided with a very rudimentary fringe—quite unlike the feathery branchiæ of the majority of specimens. In the comparatively warm water of an indoor aquarium, necessitating more elaborate processes for aerating the blood, a change

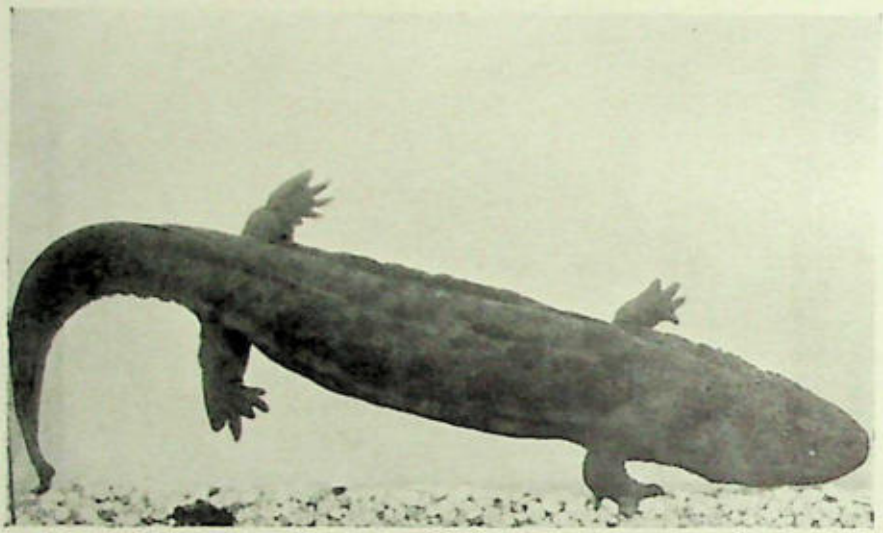


LARVA OF THE AXOLOTL, *AMBLYSTOMA TIGRINUM*

in the branchiæ of such individuals rapidly took place. A fluffy growth of bright crimson filaments appeared on the gill stalks, and the usual rich-hued, feathery tufts were present on each side of the head within a month. The writer has not only noted that specimens of *Necturus* soon die unless provided with steadily flowing water, but that an abrupt transfer of the animals from very cold water to that of a higher temperature, or *vice versa*, is often fatal. He would suggest that care be taken with examples received in the winter months. Instead of taking them directly from the shipping tank and placing them in an indoor aquarium it is advisable to take the temperature of the water of both receptacles, and, before the transfer is made, effect a slow change in the medium in which the specimens have arrived until it corresponds in temperature with that of the exhibition tank.

Among Mr. Sanborn's photographs are several of the showy California Newt (*Diemyctylus torosus*). A number of representatives of this species are on exhibition. As they are cannibalistic —greedily devouring examples of the Common Newt (*D. viridescens*) of the Eastern States—they are kept in a tank by them-

selves. The Common Newt is also exhibited. This animal is alleged to secrete a poisonous fluid in the pores of the skin. Theoretically, its bright colors have been described as "warning hues," to protect it against the ravages of water-snakes and fishes. The theory does not altogether hold good. Many of the snakes exhibited in the Reptile House have been fed upon newts when frogs were scarce. However, the European newts (*Triton*) come more within the line of argument. They have a rougher skin,



HELLBENDER, *CRYPTOBRANCHUS ALLEGHENIENSIS*.
A permanently aquatic species.

studded with minute, wart-like points. When handled their skin exudes a peculiar odor. Few snakes will eat them, and the larger frogs, that swallow every small moving object in their vicinity, usually die after making a meal of one of these creatures.

THE ECAUDATA, OR TAILLESS AMPHIBIANS.

It does not appear to be generally known that the males of most of the true frogs (*Rana*) may be at once distinguished from the females by the much larger ear-drum (*tympanum*), which appears as a round, exposed disc on each side of the head.

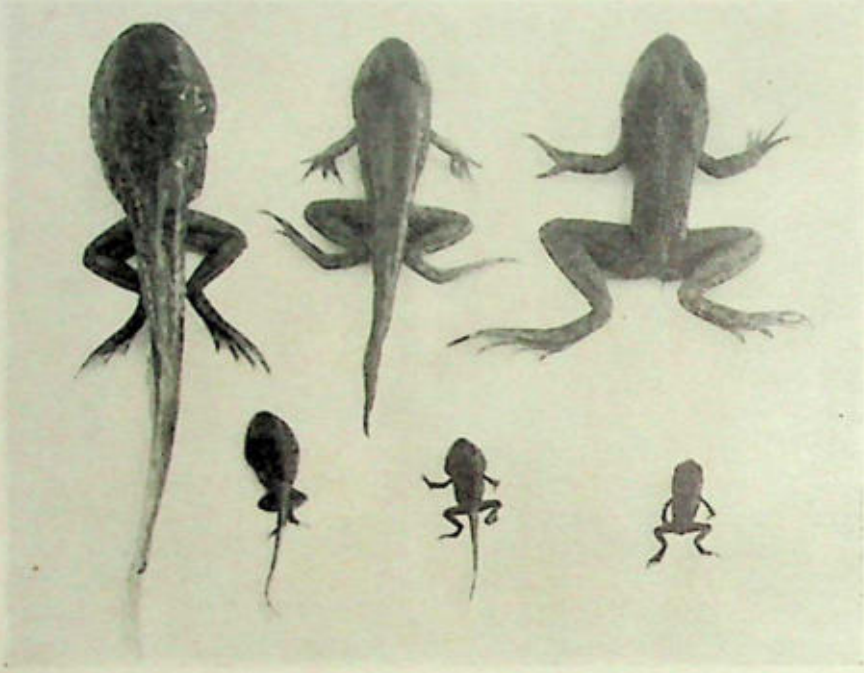
Between the North American frogs (*Ranidæ*) and the toads (*Bufonidæ*) there exists a wide degree of difference in the time of transformation from the tadpole to the perfect animal. The semiaquatic frogs, like the Bull Frog (*R. catesbiana*) and the

Pond Frog (*R. clamata*) live about two years in a larval state. The Wood Frog (*R. sylvatica*), a terrestrial species, undergoes its metamorphosis within the course of a single warm season. Though the latter species transforms from tadpole to perfect animal in a much shorter time than the semiaquatic frogs, it is quite tardy as compared with the Toad (*Bufo*). Strictly terrestrial, except during the breeding season, the latter creature completes its transformation, from the appearance of the egg to the fully developed land animal, within two months. The tadpoles of the toads never reach any but a diminutive size, and the young animal is very small. With the semiaquatic frogs the tadpole may grow to a length of six inches. The difference in size between these land and amphibious species is clearly shown in the photographs.

It appears that Nature has hastened the transformation of the terrestrial species as a matter of necessity. They lay their eggs in temporary bodies of water, left by the spring freshets and rains. Such pools evaporate during the summer. The aquatic species deposit their eggs in the permanent bodies of water about which they lurk. Moreover, the ponds and streams fed by permanent sources are colder than the ditch or lowland pool selected by the toad, and temperature plays an important part in the growth of the batrachian larva.

The greater number of frogs and toads have an intense fear of snakes. A brown snake (*Storeria*), barely larger than an earthworm, will cause a bulky pond frog or a big toad to cringe, point its snout downward, then puff up prodigiously. Most of the bull frogs in the Reptile House exhibit quite different habits. If a snake of moderate size (about one and a half feet long) be placed in their cage it is seized at once. Despite its struggles it is drawn into the capacious interior of the frog, partly by the muscular action of the throat and partly by repeated graspings of the forefeet. When placed in a cage containing several striped snakes one of these voracious frogs exhibited absolutely no fear, but gorged himself to the limit of his very elastic capacity.

During the summer months the collection of frogs and toads is supplied with an abundance and variety of food that as far as possible corresponds to what such creatures obtain in a wild state. Each day a keeper is assigned to "sweep" the meadows bordering the aquatic mammals pond for an hour or more. This man is provided with several glass jars and a large sweeping net, consisting of a stout iron ring, on a short handle, provided with

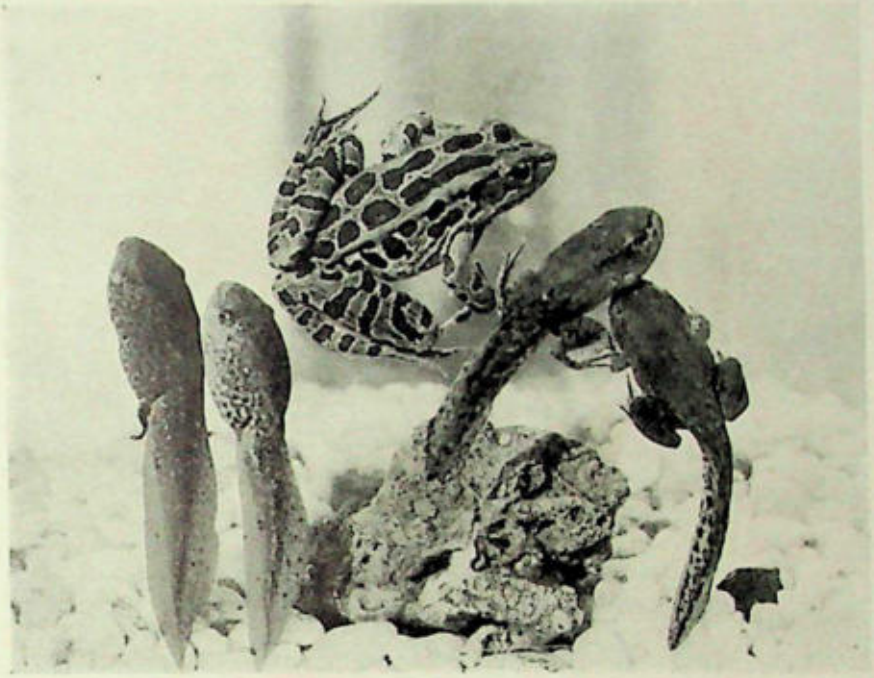


TRANSFORMATION OF THE POND FROG AND THE COMMON TOAD.

While the adults of both species are of much the same size, there is an enormous difference in the size of the young, perfectly developed animals as they leave the water. The frog requires two warm seasons to complete its transformation; the toad transforms within three months.

a heavy sail-cloth bag. Swinging the net heavily through the long grass a miscellaneous lot of insects is gathered. Among these are grasshoppers, small beetles, spiders, and the larvæ of various butterflies and moths. For very delicate species of toads, frogs, and salamanders many soft-bodied caterpillars are obtained by taking an umbrella, holding it under the bushes and the low branches of trees, then beating the latter vigorously with a heavy stick. In winter our toads and frogs subsist largely upon meal-worms.

Among the five species of frogs found locally, one—the Leopard Frog (*Rana palustris*)—exudes such an irritating secretion from the pores of the skin that few snakes will eat it. To the more greedy reptiles, which will devour them, the penalty is a much-inflamed mouth and throat. The Leopard Frog abounds in areas infested with frog-eating snakes, while the other species of *Rana* are decidedly thinned out. The poisonous secretion is intensely



TRANSFORMATION OF THE LEOPARD FROG, *RANA PALUSTRIS*
This local species exudes a poisonous secretion from the skin. Few snakes will eat it.

bitter. It has a strong odor which might be compared to very rank butter.

It is peculiar that this strikingly colored frog cannot be kept in captivity unless provided with cold, running water. If during the summer months it is placed in a tank containing stationary water death usually results within forty-eight hours. Fortunately this is not the case with the closely allied Salt-Marsh Frog (*R. virescens*), another local species. To a slight extent an exudation from the skin may be noted with this species, but snakes eat it readily. Salt-Marsh Frogs abound in the Newark Meadows, and during the winter months several thousand of them are received at the Reptile House to make up the deficiency in other food. They are raked out of the mud after the ice has been broken over shallow water.

During 1905 eight species of frogs were exhibited in the Reptile House. Of these, the most striking was Drayton's Frog (*R. draytoni*) from the Pacific Coast region. This specimen often changed color, and during some of its phases displayed a



TREE TOAD, *HYLA ARBOREA*.
A European species.

delicate shade of coral pink. Another interesting frog was presented to the Society by Mr. William T. Davis. It represents a species found only in a small area in southern New Jersey, and is technically known as *Rana virgatipes*, Cope.

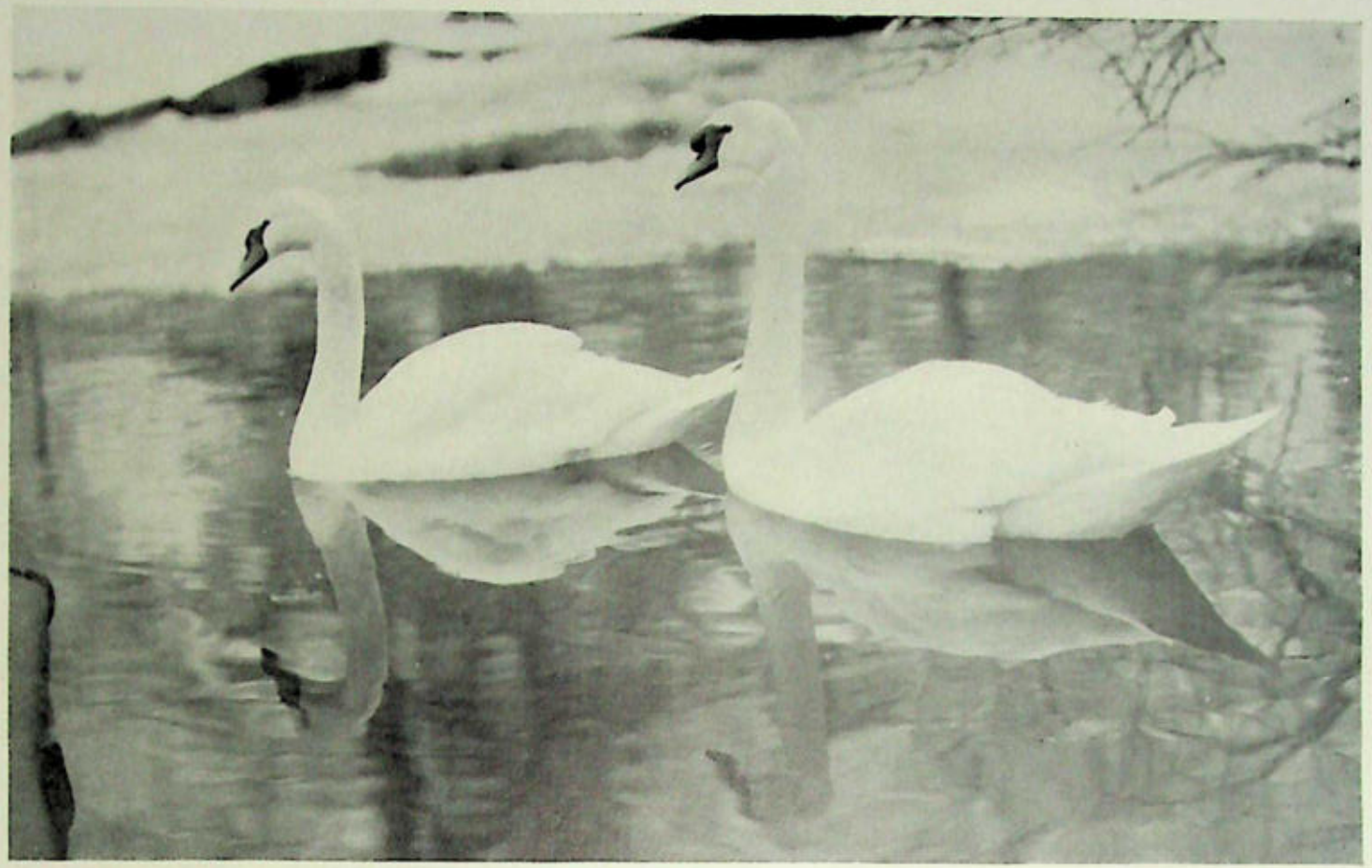
The Tree-Frogs or Tree-Toads (*Hylidæ*) are well represented in the collection, and range in size from the tiny "Peeper" (*Hyla pickeringii*)—the forecaster of spring—to a big West Indian species that preys upon tree lizards.

Among the toads the most interesting specimens represent a giant species (*Bufo agua*), inhabiting Mexico, Central America, the West Indies, and northern South America. These big, flat-bodied creatures have an enormously developed gland behind each eye and numerous warty points scattered over the back. When the larger head glands are compressed fine jets of a sticky white fluid are ejected some six or eight inches. Quite by accident the writer discovered that this secretion is intensely bitter to the taste. Until a comparatively recent date nothing definite was known about the secretion of such glands, but it has now been demonstrated that if this fluid is injected into the blood of such small animals as guinea-pigs and rabbits the symptoms of poisoning

are at once apparent, and death speedily follows. The symptoms are similar to those described as due to the use of digitalis, and appear to affect both the heart and the nerve centres.

All of the true toads are supplied with these venom-secreting glands. Our Common Toad (*Bufo lentiginosus americanus*) is a good example. A dog rash enough to seize a toad courts immediate trouble. It soon foams at the mouth, and from the champing of its jaws it is very liable to excite suspicions of that dread disease, hydrophobia. The writer once saved the life of an alleged "mad dog" that was pursued through a village street. His opinion, in judging the animal to be the victim of a toad, was based upon an accidental observation of the same dog but a few minutes before, when it was quietly nosing about a stone pile. The dog was confined, and for fully an hour seemed to be in much distress. Its jaws seemed paralyzed. Later on it fully recovered its normal condition, and was no longer a "mad dog," fit only for speedy destruction.

In the Park collection are several Spade-Foot Toads (*Scaphiopus holbrooki*) from southern New Jersey. In external structure they differ from the common toad by their smoother skin and less prominent glands behind the eye. The pupil is vertical (cat-like) instead of horizontal, as in the common batrachian. These animals are persistent burrowers, and embed themselves to the full depth of the gravel in their cage. They receive their popular name from a spade-like process on each hind foot; but the writer has noted a similar process, and considerably more developed, on many examples of the common toad, which are quite as expert in burrowing as the "Spade-Foot," though less inclined to do so.



MUTE SWANS.

THE SWANS.

By C. WILLIAM BEEBE,

CURATOR OF BIRDS.

GENERAL ACCOUNT.

FROM the time of Homer down to the present day swans have been surpassed by no other wild birds except eagles in the extent to which they have entered into the folk-lore, literature, and history of mankind. Until we have made a careful study of the annals of the past, we have no idea how many stories, myths, and legends have grown up about the swan. One of the largest and most graceful of all winged creatures, of so conspicuous a hue, and coming annually from the mysterious north, to which it later returned, we realize that there was abundant reason for the notice which was accorded it.

Like all other conspicuous objects in nature the swan, in olden time, played a prominent part in religious ceremonies, being considered either as an actual god, or feared and propitiated as a bird of prophecy. The shamen of the East, the wizard men of Lapland, and the medicine men of our Indians all prized a feather or other portion of this bird as a worthy talisman and an accompaniment of their magic paraphernalia.

It is said that in the year 1304 King Edward I of England took a solemn oath on two beautiful swans. Doubtless the idea was handed down to his time from some ancient pagan worship, and even to our own day we may hear among New England farmers "I swan!" as an exclamation of surprise. This is one version of the origin of the expression; while other authorities give a more prosaic explanation, stating that it is merely a euphemistic variation of swear.

Going back millions of years, before the first human being beheld and wondered at one of these beautiful white creatures, we have but little clew to the ancestral evolution of the group of swans. Although as to size swans are a well-marked assemblage, they differ on the whole so slightly from ducks and geese that

they have been accorded the value only of a subfamily, *Cygninæ*, in the great Order *Anseres*.

To-day only seven species of swans inhabit the earth,* and of the tens of thousands of swans which must have lived and died in the past, fragmentary bones of but four or five have been discovered embedded in the rocks of the Pliocene and Pleistocene periods. These fossils have been found in caves in Belgium and in Malta, and remains have also been discovered in Oregon and in New Zealand. The Falconer Swan of Malta was a giant among swans, being said to exceed by one-third any of the living species. South America seems to have been well suited to the maintenance of generalized types of birds, such as the seriema and screamer; and in this matter of swan relationship we find some help in a bird from that continent called the coscoroba duck, goose, or swan, as we prefer. Although perhaps closer to the geese, yet this bird possesses a number of interesting swan-like characteristics, which place it in an intermediate position. It feeds on land, however, has its lores feathered, the tips of its primaries black, and frequently utters a loud, rather musical call—something like chuck-cha-caw!

Although swans are so preëminently aquatic in their habits, yet one of the birds closely related to them on the side of the geese is the semipalmated goose of Australia, perhaps the most terrestrial of all its family, and which in consequence has all but lost the webs between its toes. So much for the relationship of the swans.

The seven living species of swans are most conveniently treated in three groups: First, the Black Swan of Australia; second, the Black-Necked Swan of southern South America; and third, the remaining five species of pure white birds—the Whooping, Bewick, Whistling, Trumpeter, and Mute Swans—inhabiting the arctic regions of both hemispheres. It is interesting to note that none of the species inhabits the tropics. The Black Swan is accorded a genus of its own—*Chenopsis*; but the other six are all grouped together as *Cygnus*.

With our present slight knowledge it is idle to speculate upon the origin and former distribution of the swans, especially of the southern species. The contiguous boreal distribution of the five arctic birds, with occasional crossing into each other's territory, accounts for the slight differences existing between the three species of the Eastern and the two of the Western Hemispheres.

* The collection of swans in the New York Zoological Park is now complete, all seven species being on exhibition.

Consideration of the evolution of color in this group reveals several perplexing problems. Like other arctic birds, such as the gyrfalcon, snowy owl, ivory gull, and ptarmigan, all the northern swans are white in their adult plumage; but if this be a protective character it requires a special definition. Feeding on organic matter, which they glean from shallow water, any question of aggressive coloration is, of course, absurd. Unlike the ptarmigan, swans are birds of strong migratory habits, and although breeding in the far north, yet their nests are not among ice and snow, but in the grass and reeds near water. So the white color would seem to be, instead of a protection, an actual adventisement of the bird's whereabouts. These great birds are well capable of defending themselves against any foe of moderate size, striking with the hard bend of the wings, blows of remarkable force and precision. When we consider, too, the usual open character of the country in which these birds spend their lives—open arctic tundras in the north, larger bays along the sea-shore when in more southern latitudes—and the unusually keen senses of sight and hearing with which these birds are endowed, we realize that the white color of the plumage may have come about by the birds' very immunity from danger.

Of course in this connection we must ignore man. Such long established and slowly evolved features as the colors of wild birds have for their causes, conditions which long antedate the comparatively recent and abrupt dominion of man. When a great swan, swinging across the sky in all his glory of wild strength, is smitten by a shower of lead from a hidden blind; or when, rendered helpless by the simultaneous moult of all their flight feathers, a whole flock is surrounded by nets, and old and young together slaughtered by the barbarous Eskimo, it is because these birds are unable to cope with such sources of danger, introduced into their environment within, comparatively speaking, but a few years.

Although the swans themselves are so conspicuous when on the nest, yet, when the sitting bird has left, the nest itself is very difficult to discover. It is a mere pile of rubbish, thrown carelessly together, and before leaving, the parent bird always carefully draws the lining of the nest completely over the eggs, so that they are well hidden from prying eyes. Under these conditions the conspicuous color of the birds and the great commotion which they necessarily make in getting under headway would all tend to distract attention from the exact position of the nest if the parents should retreat on the approach of an enemy.

But this is seldom the case, and a pair of breeding swans would launch themselves as fearlessly (and perhaps as successfully) at an attacking fox as at some inoffensive intruding duck. When, in addition to this fearlessness and great concern for the young, we realize that swans invariably mate for life, these beautiful birds take a high place in our regard. They are as admirable in their home life as they are pleasing to the eye.

The cygnets, as the young swans are called, are covered with a plumage of grayish brown, in all probability protective in character, as this color harmonizes well with the various subdued hues of the dead grass and mosses.

It is interesting to note that four of the seven species of swans have received names relating either to the quality of the voice or to a comparative lack of vocal expression. These are the Whistler, Trumpeter, Whooper, and Mute. Even the word swan, traceable to *swon*, is in some way correlated with the Latin verb *sonare*—to sound. To one who is familiar with swans in a wild state, or even with those kept in captivity, the cause of this important notice taken of the voice will be readily understood. The voice of each species differs, and even the notes of the sexes are unlike; but all are pleasant and melodious, while in the case of two species the tones are truly trumpet-like, and have as beautiful a resonant quality as have the tones from a French horn. This quality of the voice may be partly accounted for by the remarkable loop which the trachea describes within the breastbone, in some cases exactly paralleling the characteristic shape of a French horn. The Whooper, Whistler, Bewick, and Trumpeter possess this peculiarity, and the Black Swan in a lesser degree. In the Mute and the Black-Necked the windpipe is straight.

From time immemorial the "swan-song" has been famed in legend and in song; but until lately it has had no scientific confirmation. Writing of the Whistling Swan, Prof. D. G. Elliot says:

"The song of the dying swan has been the theme of poets for centuries, and is generally considered one of those pleasing myths that are handed down through the ages. I had killed many a swan, and never heard aught from them save the familiar notes that reach every one in their vicinity. But once, when shooting in Currituck Sound over water belonging to a club of which I am a member, in company with a friend, Mr. F. W. Legget, of New York, a number of swans passed over us at a considerable height. We fired at them, and one splendid bird was mortally hurt. On receiving his wound the wings became fixed and he

commenced at once his song, which was continued until the water was reached, nearly half a mile away. I am perfectly familiar with every note a swan is accustomed to utter, but never before nor since have I heard any like those sung by this stricken bird. Most plaintive in character and musical in tone, it sounded at times like the soft running of the notes in an octave.

'And now 'twas like all instruments,
Now like a lonely flute;
And now it is an angel's song
Which makes the heavens be mute.'

And as the sound was borne to us, mellowed by the distance, we stood astonished, and could only exclaim, 'We have heard the song of the dying swan.'

"I made inquiries among the gunners as to whether any of them had ever heard notes different from those usually uttered by the swan, when one was mortally wounded, and some said they had, and on my asking them what kind they were they described something similar to those we had heard and of which I have endeavored to give an idea."

The beak of a swan is horny and slightly hooked at the tip, enabling the bird to tear off mouthfuls of tough grass and reeds; while the posterior part of the beak is specialized for bottom feeding. Along the proximal portion of the inner sides are rows of horny tooth-like lamellæ, or plates, through which the mud is sifted, the water trickling out, and the organic particles being retained and swallowed. The tongue is another important factor in this method of feeding, its complicated structure and numerous recurved fleshy teeth aiding the beak in the function of sifting the food.

One peculiarity which swans share in common is, that with a large, heavy body they possess short legs and long necks. This is consequent on their feeding habits. They feed chiefly on the organic matter in the silt at the bottom of shallow ponds, and the roots of aquatic plants, but not being divers, as are some of the ducks, and lacking the long legs of wading birds, such as the flamingoes, they trust to their long necks, resting upon the surface and reaching down to the mud below. The length of neck of the swans, as long or longer than the body, is characteristic of this group; and in this connection mention should be made of the neck bones, twenty-two to twenty-six in number—more than are found in any other living birds.

The wings of a swan are of the broad, rounded type, made for

rapid wing beats, although strong enough to carry the great body of their owner hundreds of miles to the south and back again to the north every year. It has been estimated that with a slight wind in their favor a flock of swans can travel over 100 miles an hour.

The scalation of the leg and foot is reticulate, that is, in the form of very small scales rather than large, overlapping scutes. The three anterior toes are fully webbed, but the hind toe has only the faintest trace of a lobe. Its weak character and elevated position show that the swans must early have acquired their natatory and terrestrial habits, having long since lost all need for grasping a perch.

The chief defence of the swan lies in its wings, although it can pinch severely with the horny tip of the beak. But it can knock a dog senseless, and fell a man to the earth with one or two strokes of the hard wrist portion of its pinions.

In their relation to mankind the æsthetic has always predominated over the economical, although the flesh of the younger swans is very delicate, and swan's down is a valuable product of the plumage of these birds. Swans seem never to become wholly domesticated, like the pigeon, fowl, and duck, and unless their wings are clipped or pinioned are ever ready to be lured away by the clanging chorus of their wild kindred flying past overhead.

The care of swans in captivity is a very simple matter, the best regular food being a mixture of grains, such as whole and cracked corn, buckwheat, wheat, and barley. Pieces of bread thrown upon the water three times a week, and plenty of short grass or lettuce and young cabbage will keep the birds in perfect condition. They should also have Spratt's Patent Food soaked in hot water, occasionally, and of course an abundance of ground oyster shells and grit. If the birds are allowed the freedom of a wide range of water and grass they will forage successfully for themselves. The cygnets should be fed on Spratt's Patent, barley meal, chopped hard-boiled eggs, and green food.

THE BLACK SWAN.

Chenopsis atrata (Latham).

This unique swan is a native of Australia and Tasmania, and was formerly abundant in almost all parts of that region. It is of a very dark brownish-black color, except the primaries and secondaries, which are pure white. The bill is scarlet, crossed with

a band and tipped with white; the iris of the eye is brilliant scarlet, and the feet are black.

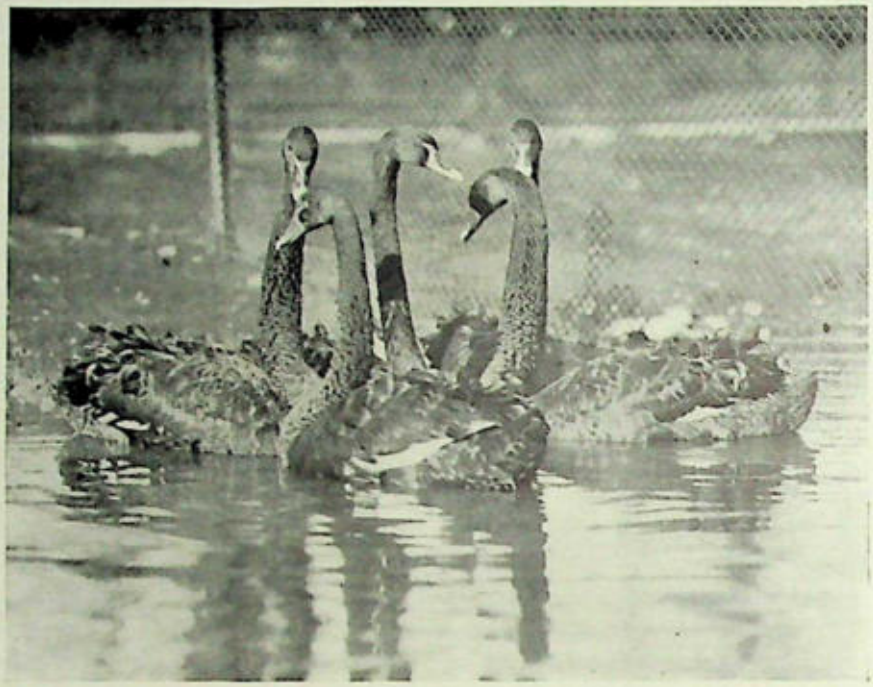
Early in the year 1697 the Dutch navigator Vlaming sailed into a great estuary on the coast of western Australia and up a river which was covered with multitudes of Black Swans. Previous to this the term "black swan" had come into current use as signifying something inconceivable, something contrary to all the laws of nature; "*Rara avis in terris, nigroque simillima cygno.*" So we can easily understand how the finding of this bird, succeeded by subsequent remarkable discoveries of other strange creatures in Australia, led to a widespread belief that in that land everything was topsy-turvy.

The Black Swan gathers together a large pile of sticks, leaves, and reeds, with a few feathers for a lining, and upon it lays from four to eight large greenish-white eggs. This rough nest is placed in a dense growth of reeds, or at the base of a tree far out near the centre of some shallow lagoon. In such a place, before the advent of man, the bird had little to fear, save from an occasional eagle, which might snatch up a cygnet, or from the several species of water-rats (*Hydromys*), whose depredations among both eggs and newly hatched young were doubtless far more to be dreaded. Both parents take turns in incubating, and woe to the nest which is left unguarded for a moment. The regular breeding season lasts from September to January. It is said that when the nesting lagoon dries up, the parents will lead the young overland to the nearest water, and always by night, in order to avoid the attacks of raptorial birds.

The dark color of the adult birds must assimilate well with the shadowy waters of the shallow lagoons, and whether of advantage as an active protective character or not, it is certainly a fact that the white spot formed by the flight feathers, when the wing is folded, is a perfect representation of a *hole* through the bird. When seen from a distance this white spot neutralizes to a remarkable degree the symmetrical bird-like appearance of the outline of the swan. On one or two occasions pure white individuals have been observed. The cygnets resemble young swans of other species in being brownish-gray in color.

Black Swans seem to have no regular routes of migration, but they are by no means wholly resident, for they make long journeys to the coast and irregularly across the country. They are fond of feeding in the brackish and salt-water swamps and lagoons along the sea-shore.

When flocks of several hundred of these swans are gathered



BLACK SWANS.

in a single estuary, and become suddenly frightened by the discharge of a gun, the sight is described as magnificent. The myriad particolored birds flap frantically along the surface until they attain momentum enough to rise; then they swing round, dividing into lesser flocks, or perhaps families. The scarlet bills of the birds fairly glow with their rich color, while against the dark vegetation the white wing feathers shimmer like flashes of lightning; but when the swift-flying birds are silhouetted against the sky their dark bodies spring into view, the long necks stretched far out, as they wing their way high overhead.

As is usually the case, the coming of white men marked the beginning of scenes of slaughter and extermination, and to-day the Black Swan, although protected by law, has been driven to the wildest portions of its haunts, and in Australia is doubtless doomed to speedy extinction. Indeed it is said that there are probably more of these birds in captivity in different parts of the world than are now living wild in their native country. We read reports of whalers sending many boats ashore and bringing back load after load of Black Swans, whose condition during the



BLACK SWANS AND CYGNETS.

From Living Animals of the World

period of moult is practically helpless, it being then an easy matter to row them down and to break their necks with an oar.

Another phase of man's dominion in the realm of the Black Swan is his introduction of this bird into New Zealand, that long suffering country, whose indigenous fauna and flora seems well on the road to extinction before the overwhelming advance of foreign importations. Separated as completely, geographically speaking, from Australia as that region is from the rest of the world, restricted competition has evolved in New Zealand no natural check to these creatures—mammalian and avian—which have spread like a ravaging fire, ousting the rightful inhabitants from forest and plain. The first Black Swans introduced were carefully protected by law, and, after the early difficulties in the way of adaptation to new conditions were overcome, they increased without check or hindrance.

Mr. E. F. Stead, who has personally witnessed present conditions in New Zealand, reports that swans may now be seen there in great flocks, sometimes of five and six thousand individuals. They are driving away all ducks and geese, not by actual aggres-

siveness, but more surely by preëmpting all feeding grounds and nesting places.

To mention a specific location, on Lake Ellesmere there are hundreds of swans nesting *throughout the year*. Every week many dozen eggs are brought into Christchurch, where they are supplanting the use of hens' eggs in bakeries and in private families. The birds are comparatively tame, notwithstanding the fact that all protection has been removed from them, and numbers are constantly shot wantonly, even while sitting upon their eggs.

As is the case with all other swans, these birds have been introduced in a semidomesticated condition into all civilized portions of the world, and they very often breed in capitivity, even when confined in a comparatively small enclosure. One pair is on rec-



HEAD OF BLACK-NECKED SWAN.

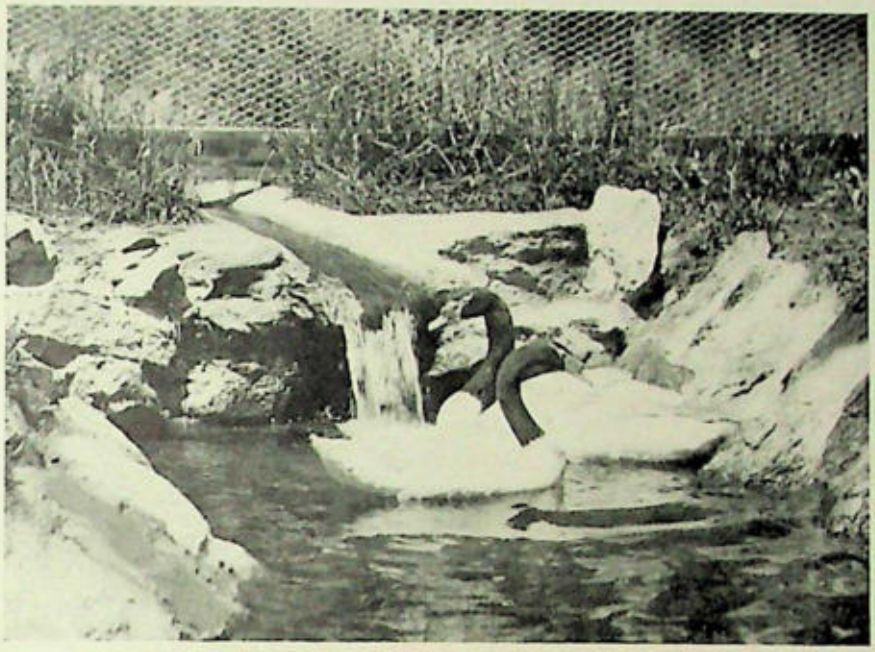
ord as having nested sixteen times in seven years, laying in all no less than one hundred and eleven eggs.

On account of the length and slenderness of the neck, and the majestic and easy grace with which the Black Swan comports itself, it may be accounted one of the most graceful birds in the world, and one well worthy of the utmost protection in its native home.

THE BLACK-NECKED SWAN.

Cygnus melanocoryphus (Mol.).

This bird is another aberrant form of swan—aberrant, however, only in the matter of color, for structurally it differs but little from the typical white arctic species. It is pure white,



BLACK-NECKED SWANS.

except for the head and the major part of the neck, which are velvety blackish brown. This is relieved by a line of white feathers about the eye, extending backward as a well-defined stripe across the entire head. While in the northern white species the bill is often decorated with bright yellow, in the Black-Necked, as in the Black Swan, the presence of a darker color in the feathers seems correlated with a change in the bill pigment from yellow to red. A full-grown bird of the present species has the cere or fleshy base of the bill swollen and enlarged above into a knob or an irregular bunch of caruncles stained a vivid scarlet. This bird is somewhat larger than the Black Swan, with a stouter, shorter neck, and, though more striking in appearance, is less graceful when swimming.

From the young birds we may, perhaps, get a hint of the development of color in this species. The white feathers of the body are tipped with rusty brown, and, still more significant, the tips of the primaries are chocolate brown. This may be a vanishing hint of a former closer relationship between this swan and the black wing-tipped coscoroba. Whether the presence of black in the plumage of the adults of this species and the Australian spe-

cies is merely a parallelism, or whether the former isolation of South America and its early connection with Australia are significant facts in the case, we can at present only conjecture.

Naturalists who have seen Black-Necked Swans in their native haunts have given no clew to the reason for their strange coloring; but if we look at one of these birds at some distance away across a stretch of water, as it swims along the shore, the magic with which, first the white body, then the black head and neck, blend with the changing environment is most interesting and significant. Our eyes show us alternately a headless body and a bodiless head; but when the bird comes out into clear open water the curving neck is constantly the conspicuous feature. It seems as if this alternative protective coloring cannot fail to be of vital assistance to the bird at some of the critical moments of its life. It is said that these birds prefer to keep close to the margins of ponds and lakes, where they find good feeding grounds.

The Black-Necked Swan is found on the lakes and lagoons of southern South America—Argentina, Chili, and Patagonia—where they sometimes congregate in flocks of several hundred. Indeed the late J. B. Hatcher reports seeing over a thousand swans upon one lake of moderate size. Excepting what Hudson relates we know but little of the habits of these birds. He says that owing to their heavy bodied, short-winged condition the noise which their wings make is remarkable—a loud rushing which can be heard a great distance away.

These swans experience such difficulty in taking flight, especially when suddenly frightened and away from the water, that the savage horsemen of the southern pampas occasionally ride them down and catch them by hand.

Black-Necked Swans begin to nest in July, and they seem to take great care in choosing a safe location. This is probably very necessary, as these pampas are the home of many predatory animals. Three to six cream-colored eggs are laid upon a firm pile of leaves and sticks, the foundation of which is the bottom of a swamp, sometimes in four feet or more of water, and among a thick clump of reeds. By swimming to and from the nest many dangers are avoided. One observer reports having seen a Black-Necked Swan swimming away from her nest with her young perched upon her back.

Strange to say, more than a quarter of a century before the discovery of the Black Swan, this South American species was first observed by a European, Narbrough having reported seeing

Black-Necked Swans on August 2, 1670, while sailing through the Straits of Magellan.

The bird is not uncommon in captivity, and occasionally breeds, but unless gradually acclimated it is apt to succumb to severe cold weather. It requires more careful feeding than does any other species of swan.

THE MUTE SWAN.

Cygnus olor (Gmel.).

This is the most common swan of European history and legend. Its common name is given because of its inability to give utterance to tones as loud or as musical as those which characterize its congeners; while its scientific name is from two Latin words, each meaning a swan. The bird is, however, far from being actually mute, and has a soft, not unmusical note. This beautiful swan, the commonest of all seen in captivity, ranges in a feral state over almost the whole of Europe, and as far east as central Asia. In winter it is found on the waters of northern India and Egypt.

The Mute Swan is pure white, with dull black feet and legs, and its most distinguishing characteristic, which at once sets it off from the four remaining species of white swans, is a large black knob, or tubercle, at the base of the bill. The lores, the knob, the base of the upper and the entire under mandible are black; the remaining part of the upper mandible being reddish orange. The female is similar to the male, although rather smaller, with a more slender neck and with the frontal knob less developed. This species reaches an extreme length of five feet.

The Mute Swan was introduced into England during the reign of Richard Cœur de Lion, and, although not indigenous, it has become so naturalized that full-winged birds show no inclination to leave.

Both sexes unite in gathering a large pile of reeds and other aquatic plants, two or three feet high and five or six across, in a hollow in the top of which the female lays from five to nine eggs, grayish olive in color. After five or six weeks of incubation the young are hatched, coming into the world clad in a thick down of sooty gray, which gives place to the first plumage of dark grayish brown. In the course of a year, or even a longer period, this, in turn, is gradually replaced by the white feathers of the adult.

The young, as is the case with all swans, seem to feed and swim instinctively. The parents are very solicitous about their

brood, and have been known to take the young birds upon their backs, after the manner of some species of grebes.

When several pairs of swans nest in close proximity to one another, each pair keeps carefully to the limits of some well-understood range. The parents associate with the young throughout the winter, but drive them away in the spring. These swans, like all others, feed chiefly upon water-plants, roots, leaves and seeds, insects, and the organic material which collects at the bottom of ponds. They also occasionally catch and devour small fish and crabs, as well as mollusks, when feeding along the coast.

Of the Mute Swan, Bewick quaintly but veraciously writes: "At the setting in of frosty weather the Wild Swans are said to associate in large flocks, and thus united, to use every effort to prevent the water from freezing; this they accomplish by the continual stir kept up among them; and by constantly dashing it with their extended wings they are enabled to remain as long as it suits their convenience in some favorite part of a lake or river which abounds with their food. The swan is very properly entitled the peaceful Monarch of the Lake; conscious of his superior strength he fears no enemy, nor suffers any bird, however powerful, to molest him; neither does he prey upon any one. His vigorous wing is as a shield against the attacks even of the Eagle, and the blows from it are said to be so powerful as to stun or kill the fiercest of his foes. The wolf or the fox may surprise him in the dark, but their efforts are vain in the day." There is no exaggeration in the account of the strength of a blow from a swan's wing. They have been known with one stroke to fracture a man's arm.

The inner flight feathers are large, and capable of performing a peculiar function. One may often see a Mute Swan progressing through the water without ever a stroke of the large webbed feet, the inner wing feathers being elevated to such a degree that they catch the breeze, sail-like, and carry the bird along with considerable rapidity.

It is interesting to observe the special conditions under which swans were formerly allowed to be kept. For not then, as now, could any one go to a dealer in birds and purchase at will one of these birds for $15.00 or $20.00. In the time of Edward I. no one but the king's son could keep a swan unless possessed of five marks rental. Stealing their eggs was punished with imprisonment of a year and a day.

Newton tells us that formerly in England the Mute Swan was much more abundant than at present, the cygnets being then

highly esteemed as a table delicacy. "It was under special enactments for its preservation, and regarded as a 'Bird Royal' that no subject could possess without license from the crown, the granting of which license was accompanied by the condition that every bird in a 'game' (to use the old legal term) of swans should bear a distinguishing mark of ownership (*cygninota*) on the bill. Originally this privilege was conferred on the larger freeholders only, but it was gradually extended, so that in the reign of Elizabeth upward of 900 distinct swan-marks, being those of private persons or corporations, were recognized by the royal Swanherd, whose jurisdiction extended over the whole kingdom." The largest swanery at present in England is the one belonging to Lord Olchester, where from 600 to 1,200 swans are kept.

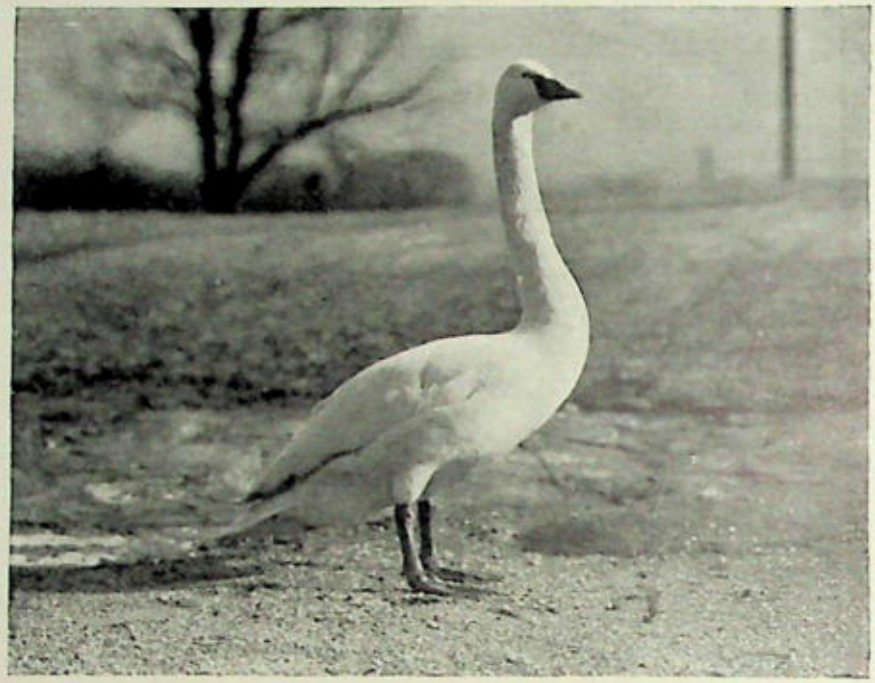
Mute Swans are very easily bred in captivity, and in our own country often begin to build their nests as soon as the snow has gone and the water is free of ice.

THE WHOOPING SWAN.

Cygnus cygnus (*Linn.*).

This is the species which ever since the days of the Iliad has been lauded for the beautiful musical clanging of its notes. No words or syllables can express the character of these tones, but the succession may be indicated by hoop-hooper-hoop—clang! The breeding range of this swan covers much of arctic Europe and Asia, including Iceland. In winter it ranges south over Europe, central Asia, China, and Japan, occasionally reaching Egypt. It also justly claims a place in the avifauna of our own hemisphere, as a number of specimens have been taken in southern Greenland, doubtless storm-blown, or perhaps individuals with unusual wandering instincts which have made their way from Iceland. It is said that these birds formerly bred in Greenland, but that they were exterminated by the Eskimo during the period of helplessness at the moulting season.

Pure white, like the Mute Swan, this species lacks the frontal knob, and differs in a number of other respects. Its neck is shorter, and its general carriage is so unlike that of the Mute that the two species are easily distinguished. The trachea, as mentioned before, enters the breastbone, where it describes a loop. In this, as in the three species to follow, the most reliable character for specific identification is the arrangement of color on the bill (see illustration between pages 174 and 175). In the



BEWICK'S SWAN

Whooping Swan the lores and two-thirds of the upper mandible (to below the nostrils along the sides) are brilliant yellow in color. The remainder of the bill is black.

Although in color and size the Mute and the Whooping Swans are quite similar, there is a very pronounced difference between the texture of the shell of the eggs of the two birds; that of the Mute being very coarsely granular. Under the microscope the specific differences are very apparent.

In general the nesting habits of the Whooping Swan resemble those of the Mute, the favorite sites being the half-frozen marshes or tundras of the far north. Four to seven eggs are laid, generally in May, and the cygnets are on the wing in August or September.

When on their winter feeding-grounds these swans are very shy and travel in small wedge-shaped flocks or families. Large individuals weigh from fifteen to twenty pounds. Mating for life, as do all the swans, they are very jealous of intrusion and are ever watchful and on the lookout for danger. As an instance of this, these swans for a number of seasons bred in the Zoological

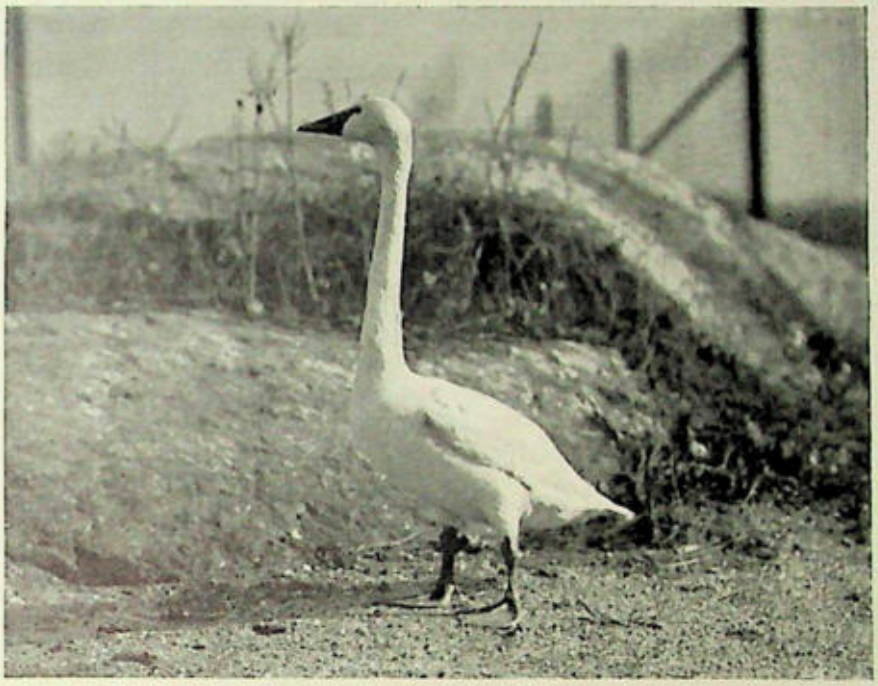


(The yellow spot on this individual whistler is of unusually large size.)

WHOOPING SWAN.
BEWICK'S SWAN.
WHISTLING SWAN.



TRUMPETER SWAN.
BLACK SWAN.
MUTE SWAN.



WHOOPING SWAN.

Gardens of London, and one year when the cygnets, only a few days old, were sunning themselves on the margin of an island a hungry carrion crow made a sudden descent and struck at one of the young birds. In an instant the old male Whooping Swan rushed up, seized the crow in its beak, and pulling it under water held the bird there until it was drowned.

THE BEWICK SWAN.

Cygnus bewicki (Yarr.).

Closely related to the Whooping Swan and for a long time confused with it is the Bewick Swan. Its habitat is much the same as that of the former bird, except that it has never been found in Greenland. Its breeding grounds are more to the eastward in Siberia, and it is found in England only during severe winters. In appearance it is considerably smaller than the Whooping Swan, and the yellow on the bill covers only the lores and the basal third of the upper mandible, not extending as far down as the nostrils.

The call note is a loud, deep whistle, very unlike the notes of

the Whooping Swan—another diagnostic character of this perfectly distinct species.

Bewick Swans migrate from the north in October and return to their breeding grounds in March. The nesting habits, time of incubation, and coloration of the cygnets are much the same as in the preceding species.

THE WHISTLING SWAN.

Cygnus columbianus (*Ord.*).

This and the following species of swans are both inhabitants of our own continent, and the present species is the New World representative of the Bewick Swan. It is larger in all dimensions, however, and it may be at once distinguished by the small amount of yellow on the beak, this being, in extreme cases (see illustration between pages 174 and 175), an oblong patch on the lores, extending from the eye to the junction of the mandibles. Usually it is much smaller, a mere spot of orange or yellow, smaller in circumference than a cent, in front of the eye. This often becomes much fainter in winter than later at the breeding season.

These swans breed in the boreal regions of North America. In winter they are scattered southward, more especially along the coasts, as far as California on the Pacific and North Carolina on the Atlantic seaboard. The birds range down the Mississippi Valley to the Gulf of Mexico.

Currituck Sound, North Carolina, is a famous winter resort for these birds, feeding grounds being abundant. It is there that hunters usually go for swan shooting. The dead birds for sale in our Eastrn markets are almost invariably of this species. The old birds are tough and hardly fit for the table, but the cygnets of the first or second year are tender and delicious, the meat being very dark, with but little "gamey" flavor.

On the coast of Alaska Whistling Swans begin to arrive from the south about May 1st, generally small flocks beating north through the late storms, stopping at spring holes, and biding their time until the snow and ice begin to disappear. They then scatter to their inland breeding places. A favorite nesting site is on some small island in an isolated mountain lake, where from three to six eggs are laid upon a pile of leaves and moss. It is very difficult to find the eggs when once the bird has left them, as she invariably covers them carefully with a loose layer of rubbish, differing in no way from the surrounding vegetation.

In July the young swans are led to some good-sized stream or body of water, where the critical period of moult is gone through, every flight feather being shed simultaneously, leaving the birds stump-winged and helpless for several weeks. The natives of Alaska, besides using swans for food, utilize the skin of the leg and foot for small pouches, and by cutting off the wings and legs and skinning the bird entire a complete garment for a small child is obtained, warmer than any made to order.

If the birds escape the myriad dangers, or rather if they evade their most deadly foeman—man—they gather into flocks in mid-September, restless with the spirit of migration. Of a lake in Alaska, to which the gathering clans of the swans invariably resorted in the fall of the year, Mr. E. W. Nelson writes: "About twenty miles from Saint Michael, toward the Yukon mouth, is a small shallow lake, about one-fourth of a mile in diameter, which is grown up with 'horse-tails' (*Equisetum*). This lakelet forms a general rendezvous for all the swans of that vicinity during the summer and fall. During the breeding season they gather there to feed, and the males make it their home. In autumn, as the old birds regain their wing feathers and the young are able to fly, all congregate here, so that I have rarely passed this place without seeing from 100 to 500 swans gathered in this small area. Their combined cries can be heard for three miles or more, and make a grand and melodious concert.

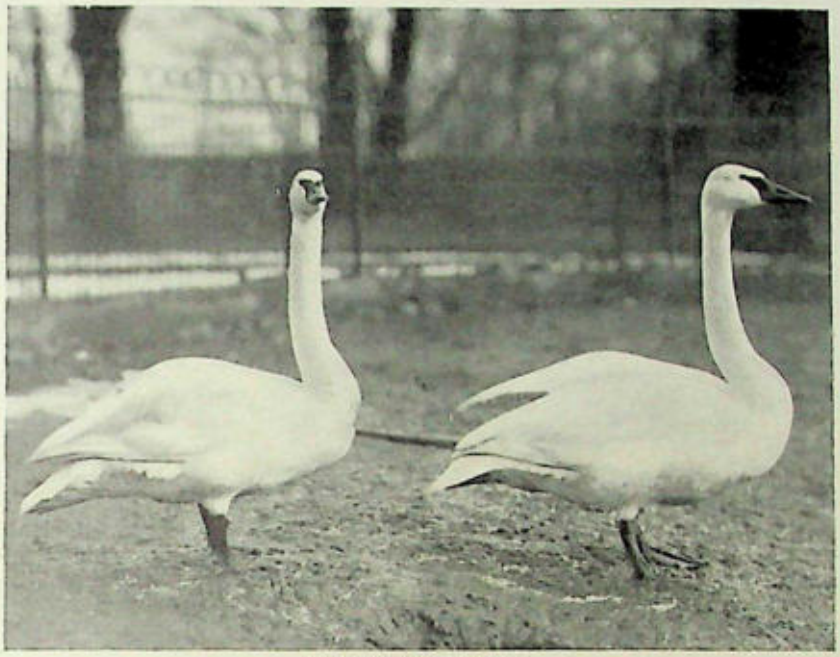
"I have frequently sat and listened with the keenest pleasure to the organ-like swell and fall of their notes, as they were wafted on in rich, full harmony, then sank to a faint murmur, not unlike that of running water. A series of low hillocks afforded a cover by which the lake could be approached, and it was a majestic sight to lie here on a mossy knoll and gaze on the unsuspecting groups of these graceful birds as they swam back and forth, within rifle-shot, not suspecting our presence. Their snowy bodies and beautiful forms, as I last saw them in this far-away spot, will linger long in my mind as one of the most unique and interesting sights of my experience in the north. The report of a rifle is sufficient to change the scene into wild confusion. A chorus of confused cries and the heavy beating of hundreds of mighty wings is heard. A cloud of white rises, breaks into numerous fragments, and the birds scatter over the wide flats on every side."

About October 1st the birds begin to leave for the south, "gangs" of ten to thirty passing over continually, all keeping up a continuous high, mellow clanging.



TRUMPETER SWANS AND NEST.

It is said that hunters usually see an average of two birds of the year with their parents, this perhaps indicating the usual number brought to maturity. Sportsmen along the shores of the Chesapeake see the first Whistling Swans, about the first week in November, coming in small flocks, passing high in the air over the beach and the waters of the ocean. The long necks are stretched straight out, the great wings beat steadily, and the beautifully clear notes come down through the air, answered by the leaders of other flocks. Such an arrival is well described by Prof. D. G. Elliot: "Beautiful indeed the splendid birds appear, sailing onward in the blue sky, the bright rays of a midday sun glancing from their immaculate plumage, causing it to glisten with the sheen of burnished silver, or, if the birds are passing directly overhead, the light streaming through the feathers of the wings reflects on the under side and also on the body a glow like the faint blush on the petals of a rose. With redoubled cries the glad birds welcome the well-known waters of their winter home, and gradually lowering themselves from their lofty altitudes turn head to wind, and checking their momentum by a few rapid wing beats launch themselves into the waters of the sound. Should there be any swan in the vicinity, and the newcomers are the



TRUMPETER SWANS.

fewest in number, they swim to them, otherwise little attention is paid to other flocks.

"Their journey having provided them with sharpened appetites, they soon commence to feed by immersing their heads and dragging up the grass from the bottom. If the water is deeper than the length of the neck, the hinder part of the body is tilted up and held in position by paddling with the feet until a quantity of tender grass is torn from the bottom. While feeding, usually one or more birds keep a lookout for approaching danger, and should any be descried a warning note is sounded and the flock begins to swim away, heading to windward if possible."

It is probable that four or five years pass before the perfectly immaculate adult plumage is assumed, the dull gray coat of the first year changing, moult by moult, to a lighter hue.

THE TRUMPETER SWAN.

Cygnus buccinator (Rich.).

This is the largest swan in the world, sometimes measuring over five and a half feet from head to tail, and with a spread of wings of eight feet. It occasionally reaches a weight of thirty pounds.

The trachea is even more convoluted than in the Whistling Swan, and it well deserves the Latin appellation *buccinator*—the trumpeter—its rick, mellow notes possessing a peculiar sonorous quality characteristic of the species. The lores and beak are black, unrelieved by any bright color whatever, and this, together with the great size of the bird, makes this swan easy to identify.

Unlike the Whistling Swan, the Trumpeter haunts by preference the interior of North America, breeding from the northern United States northward, and occurring rarely, and only as a straggler, on the Atlantic Coast. It migrates southward along the Pacific Coast and down the Mississippi Valley.

The nesting habits are similar to those of the Whistling Swan, the five to seven chalky white eggs being of unusually large size measuring about four and a half by three inches. The Trumpeter, like the Whistler, feeds on aquatic grasses, shrimp, mollusks, and what organic substances it can gleam from the bottom of shallow marshes and bays.

This species migrates northward somewhat earlier than does the Whistling Swan, and occasionally the late blizzards almost freeze the birds, compelling them to crowd into the narrow open water at the foot of falls or rapids, where they fall easy victims to the Indian trappers.

This species breeds readily in confinement, but care must be taken to give the swans plenty of room, as they are liable to kill other birds which approach their nesting site.

DOUBTFUL SPECIES.

The so-called Polish Swan (*Cygnus immutabilis*) is merely a quasi-albino race of cygnets of the Mute Swan.

Cygnus unicini is, doubtless, the immature of the same species.

David's Swan (*Cygnus davidi*), founded on a single specimen now in the museum of the Lazarist Mission in Pekin, is probably only a variant of the Bewick Swan.

THE WICHITA BUFFALO RANGE.

A REPORT TO THE NEW YORK ZOOLOGICAL SOCIETY OF AN INSPECTION OF THE WICHITA FOREST AND GAME RESERVE, IN OKLAHOMA, TO SELECT A SUITABLE LOCATION FOR A BUFFALO RANGE.

By J. ALDEN LORING.

ON November 21, 1905, I left New York, with instructions from the New York Zoological Society to proceed at once to the Wichita Forest and Game Reserve, in Oklahoma, and, if possible, select a tract of land suitable for a range on which to confine and propagate American bison.

Arriving at Cache, Oklahoma, on November 24th, I spent the three following days riding over the reserve. These three trips, together with two others that were made to ride over the boundary line and explore the territory that was finally chosen, covered about 150 miles. I think I am safe in saying that all of the country within the reserve that is suitable for a buffalo range was either ridden over, or observed carefully from the tops of mountains. Whenever a location met with approval, it was afterward inspected closely.

Although I was charged with locating a buffalo range only, the pasturage and character of the country were so admirably adapted for other big game mammals that it was possible to locate a site suitable for elk, deer, and antelope as well, and that without in the least interfering with the rights of the buffalo. In a certain large area, wherein prairies, hills, gullies, ravines, and mountains occur, there is ample opportunity for animals to escape from the attacks of each other.

The Buffalo Range, as it is now mapped, embraces about 12 square miles. It is situated in the western centre of the Wichita Reserve. Although there is enough grazing land outside the range to supply the cattle now feeding there, the preserve includes the choicest grazing sections within the reserve. If at any time it is deemed necessary to enlarge the range, it may be done by including the land north of the northern boundary.

The range is 12 miles northwest of Cache and 24 miles west of Fort Sill. Unfortunately there are no buildings on it that can be utilized by caretakers or as storehouses.*

With the exception of a valley three-fourths of a mile wide, which leads out of the southeast corner of the range, and a few narrow valleys of little consequence, the range is practically surrounded by mountains, hills, and ridges, which afford protection from storms. These mountains are from 100 to 600 feet high, and while the boundary line does not always run at the foot of them, the peaks are so close that as a whole they shelter the range.

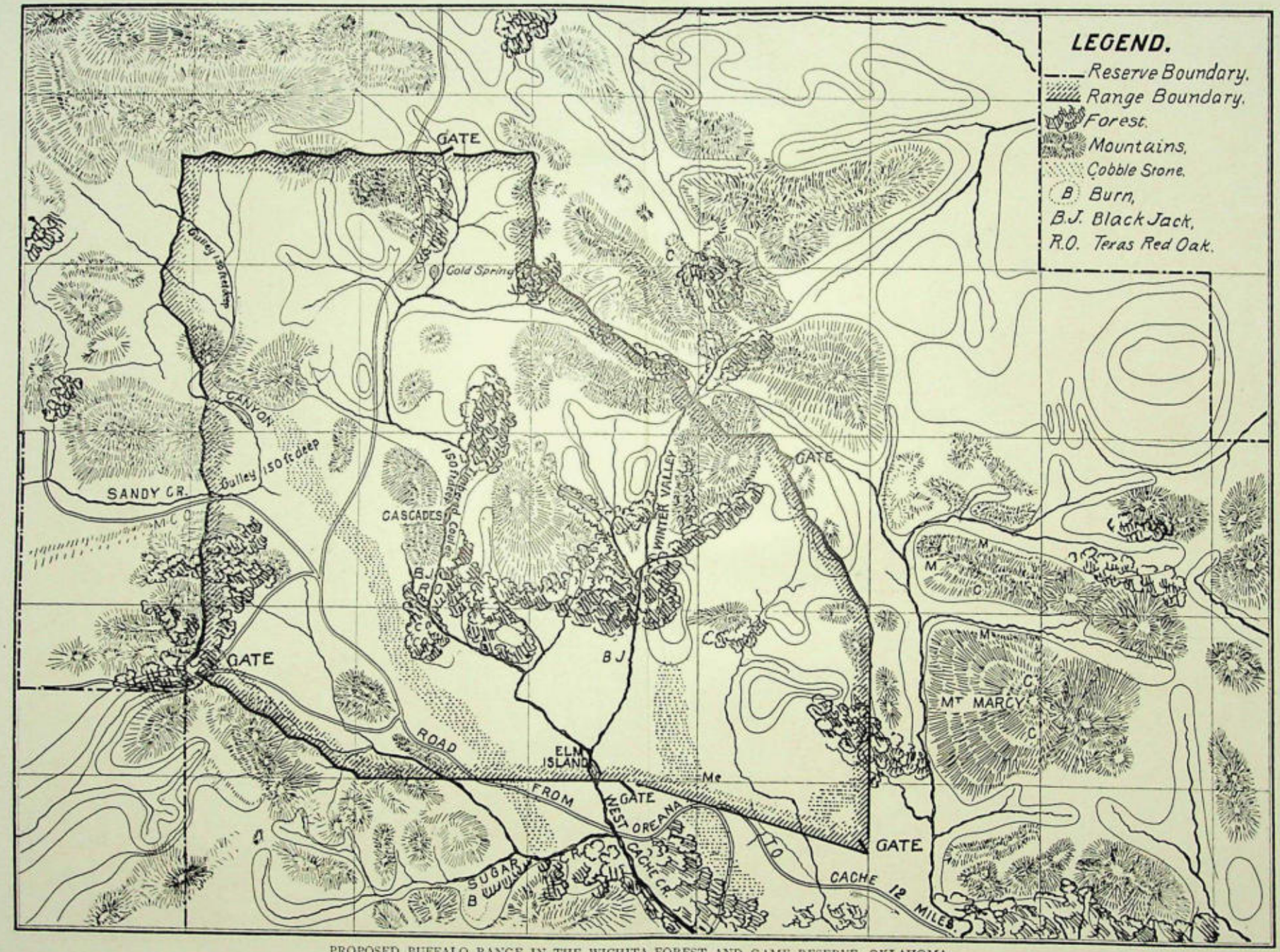
Although there are several high, round-topped, or rock-capped hills on the west side of the range, the remainder of the mountains, both inside and outside, are very rocky, being covered with huge loose bowlders, and cliffs and ridges of red granite rock. Heavy growths of black-jack oak usually cover the slopes, and in the bottom (sometimes extending out into the level country for a quarter mile) post-oak timber is mixed with the black-jack. In several places it forms a small forest of trees 60 feet high. It is doubtful if more than 25 cedar trees exist on the preserve. A few are situated in a canyon on the west side, and on the summit of a high mountain near the northeast line.

Occupying about the centre of the range is a cluster of mountains, hills, and ridges that completely surround a beautiful valley about a mile long by three-quarters of a mile wide. The highest peaks are fully 600 feet, and they shut out the storms from the north and west—the directions from which the worst storms blow. The top of one of these mountains is flat, well grassed with blue-stem and mesquite grass, and during all but the dry season water can be found upon it. This plateau would make an excellent retreat for antelope, elk, or buffalo during the hot weather, as it is easily accessible through the draws and passes that lead up to it from the valley. A story is told of a cattleman who searched six weeks for a bunch of 30 cattle, and finally found them on this mountain in excellent condition.

The valley surrounded by these mountains I have named "Winter Valley," because it makes such an excellent winter range. In it we found many buffalo wallows, and mesquite grass in sufficient quantities to winter such a herd of buffalo as it is proposed to place on the range.

Passes lead from this valley in all directions, some into the open

* For the fencing of the range as proposed, about fourteen miles of fence will be required. Of this about nine and one-half miles of fence could be fastened to trees, and four and a half miles would require posts.



PROPOSED BUFFALO RANGE IN THE WICHITA FOREST AND GAME RESERVE, OKLAHOMA

prairie country to the northwest and southeast, others into smaller valleys, and still others to rough-timbered draws or gulleys, where the shelter of the high hills and timber gives fine protection from sun and storms, and where there is plenty of fine grazing. The most notable of these draws leads to a fine sheltered gully through which Cache Creek flows, and where water of the finest quality can be had at all times of the year. Properly speaking, it is a timbered "coulee" cut into the prairie.

Standing on the prairie a few hundred yards from the brink of this coulee one looks over it to the rocky, timber-covered hills beyond without being aware of its existence. Descending to the creek, however, he finds himself 150 feet below the prairie level in a grove of post-oak and jack-oak timber of large size. Continuing south the coulee broadens. Beautiful, open, grass-covered parks, containing fine grazing grounds, occur here and there, or wind in and out of the timber. This coulee is about a mile long by three-quarters of a mile wide, and it extends through a thickly timbered pass to "Winter Basin."

A hard climb for about fifteen minutes brings one to the summit of a high, rocky mountain a quarter of a mile to the east of the coulee, from which one can survey with the naked eye all but a small section of the range to the north. Here the view is obstructed by mountains. It would be an excellent spot on which to establish a lookout station, which a keeper could visit daily to locate the buffalo.

A mile and a half west of the grand coulee is another coulee of similar character, but smaller. Both of these coulees broaden at the mouth and empty into the prairie. Leading into the smaller coulee, and close to the western line of the preserve, there is a deep, narrow canyon that contains permanent water. This canyon is three-quarters of a mile long, 100 feet deep, and very rocky, having in places perpendicular sides. There is another small ravine on the east side of the proposed buffalo range.

The bulk of the grazing country on the proposed range is gently rolling prairie, three-fourths of a mile wide, that extends over the southern part (4 miles) of the range, and a flat of about two and a half square miles in the northwest corner of the preserve. While there is no section on which mesquite grass grew in such abundance as I found it on Mr. Charles Goodnight's ranch, the grazing on that ranch seemed to be confined to one area, outside of which little of the choice mesquite and buffalo grass were found. On the Wichita buffalo range, however, the mesquite grass is mixed with the blue-stem. Sometimes a patch



TYPICAL OAK TIMBER ON BUFFALO RANGE.

of an acre or more will be found. Even on the mountains and hill-sides this favorite grass is found in abundance, and on the prairie, where at a glance there seems to be blue-stem only, careful examination will reveal small bunches of mesquite grass mixed with the former. In fact, on the greater portion of the range an animal can, without moving from its tracks, crop several mouthfuls of mesquite grass. Even in the fall and winter, when the mesquite grass appears too dry and brittle for food value, it has fattening properties that are truly wonderful, and it is the grass that is most esteemed by cattle-raisers as well as propagators of buffalo.

After one or two fall rains or snow-storms green blades begin to appear about the roots of the mesquite grass, and naturally the buffalo begin at once to feed on it. A grass known locally as "blue-stem" grows in rank profusion all over the range. This

grass is a kind of bunch-grass, and makes excellent hay. Mr. Goodnight says that buffalo will eat it, and do well upon it, when better grass is not to be had. A kind of salt grass grows on the moist flats, both in the foothills and on the sides and tops of the mountains. This grass is eaten in the spring, when green, and before the other grass begins to grow; but as soon as it has dried the cattle do not touch it.

There is no impure water on the range. The most important announcement regarding water is that all springs and streams that supply the range head on it and flow out of it. Therefore there is no danger of contaminated water reaching the animals. The chief water-supply is Cache Creek, which heads in the centre of the range, about a quarter mile from the northern boundary. The spring that forms its source, though small, can easily be dug out and covered, so that the animals cannot get into it. The water could then be run into troughs, and the overflow allowed to continue down the stream bed. I drank from this spring, and found it clear, cold, and delightful.

From this spring Cache Creek winds southward through the centre of the range for about three miles. At the time of my visit there was plenty of water throughout its entire length, and during the rainy season this is always the case. There are times, however, during July, August, and September, when the creek goes dry in places, the water sinking and reappearing. But during the dryest seasons water in abundance can always be found in pools and rivulets not farther than a quarter mile apart.

In the extreme southwest corner of the range perpetual water is found in Sugar Creek, which also has a spring for its source. Again, in the canyon on the west side of the range there is permanent water; and on section 7, in the centre of the range, and a mile east of Cache Creek, permanent water exists. In fact, during the dry season an animal cannot get more than one and a half miles from water. In late November, 1905 (there had been several rains of late), there was plenty of water all over the range.

Water is always found close to the surface, and wells can easily be driven if they become necessary.

The boundary line of the proposed Buffalo Range runs as follows:

Beginning at the southeast corner of the reserve, the line passes through prairie country one and a half miles in a northwesterly direction; thence west one and a half miles to the base of a high, rocky mountain. Thence it skirts along the foot of this mountain,

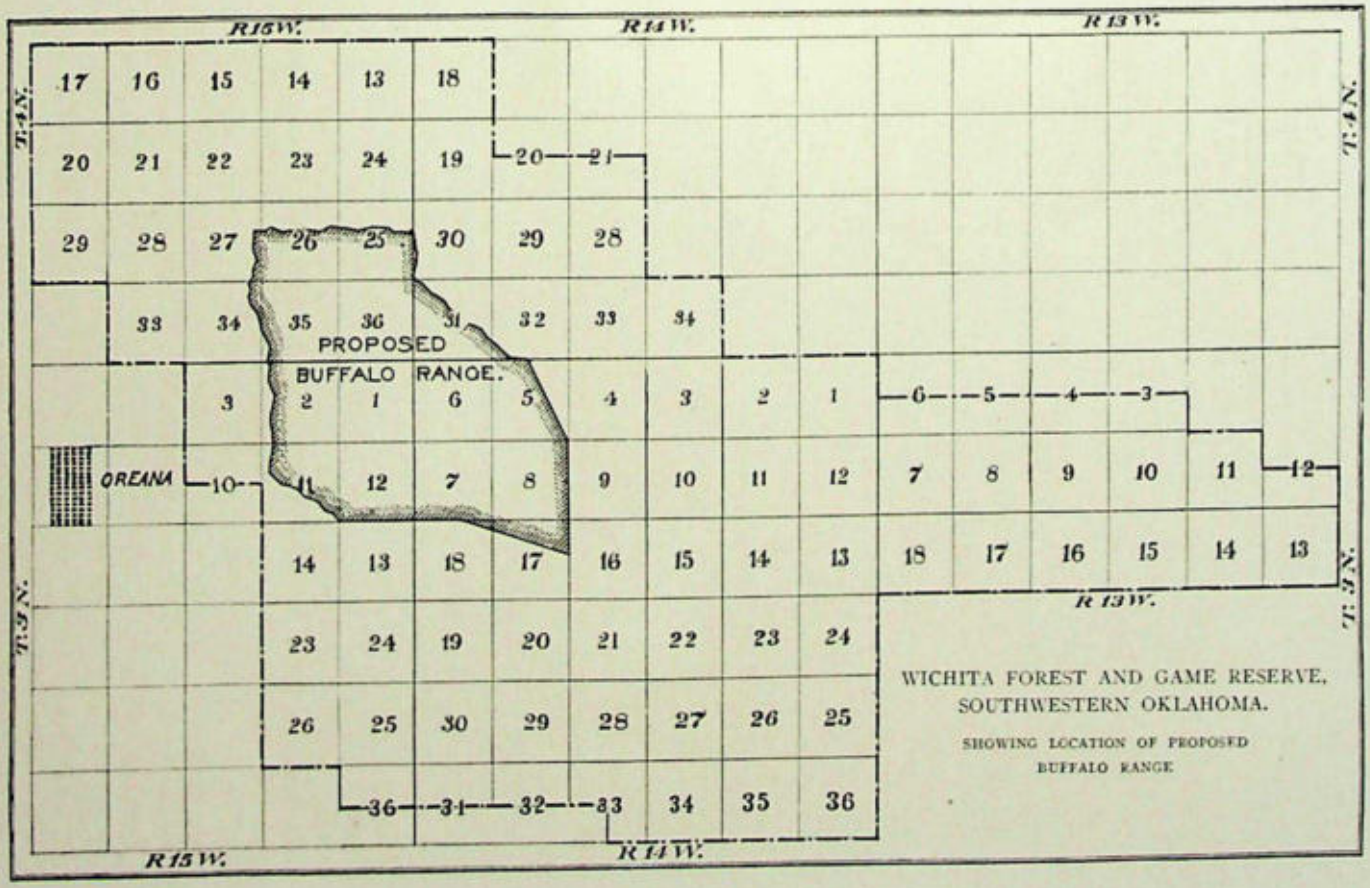
winding in and out among the post-oak and black-jack trees in a northwesterly direction for another mile. There it turns due north through an open flat and enters the timber at the foot of another mountain. The timber for the next mile, while scrubby, affords shelter from the summer sun. After crossing the gully marked on the map on section 2 there is another open flat of about a quarter mile, and again the fence will run through scrub black-jack oak trees, some of which can carry a wire fence. This stretch is about half a mile long, and the remainder of the distance (about a mile), to the northwest corner of the range, is over open rolling and broken country.

The northern boundary runs two miles east through sections 26 and 25, inclosing a strip of jack-oak timber about 150 feet wide. This lies at the foot of a high, rocky, timbered ridge that extends northward as far as the eye can reach. At the east end there is a narrow valley of probably 200 yards. From the southern turning point to the southeast corner of section 25 the line runs half the distance through a prairie and the rest of the way through timber. Here it turns southeast through timber and a narrow-timbered pass, cutting across the southwest corner of section 32. Thence it runs east a quarter mile and southeast for a mile to the southeast corner of section 5. This stretch also leads most of the way through timber. It is thickly strewn with large bowlders, to avoid which, and still take advantage of the trees for posts, it will be somewhat difficult to run the fence. The country just outside of the range, from the turn at the southeast corner of section 25 to the southeast corner of section 5, is hilly and mountainous and timber-covered. Here the line turns due south, and runs over the prairie one and a quarter miles to the starting-point—the middle of the dividing line of sections 16 and 17.

The object in running the line through the timber is to minimize the expense of supplying posts, and at the same time give the animals shade and shelter. About half of the west, north, and southeast line runs through timber that can be used as fence timber by supplying a few posts here and there; and there are many places where even the black-jack oak can be worked in to good advantage.

Posts can be cut outside of the range, very near the locations where they are needed, with the exception of the southern line, where it may be necessary to haul them two or three miles.

As the proposed range is now laid out it does not interfere with what the ranchmen and miners who have ranches and claims



WICHITA FOREST AND GAME RESERVE,
SOUTHWESTERN OKLAHOMA.

SHOWING LOCATION OF PROPOSED
BUFFALO RANGE

on or near it naturally suppose are their rights—namely, the water-supply and public highways. As far as the roads are concerned, there is no chance for a legal fight. Excepting a small piece of roadway in the southeastern part of the Forest Reserve (not included in the Buffalo Range), all roads were made since the Wichita Forest Reserve became a reserve.

The boundary of the Buffalo Range leaves plenty of water outside for cattle. Part of Cache Creek and a spring near the centre of the eastern line were left outside the reserve for that purpose.

On the proposed range there are about 20 prospect holes which will have to be filled or surrounded with fences. While these prospects have not been worked according to law, it would be difficult to prove that the required amount of labor has not been done, provided the owners wish to take the matter to court. Again, these people may, if they learn that their prospects are on the range, stake out new claims with the idea of being bought out by the Government. If they do, and are forced to leave without remuneration, it is apt to cause ill-feeling, and the amount of damage that a man can do on a windy night in October by dropping a match in the dry grass can easily be imagined.

In all probability the Wichita Mountains never will prove to be a paying mineral district. Nine-tenths of the miners who came in with the rush have left disgusted, and the only ones now remaining are a few who cling to their claims, hoping to sell out to some one. If at the time that the range is established there are any miners working there, it seems to me the wisest plan, and at the same time one that will not cause discontent, is to let the owners understand that their property is not to be disturbed, and that they can mine as long as they choose.

ANIMALS THAT WILL THRIVE ON THE PRESERVE

Buffalo.—From all accounts buffalo in large numbers travelled over the proposed Buffalo Range during their northward and southward migrations, and doubtless many of them wintered in the foothills of the Wichita Mountains. From information gained from the old settlers, both white and Indian, it seems that the buffaloes were hunted so persistently that they were not allowed to winter in peace in this locality. Buffalo wallows were found all over the prairie and level country on the range, and buffalo bones and horns were found on the range by Mr. Morrissey when he first came there.

Prong-Horned Antelope.—Next to buffalo the range is natu-

rally adapted to the wants of the prong-horned antelope. It is only within the last few years that antelope were exterminated from this section of the Wichita Mountains. The wide prairie in the southern part of the range, the flat in the northwest corner, and the flat-topped mountain in the middle, make excellent feeding grounds for antelope.

Elk.—Elk in great numbers once roamed over the rocky hills and mountains on the range, and doubtless they fed on the flats and prairies. The wooded margins of the range, the gulleys, the coulees, the timbered valleys and mountains all make excellent places for these animals, although this country cannot be compared with the heavily timbered elk country of Colorado, Idaho, Wyoming, Washington, and Oregon.

Deer.—While there are now a few white-tailed deer on the range, Mr. Morrissey is of the opinion that by making a drive in the timbered mountains west of the range, just before erecting the fence on that side, a dozen or more deer may be forced into the enclosure.

As soon as it is definitely settled that the range is to become a game preserve it would be wise to establish salt licks somewhere within the limits of the enclosure, thus enticing the deer to use them before work commences. The deer would soon find the licks, and would naturally make their home within the area of their own will.

It would also be wise to keep permanent licks in suitable places just outside of the range. Wild deer frequenting them could, after they become accustomed to them, be enticed into the range through a gate placed for that purpose. There are a few deer outside of the range, and for many reasons it seems desirable to capture all of them before they are killed.

The rocky hills and mountains with their scant growth of oak timber are better adapted to Columbian black-tailed deer and mule deer than to white-tailed deer, both of which should do well there.

Unless the deer in this country feed on the acorns and mesquite grass to a large extent, there does not seem to be enough of their favorite food, or at least of the woody food that constitutes the greater part of their living in the Adirondacks, to support a herd of any great size.

Wild Turkeys.—Turkeys were once common both in and outside of the range. A few, not more than one or two flocks at the most, are still on or just outside of the Wichita Forest Preserve. If introduced they would doubtless thrive.



WINTER VALLEY
One of the best grazing grounds.

Prairie Chickens.—Prairie chickens (either the sharp-tailed grouse or the pinnated grouse) are found on the range, but none were seen by us while riding over it.

Bob-White.—Occasionally bob-whites were flushed, but they were not as common on the range as they were in the cultivated districts just outside, where hunters often bag from 50 to 75 birds a day.

English and Mongolian Pheasants.—If introduced, pheasants should do well. There are several places along Cache and other streams that afford just the kind of cover these birds like.

The only drawback to raising prairie chickens, bob-whites, and pheasants is the lack of food. Should the task be undertaken, it would be necessary to plant "kaffir corn" and other food for them. As soon as a person leaves the confines of the Wichita Reserve he at once finds quail in large numbers, but on the Reserve, where there is no farming, comparatively few quail were



HIGHEST MOUNTAIN ON THE RANGE.

seen. Of course if food crops for birds were raised it would be necessary to fence off the crops from the large game.

At Fort Sill Mr. W. H. Quinette and Mr. A. C. Cooper expressed their willingness to start a subscription among the sportsmen in that section for the purpose of purchasing pheasants to be liberated on the range. Such a step should not be taken until some provision for feeding the birds has been made, otherwise they would wander beyond the bounds of protection. Kaffir corn is easily raised, and requires little attention. It does not need so much moisture as common corn, and a good crop can be grown in a season when maize would do poorly.

DISEASES AND INJURIOUS ANIMALS.

Texas Fever.—During my stay in Oklahoma I interviewed many old-time plainsmen and Indians. Among them were Charles Goodnight; Ben Clark, the old Government scout who

hunted buffalo during the days of Custer's campaign on the Canadian River; Quannah Parker, Chief of the Comanches; Kiawa Dutch Pennah, a man 80 years old, who had been captured by the Indians when a child, and had lived with them almost continually since then. All of these men had hunted buffalo in the early days—some of them on the very land now being considered for a buffalo range.

Although I questioned all of them closely, with but one exception I was unable to learn that buffalo in those days had died of any contagious disease. Mr. Goodnight said that when cattle came into Texas the buffalo died of Texas fever. Aside from this report, all agreed that there were few deaths among the herds outside of the regular mortality among the old bulls and cows, or the very young calves that occasionally died during severe winters.

Texas fever is the only questionable point worthy of consideration in connection with propagating buffalo in Oklahoma. Just how serious it will prove to be can be told only after the buffalo have been put on the range. There may be ways of treating the buffalo so that they will be immune to the disease.

From the time that I arrived at Cache I heard of Texas fever among cattle. Naturally the question arose, "Are buffalo susceptible to Texas fever?" The only way to settle the question was to talk with men who had raised buffalo in or near the fever district. Accordingly, I decided to visit Mr. Charles Goodnight, of Goodnight, Texas, the 101 Ranch at Bliss, Oklahoma, and Major Gordon W. Lillie at Pawnee, Oklahoma. The information gained from these gentlemen was as follows:

While Mr. Goodnight had never lost buffalo from Texas fever, he feels convinced that they are susceptible to it, basing his belief on the experience of others. Mr. C. J. Jones ("Buffalo Jones") took two of Mr. Goodnight's buffalo to Sherman, Texas (in the fever district), and they were there just long enough to get the fever, which killed them. On the other hand, Mr. Goodnight sent 4 buffaloes to San Antonio, which is also in the fever district, and he thinks they are still living.

Mr. Joseph Miller, President of the 101 Ranch at Bliss, bought a herd of buffalo in the fall of 1904. He has never taken buffalo into the fever district. The fever quarantine line is about a mile west of his buffalo pasture, yet Texas fever has not affected his herd. The buffalo that he got in the spring of 1905 he brought from the Allard ranch in Montana, and soon after arriving they began to die, and he had lost 15. They would first refuse to eat,

stood alone with heads down, and seldom lasted more than two or three days.

All of those that died were examined by a Dr. Johnson, of the United States Department of Agriculture, who failed to discover any ticks. He pronounced their death due to "change of altitude, excitement of being transferred, and climatic fever."

From Major Gordon W. Lillie ("Pawnee Bill") I learned more of Texas fever affecting buffalo than from any other person. Major Lillie says that in 1895 he had with his Wild West Show 7 head of buffalo. He took them on a trip through Texas, entered at Dennison, and travelled through Dallas, Temple, and Wahatche, coming out at Shreveport, La. The trip consumed 6 weeks, and all 7 of the buffalo died. They came originally from the Jones herd at Garden City, Kan. The State Veterinarian pronounced the cases Texas fever.

In 1905 Major Lillie showed within five miles of the Texas line. He had with him five buffaloes. All were taken sick, and two died. His show was about to go into winter quarters, so he hurried the three sick ones to Ohio, where, he thinks, the cold weather killed the ticks and saved them. The Ohio State Veterinarian pronounced the disease Texas fever. A taxidermist that examined the skins of the two that died said they were literally covered with ticks.

Major Lillie says that cattle die of Texas fever all about Pawnee, some but a few yards from the range in which his buffalo are kept; but his buffaloes in a fenced range at Pawnee have seemed to be immune. Thus far Texas fever has not affected his herd. To his knowledge Colonel Cody lost eight or ten buffaloes during one of his trips through Texas, and Major Lillie is sure that it was Texas fever. The second time that Colonel Cody went to Texas with his show he left all of his buffalo at Guthrie, Okla. From this it will be seen that buffaloes are susceptible to the Texas fever tick. Buffalo have never been kept in the Wichita section of Oklahoma since fever-stricken cattle have been brought there. Cattle die of the fever in this section by the hundreds. It now remains for some of the Government experts on this disease to tell us whether there is any way out of the difficulty. I have stated the facts as I found them and as they were told to me by men of truth and experience.

If buffalo are brought to this range Mr. W. H. Quinette, of Fort Sill, an experienced cattle dealer, says that he thinks it advisable to unload them at Fort Sill and haul them in from there. The danger of the animals becoming infested with the fever ticks



CACHE CREEK.

Permanent water supply in buffalo range.

would be less than if they were unloaded elsewhere, for the Government is careful not to bring infected cattle on the military reserve through which the buffalo would pass.

Wolves.—Next to Texas fever, the wolf question is of greatest importance. Up to the time that Mr. E. F. Morrissey was appointed Supervisor of the Wichita Forest and Game Reserve wolves had been held in check by the ranchmen and hunters—therefore there were few complaints of cattle being killed. Since then all hunting has been stopped and the wolves have increased, until now they are one of the worst enemies to the cattlemen. On the Reserve alone 72 head of stock had been killed by wolves within the last six months.

Mr. Morrissey estimates that there are probably ten or fifteen wolves on the Reserve. They spend the day among the boulders on the oak-timbered hills and mountains. Sometimes one can be seen sunning himself on a rocky prominence, and as the hunter approaches he "loafs" away to the opposite side of the hill, and is soon lost to view in the timber.

As evening draws near the wolves leave the rocks and hills and seek the open countries to hunt for stock. They seem more active after rain-storms. As many as four or five have been seen in a bunch, but they usually hunt in pairs. Cattle at once attack a wolf, and while one wolf leads the cattle away the other follows in the rear and picks up any calf or "two-year-old" that has been left behind. After "hamstringing" the animal, the wolf then drags it to the earth by the throat.

During one of our trips over the range I saw a wolf as it sneaked out of sight over the mountain. On another occasion we came upon the body of a two-year-old steer that had lately been killed by wolves. Scarcely more than the skin and skeleton remained. That wolves will kill game animals, even buffalo calves several months old, there is no question. The wolf in the Oklahoma buffalo range, unless he is exterminated, will take the place of the cougar in the Yellowstone Park. As it now stands, the Wichita Forest Reserve is a breeding ground for wolves and coyotes—consequently it is a breeding ground for discontent among the ranchmen and cattlemen who suffer by their depredations.

The Government accepts from its private citizens a fee of fifty cents per head for grazing cattle on its lands, yet prohibits the killing of animals that not only feed on the cattle, but depletes its own treasury at the rate of fifty cents a year for each grazing animal killed. There is no more reason for protecting the wolves on the Reserve than there would be in allowing a band of outlaws to live there in peace while they were plundering and murdering the neighboring settlers.

Coyotes.—Coyotes, too, are said to be abundant, but I saw many more wolf tracks than coyote tracks. Coyotes not only kill small game, but they will kill young deer as well. Some arrangement should at once be made which would allow coyote and wolf hunts under the leadership of Mr. Morrissey, or of some one appointed by him. Otherwise these animals will become so thick that the discontentment of the ranchmen and cattlemen on and outside of the Reserve is apt to cause them to commit acts anything but friendly to the interests of the animals that it is proposed to place there.

The ranchmen are now appealing to Mr. Morrissey for the privilege of organizing wolf hunts. He is powerless to grant the permission, yet nothing but good could result from such a hunt, and it should be done now, before the range becomes a game preserve. After that, other ways of killing the predatory animals must be adopted.

Foxes, Coons, and Skunks.—All of these animals are common. I saw several golden eagles, bald eagles, duck hawks, red-tailed hawks, and marsh hawks. The foxes, raccoons, skunks and duck hawks will destroy large numbers of game birds if they are not held in check. While I am not in favor of attempting to exterminate these animals by poisoning them, some protective steps should be taken if the range is to be made a reserve for feathered game. Many trappers would be glad of the opportunity to trap the smaller fur-bearing animals on the range.

Rattlesnakes.—Rattlesnakes were common before the miners came into the Reserve, but they have performed the valuable service of almost exterminating them. It is safe to say, therefore, that there will be few deaths among the animals from snake-bites.

Insect Pests.—Black flies, "deer-flies," and "heel-flies" constitute the insect pests that are apt to affect the game. The black flies and deer-flies are not abundant enough to annoy the game much, but the heel-flies attack the hoofs of the animals and make them restless, thus preventing them from feeding and resting quietly. During the fly season the cattle seek the high country.

Poisonous Plants.—Poison ivy and poison sumach are abundant all over the timbered portion of the range. There is no "loco-weed," but if there was it would not affect the buffalo, as they do not eat it.

Soap-Holes, etc.—There are no "soap-holes," "quicksands," or dangerous spots of similar character on the range. A deep ravine on the west line is the only place where animals could injure themselves, but the chance of such occurrences is small indeed.

Prospect Holes.—Mr. Morrissey says there is a law in Oklahoma that prohibits filling in prospect holes. There are about twenty bad prospect holes that would have to filled or fenced. Cattle have tumbled into them and been killed, and Mr. Morrissey lost three or four cattle in that way only last summer.

Prairie Fires.—The possibility of prairie fires is another danger that needs serious consideration. From the last of October until the 1st of April the grass is so luxuriant and dry that it burns like tinder. Prairie fires are of common occurrence. Mr. Morrissey

has seen fires that would carry brands and set fire to the grass a mile in advance of the main fire. On one occasion he was forced to call upon the troops at Fort Sill for aid, and with their help and the help of the persons living in the vicinity the fire was finally subdued. Unless extreme precautions are taken a fire could—under conditions—sweep the range from one end to the other.

Wherever it is possible to work a plough a wide fire guard should be thrown up all around the range, both inside and out. In places too rough or rocky to work a plough the grass must be burnt off frequently. On the outside of the range, also, a wide stretch of land should frequently be burned. It might be advisable to plough fire guards at intervals through the centre of the range. Under the head of "Labor, etc.," will be found some suggestions on requiring the inhabitants and homesteaders living on or just outside of the range to fight fire.

Mr. Morrissey's method of successfully fighting prairie fires has been by means of "back fires" and the use of wet gunny sacks. Large quantities of these sacks should be kept on hand. The caretakers who watch for fires should live at opposite ends of the range, and they should have some means of communication. By far the best system is the telephone, the wire of which could easily run over the fence posts and through the timber.

CLIMATE.

Inquiries among the old settlers of the region established the fact that, with the exception of last winter, the winters nowadays are milder than they were during the days when buffalo roamed over the range. Last winter was the severest winter the country has experienced in twenty years. It was particularly hard on cattle. A thick sleet over a fall of snow prevented stock from grazing, and many animals died in consequence. In anticipation of a winter of this kind it seems advisable to lay in a stock of wild hay, which can be cut inside the range, or just beyond its bounds. Grass cut in July will spring up again, and by September is good winter grazing. For the first winter at least the buffalo should be fed on harvested hay in addition to the food they can secure by grazing.

Mr. W. H. Quinette, of Fort Sill, can remember when ice fourteen inches thick was harvested in the vicinity. During recent years it has seldom frozen more than from four to six inches. Mr. Morrissey reports ice on Cache Creek, close to his house, eight

inches thick last winter; but during the three previous winters that he has been on the Reserve it did not average over three inches in thickness.

The snowfall in a season is light, and it usually melts as fast as it falls. Two or three inches is about the limit, and that which falls seldom remains more than two or three days. It seldom snows before January, and the severest storms come from the northwest. New grass appears about the 1st of April, and by the 1st of May grazing is good, and continues so until August, when it becomes dry.

With July comes the first hot weather, and it continues for eight weeks. The mercury at times reaches 118°, with a very slight degree of humidity. During this period the cattle feed on the slopes and tops of the mountains, where there is usually a breeze.

There is no excessive rainy season in this region.

Labor, etc.—The work of enclosing the range could be carried on at any time of the year. There would be only a few days in winter wherein laborers could not work. During spring and summer it will be difficult to get teams from the immediate vicinity. In the fall and winter all the teams necessary can be hired, with drivers, at $3.00 per day. Daily labor costs $2.00 per day without board, or $1.50 per day with board.

In establishing this range everything possible should be done to foster good feeling between the Government and the public. To a large extent this may be done by giving employment to persons living on or near the range. These people should be made to feel that it is to their interest to watch over the animals in the range, and report everything that should be brought to the attention of the forester.

Contracts for post-cutting and hauling, post-hole digging, hauling the wire, etc., should be given to responsible white men and Indians living near the range. At the time these men are hired there should be an understanding with the employees to the effect that as long as they live within reach should their services be required at any time to fight fire or help in any other emergency they are to do so without pay. They should be assured that their employment in the future will depend largely upon the manner in which they observe this agreement. Mr. Morrissey has an agreement similar to this with the people living near him, and has several times used it to good advantage. While it might seem advisable to pay for services of this character, a second thought will at once convince one that it might also be unwise.

CARETAKERS.

It is quite essential that there should be one man living on the range besides the Forester, if for no other reason than the moral effect it will have on the community. The caretakers would also be required to watch for and fight prairie fires, keep up the fence, cut hay for winter use, cut water-holes through the ice in winter, keep the drinking troughs clean, dig out springs, and, in fact, do the hundred and one little things that are constantly arising when least expected.

It is not absolutely necessary that the men in charge of the range should be experienced in raising buffalo. After the buffalo have been put on the range and are permanently settled the less they are herded and driven about the better it will be for the breeding cows. Outside of salting them occasionally and feeding with hay in severe winters they will need no more care than their ancestors, who would now be roaming the plains in thousands had they simply been left alone.

If the Texas-fever difficulty can be overcome and no unforeseen calamity appears, judging from the breeding experiences of buffalo raisers both east and west, there is reason to believe that the buffaloes placed on the proposed buffalo range in Oklahoma will in a reasonable time become one of the largest herds in existence.

PUBLIC SENTIMENT.

Every one that I talked with, both white men and Indians, took great interest in the prospect of a portion of the Wichita Forest Reserve becoming a buffalo range. Several old Indians could not suppress their delight at the thought of again seeing buffalo roaming over the plains of Oklahoma.

Quannah Parker, Chief of the Comanches, has a fine ranch just off the Reserve. When I questioned him regarding the buffaloes in the early days, and told him that President Roosevelt was deeply interested in buffalo preservation, he replied: "Tell the President that the buffalo is my old friend, and it would make my heart glad to see a herd once more roaming about Mount Scott."

With an eye to business another old Indian, "Sankadody," followed me out of the agency where, through an interpreter, I had been carrying on a conversation with him, and said confidentially, in broken English, "Mabeso me, my son, cut post; haul post, my horse; you, my post-office write, Mr. Scott."

Charles Goodnight, Joseph Miller, President of the 101 Ranch,

and Major Gorden W. Lillie ("Pawnee Bill"), of Pawnee, Oklahoma, all expressed their willingness to assist the movement in any way possible, and during my visits with them did everything in their power to assist me.

Courtesies.—The Supervisor of the Wichita Forest and Game Reserve, Mr. E. F. Morrissey, and his wife made my stay at their house a most enjoyable one. They would not consent to my staying at Cache, which would have meant to me a ride of twelve miles every morning and evening.

From the start Mr. Morrissey entered into the inquiry with an interest and will that was indeed most helpful. He knew every foot of the ground and every stone that marked the corners of the sections. As soon as he understood what sort of a range was wanted he was able to put me on the ground without delay. He spent four days with me in the saddle. On the fifth day, when he was obliged to go to Lawton in discharge of his duties, and I rode over the range alone to map out certain mountains and streams. I then realized the full extent of Mr. Morrissey's knowledge and coöperation.

My thanks are also due Mr. Charles Goodnight, Mr. Joseph Miller, and Major Gordon C. Lillie, all of whom did everything they could to further investigations.

To Mr. A. C. Cooper, of Fort Sill, I am indebted for kind attentions. He went with me to the Indian Agent at Anadarko, and through him I met many experienced cattlemen, old-time buffalo hunters, and scouts, gathering from them much valuable information, all of which has been embodied in this report.

NOTE.

The map that Mr. George M. Beerbower, the Zoological Society's engineer, has made of the Reserve, is accurate as far as the boundary lines and the character of the country about them is concerned. Mr. Morrissey went with me over that ground and noted on the map many of the features that are shown. The mountains, h ls, valleys, and coulees of the interior, however, were mapped by me when it was not possible for him to be there. It is of course to be understood that we had no time to make surveys with instruments of precision, and in mapping details were guided by the section monuments.

Respectfully submitted,

J. ALDEN LORING.

Owego, N. Y., Feb. 1, 1906.

THE IDAHO MOOSE.

By HARLOW BROOKS, M.D.

MADISON GRANT, in his article concerning the range of the moose,* mentions the appearance of this animal in southeastern Idaho. Except for this widely quoted, though brief description, I have been unable to find any account of the Idaho moose based on actual observation of the animal, which as Mr. Grant states, differs very materially from the ordinary moose of Canada and the northeastern portion of the United States.

Since it has been my privilege to have spent some nine weeks in the country frequented by this moose I have, at the suggestion of Prof. H. F. Osborn and Mr. Grant, undertaken to record my observations, though in a very amateurish way, in the hope that I may add some small portion to the sum total of our knowledge concerning the most magnificent member of our native deer.

Throughout this report I shall constantly compare the Idaho moose with the animal as it is found in eastern Canada and Maine. As my previous experience has been gained chiefly in Ontario and Quebec my standard of comparison doubtless adheres most closely to the moose found in these localities.

The Idaho moose are found in southeastern Idaho and in the southwestern part of the Yellowstone Park, in the territory comprised between the eleventh auxiliary meridian on the west and the Fall or Cascade Creek on the east. Their present range does not extend beyond the southern branch of the Warm River on the north and the Big Robinson on the south, though formerly they were found as far south as the Jackson's Hole Country and east of the North Fork of the Snake River in Idaho, Wyoming, and Montana.

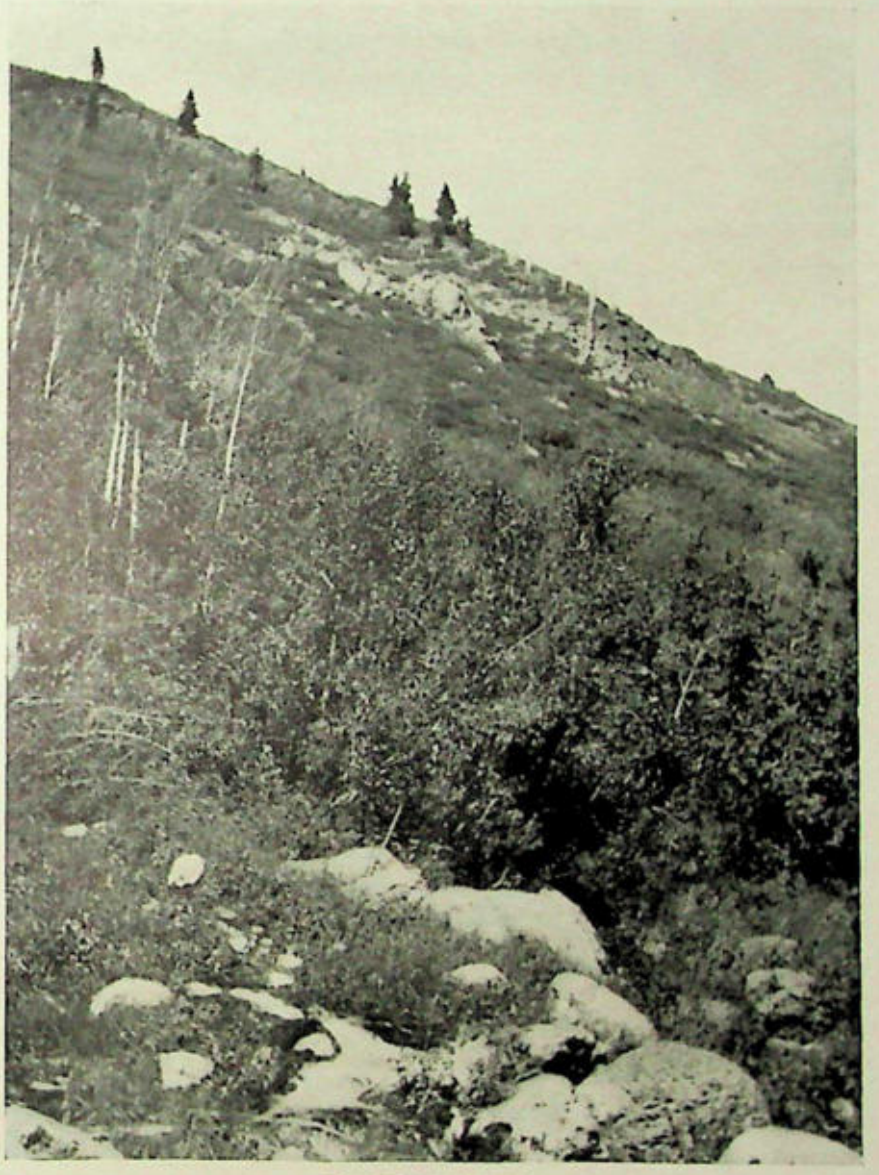
For the past ten years their range has become more and more restricted until they are now seen in large numbers only on a tableland locally known as the Big Black Mountain or Moose Mountain. Though occasionally stray moose are found several miles from this tract, the fact that this is but rarely the case indicates

* Seventh Report, New York State Forest, Fish, and Game Commission.

that the habits of this moose, which is ordinarily notorious for the size of its range, differ very materially from those of the ordinary moose. The area in which these animals are now found barely measures ten miles in diameter, though the surrounding territory is equally uninhabited, and in many places apparently offers good food and cover closely approximating that selected from choice by the eastern moose.

Moose Mountain is a table-land rising from 800 to 1,500 feet above the bottom of the surrounding cañons. The longest diameter lies north and south and is about two miles in length, while the breadth is one mile. The mountain is half in the Yellowstone Park and half in the Idaho Forest Reserve. On the western side the Little Robinson Creek rises and from the southern and eastern faces small cañon streams flow into the Big Robinson. The surrounding country in general closely resembles the foothills of the Rocky Mountains throughout Idaho and Wyoming. The country is drained by the Warm River and by the Big and Little Robinson Creeks, all of which empty into the North Fork of the Snake River. The altitude of the cañon beds is about 6,000 feet and the highest of the hills rise to 7,000 or 8,000 feet. The topography is much broken, and there are no flats or prairies of any considerable size. Except in the spring the country is very dry, and water is found only in the widely separated streams and in the Big and Little Robinsons. These watercourses are confined to cañons, mostly narrow and rocky, often with very precipitous sides. The larger of these gulches measure from 100 to 300 yards in width, but the sides are always broken, steep, and usually almost devoid of vegetation, except for scattering bunches of sage brush or a few scrubby pines.

The floors of most of the wider cañons show a sparse growth of "buffalo grass," but where the streams have broadened out, so as to irrigate considerable patches of ground, grass grows luxuriantly from early spring until the snow falls. Natural marshland is very scarce, but owing to beaver dams, for beaver are quite plentiful, there are considerable areas of artificial marsh backing into the side cañons; in these, rushes and an abundance of succulent grass and water-lilies are to be found. Between the North Fork and the Warm River there are considerable tracts of natural slough in which lilies and rushes grow abundantly, as in Cal's Lake and Duck Pond. Notwithstanding the fact that moose occasionally wander into this country, otherwise entirely uninhabited, I have never seen evidence of their using these ponds for feeding purposes, though they sometimes go to them for water.



MOOSE MOUNTAIN.
Showing character of country and a popular feeding ground.

Except in some of the cañon beds, where dirt has been washed down by the action of rain and snow to the depth of from a few inches to a foot or so, there is little soil in the district. The rock



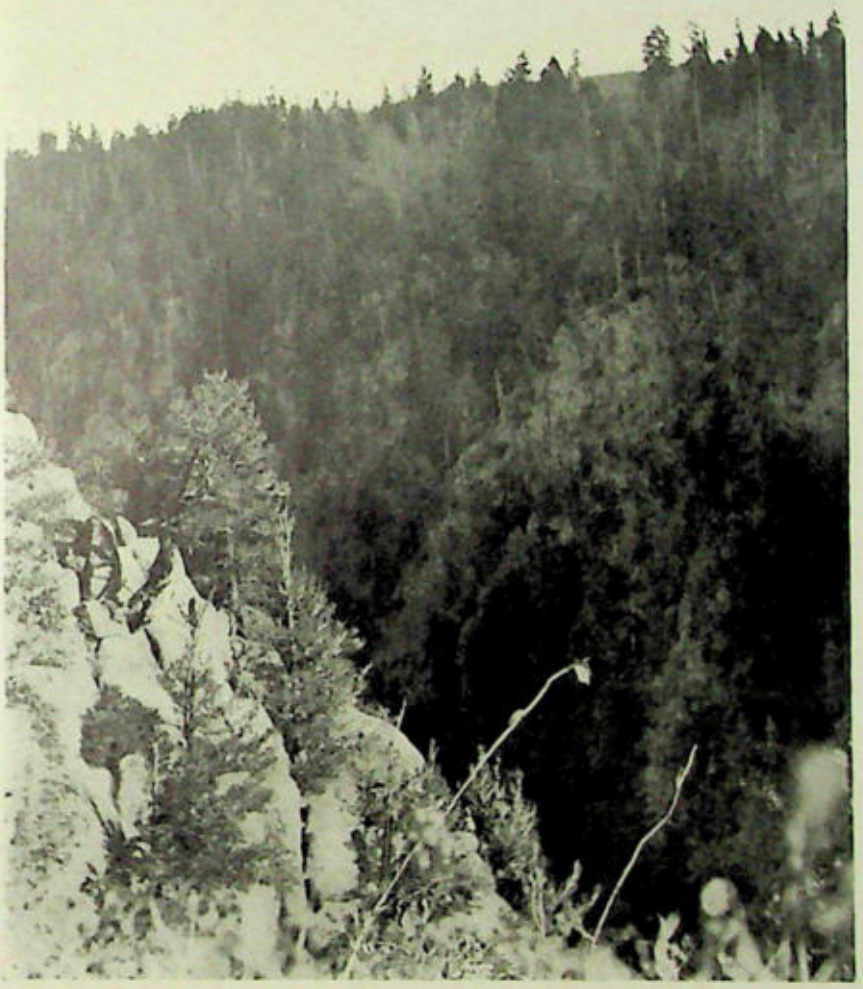
GULLY LEADING INTO MAIN CAÑON.
This ravine is used frequently by moose coming down to water.

is practically all igneous, a good deal of obsidian is present, and in places, particularly along the cañon sides, the rock is arranged in typical basaltic columns. Very little granite is found except for occasional bowlders which lie in the river beds.

The country apparently used by the moose is along the tops and sides of the foothills. The lower hills are covered by a growth of inferior pine, mostly scrubby and low, or where this has been burned off by old forest fires it is replaced by a thick tangle of bull-pine.

The tops of the higher mountains are for the greater part naked, except for a few scattering weather-beaten pines. The sides of the less precipitous mountains, and in places the tops as well, show patches of bayberry bush and a good deal of quaking asp, interspersed with thickets of bull-pine. Lower down, where the sides of the mountain are not too precipitous, a growth of larger pine is found extending into the cañons. The bayberry and quaking asp are seen only well up on the sides or on the tops of the mountains.

The declivities are marked by rocky gullies, which become of considerable size before they break into the main cañon. The lower levels often show a considerable growth of the low blue-



CAÑON OF BIG ROBINSON

berry bush. The spring holes are commonly found well up on the sides of the mountains and are surrounded by quaking asp and usually a few willows. Willow, as a rule, is not seen in the cañon beds about the watercourses, except where old beaver workings are found.

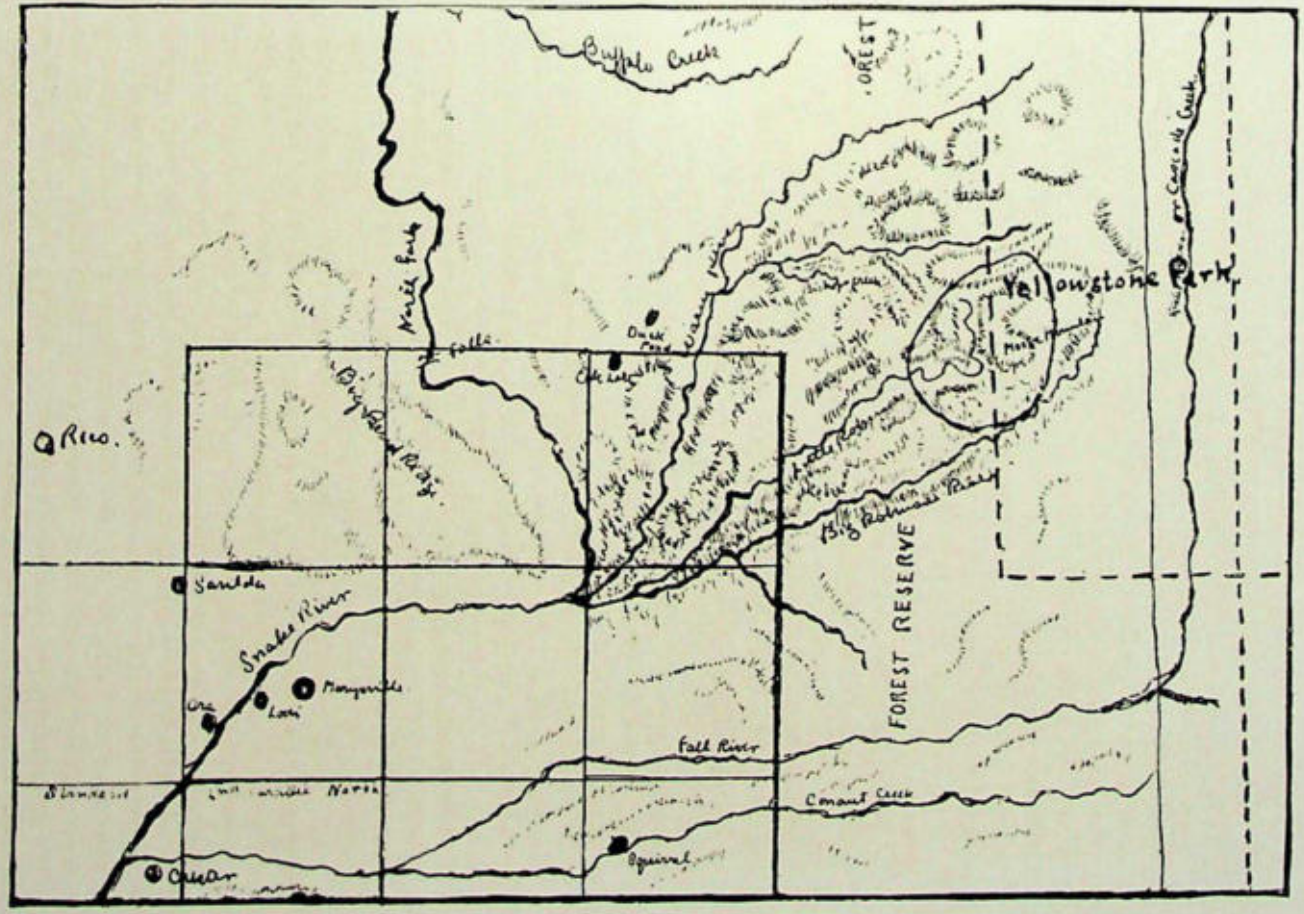
The favorite range of the moose, in so far as I can determine from the statements of sportsmen, ranchers, and prospectors who have frequented this country, is apparently the southeastern slope of Moose Mountain, which lies within the Park. Though their range is now less extensive than formerly, the numbers of moose are increasing, doubtless due largely to the protection afforded by the National Park and by the complete close season which the laws of Idaho have recently established. One has no difficulty in seeing specimens if ordinary caution is practised, for the nature of the country makes the detection of the animal considerably easier than in the moose ranges of Canada.

The animals are small, the three living specimens which I saw have not averaged over 500 to 650 pounds in weight, and judging from the heads of the five other animals taken from this district which I have seen this is not far below the average weight of the adult animal.

The color differs very materially from that of the eastern moose. The Idaho moose are dark, almost black over the back, sides, and neck, while the belly, the inside surface of the legs, and the entire leg below the knee are dark gray, sometimes with a brownish cast. During the spring and summer the color generally becomes lighter, but never as much so or as brown as the Canadian moose.

The animals, as a rule, have a well-formed "bell," either in the shape of a long cylindrical appendage or as a heavy and pendulous "dew-lap"; the latter being apparently more characteristic of the older animals.

The head does not differ materially from that of the eastern moose except in matters of color and size. As a rule, however, the nose seems less heavy, and the size of the head, as compared to the body, less massive; this may, however, be due to the very deficient antler development which all these animals show. Of the nine heads which I have either seen or regarding which I have secured accurate information only two show any attempt at palmation. Of these nine heads, three were those of young animals, but the others were adult or old specimens. The two heads which presented palmation showed it only in very slight degree, the blade of the largest not exceeding the breadth or size of a man's hand. From the statements of reliable pioneers and prospectors who have been familiar with these animals for the last thirty years, I feel justified in stating that palmation is rarely present, and never reaches a size which in any way approximates that seen in the eastern moose. As a rule the antlers,



SKETCH MAP BY AUTHOR, SHOWING SURROUNDING COUNTRY AND CHIEF RANGE OF MOOSE

even of adult animals, consist only of the anterior spikes, usually two, three, or four in number. The spread of the widest specimen seen by me did not exceed 75 cm. I have received an account of an adult bull, killed near the North Fork fifteen years ago during the month of September, which showed no antler development. I am somewhat sceptical, however, in regard to the accuracy of this observation.

The antlers are apparently dropped during January. The new growth begins during March or April, and the recent antlers remain covered with the skin until September or early October, when they begin to peel.

The body presents few variations from that seen in the eastern animal except that it is perhaps relatively somewhat shorter. No gross variations in myology or osteology are apparent.

The feet differ quite materially from those of the eastern moose, so much so that the tracks might easily be mistaken for those of some other animal by one familiar with the ordinary moose only. The hoofs are relatively longer, more lanceolate, and as a rule the points are more acute. In walking even on soft ground the hoofs do not spread widely, as do those of the Canadian animal, and the imprint of the " dew-claws " is less frequently seen. The size of the hoof in proportion to the animal bulk also seems to be less. Tracks of 10 to 12 cm. in breadth by 13 to 14 cm. in length are considered to be of large size among these animals. In general, the tracks of an unusually large animal in Idaho would about equal that of a small or medium-sized moose in Ontario or Quebec. The hoofs are jet black in color as a rule. As in the Canadian animal some of the specimens have a tuft of slightly greenish hair in the cleft of the hoof. The spongy portion of the foot is more firm and highly keratinized than usual, and even the softer heel pads are sharply corrugated and very hard. Taken as a whole one cannot but be impressed with the idea that this hoof is particularly well adapted for the rock climbing which characterizes this variety of moose.

Though I have dissected but five eastern moose, and do not therefore feel very well qualified to judge as to anatomical facts in regard to this Idaho moose, it appears to me that the viscera in the two specimens which I have dissected show no more than a normal amount of variation in form and arrangement.

The Idaho moose differs chiefly in its altered habitat and mode of life. Though, as has been shown in the description of the country in which these animals are seen, range and food materials closely resembling those familiar to the eastern moose are

found in this country, the animal frequents, evidently by choice, high and rocky land. This cannot be on account of disturbance by man or wolves, since neither is present in any considerable numbers in the low marshy country adjacent to the home of these moose.

The animals range along the sides and tops of the mountains, far above the level frequented by the elk; and their tracks are found mingled with those of the mule deer, which are fairly numerous in this country. The moose descend by necessity to the cañon beds for water unless there are springs on the mountain sides, in which case they appear to be the watering places of choice. I have often traced the tracks to the rivers, sometimes in marshy places, and have found that after drinking they returned directly to the mountains, only very rarely feeding along the banks of the streams, even though willow bushes may be fairly abundant in these spots. They seem to come down for drink for the most part early in the morning or late in the afternoon after sundown. Apparently they can go for a long time without water, a fact very easily demonstrated in a country so scantily supplied with water as is this section of the Rocky Mountains.

I have carefully searched the bottoms of the cañons for evidence of feeding or beds, but rarely with success. Nearly all the tracks seen were clearly those of travelling animals which came to the stream with the definite purpose of securing water and immediately returning to higher ground. The favorite drinking places about Moose Mountain are Moose Spring, a shallow bog hole, and the Hidden Spring, both of which are situated high up on the mountainside.

From an examination of the stomach the food appears to consist entirely of twigs, chiefly quaking asp and bayberry; but occasionally willow and segments and berries of a species of sumach are found. I did not find grass, rushes, or lily pads in the stomach, nor have I ever seen evidence of cropping of these plants where they exist in close proximity to the moose haunts. The favorite feeding time seems to be between sunrise and about 11 A.M., though I have run across them eating in the early afternoon.

In feeding, the animals seem to favor the open parks or spaces where the bayberry and quaking asp grow, and where an uninterrupted view of the surrounding country can be obtained, though there are patches of this growth mingled with pine and heavy timber.

In going to and from the feeding grounds and into the cañons for water these moose strangely select rocky passes and gullies rather than the wooded and gentler declines. One often finds them choosing for their trails routes which seem impassable for an animal of the size and build of this moose. Perhaps it suffices to say that they go by preference where a well-shod and trained western horse cannot be driven. In one case I watched a young moose come down to water and return, deliberately selecting the steep dry bed of a narrow and rocky gully, though on either side there was a gentle slope covered by open timber. Their agility in climbing over bowlders and in going down steep declines and through narrow passages is almost incredible. They are rapid travellers, usually walking, increasing to a fast, awkward lope when alarmed. I do not think that they travel either so frequently or so far during the night as do the Canadian moose.

The beds are usually found either in the low brush where the moose have been feeding, generally in some open place, or in small dense thickets of pine near the summit or high up on the mountainside.

In general intelligence the animals appear to equal the Canadian moose, with which I have had experience. By still hunting one has the greatest difficulty in approaching them, but they seem to be frightened more by the scent than by the sight of man, and they occasionally exhibit the most amusing curiosity. We followed a band of three, a cow, bull, and yearling calf, for nearly a week, and though we did our best we were unable to get a fair sight of them. We took special care that they should not get our scent, and they stayed in the locality throughout the entire week. Several times I was convinced that they saw us, and from the location and character of their tracks I am certain that they purposely watched us through the greater part of one day while we were tracking them. Judging from the trail, when they finally got our "wind" they made off for the Yellowstone Park in great haste and did not return to their regular haunts while we remained in the country. On the contrary, a single bull stayed for over five days within a mile of our camp of four people and seven horses. One night, evidently attracted by curiosity, he came within a few yards of camp. This animal was subsequently found to be a well-developed adult which had been summering in this locality. One day at 10.30 in the morning a young bull came down from the mountain directly into our cañon, evidently making for the horses, of which he appeared to have no

fear; but when he discovered us he slowly walked away, occasionally stopping to look back at us; he expressed no signs of haste or fear. The old hunters, however, speak of them as ordinarily very wary and difficult to stalk. They are evidently unfamiliar with man, though accustomed to horses, and will often follow horse trails to water holes.

These moose often travel in small groups, and several times we have seen their trails with those of bands of elk, though they are rarely found in the country generally preferred by elk (wapiti).

The period of "rut" appears to be somewhat earlier than among the Canadian animals, and takes place between the 1st of September and the 1st of October. In so far as I have been able to learn the animals seldom or never "call." Though I have spent upward of nine weeks in their country from the last of August into October I have never heard either the cow or bull give "tongue," while old hunters familiar with the country and these animals tell me that they have never heard a moose "call," and most of them are very sceptical in regard to a call being given by any moose. Apparently at least, they do not answer to the artificial "call" as do certain of the Canadian animals, though I am not positive in regard to this, since I cannot profess to be at all expert in calling moose.

I am told that the young are dropped in May, but my knowledge on this point is entirely hearsay. The calves stay with the cow for a full season, and not infrequently one finds a cow attended in the fall by two calves, one a yearling and the other born that spring.

During the winter they remain about Moose Mountain, where the snowfall is not particularly heavy and where the tops of the mountains are often swept clear enough of the snow to permit them to secure sufficient food. They apparently do not yard-up during the winter.

A great deal of my information regarding these animals has been corroborated or secured in conversations with the sportsmen, ranchers, and prospectors of this country, and especially from Dr. Sharp and Mr. Caleson, two well-known sportsmen of Salt Lake, and from Bishop A. C. Wilson, of Marysville, Idaho, who has lived in Fremont County for the past sixteen years, and has frequently hunted and prospected in the mountains inhabited by these moose.

It seems to me most probable that these animals are closely related to those living farther north in the Canadian Rockies. Mr.

Grant describes the moose of the Canadian Rockies as having smaller antlers and being much darker in color than the moose of eastern Canada. In point of habitat those animals also appear more closely to approximate the Idaho animal, but reports as to their size class them as distinctly larger than the mountain moose of the United States. Certainly these two types approach each other more closely than either one does the moose of the east.

It seems to me that the moose which I have given an account of here differs quite materially from the animal of the Bitter Root Mountains (as described by Roosevelt in "The Wilderness Hunter"), particularly in antler development, size, and food selection, though not in its mountainous characteristics.

I have no doubt but that the Idaho moose is in reality specifically identical in origin with the eastern moose, but that this small group of animals, now widely separated from others of their kind, have inbred extensively, thus tending to accentuate any peculiarities which may have existed in the immediate progenitors. This fact and the manifestly unfavorable habitat have resulted in a moose of smaller size and less perfect development in every respect, and particularly in regard to the largely ornamental antlers. I look upon the variation in the shape of the hoof as highly characteristic of these animals, due doubtless to the altered demands resulting from the widely different character of the country over which they travel. That this modification is not entirely the result of the hoof being worn down by contact with the rock is apparently indicated by the fact that even on soft or marshy turf the foot does not spread as do those of the eastern moose, but is held much more compact.

I do not think that this animal is entitled to sub-specific rank, an opinion indorsed also by Mr. Grant, but it does seem to me that it illustrates very well the alterations in even primary attributes which the moose may undergo when forced to live for a considerable time in isolated groups under more or less unfavorable surroundings.

DESCRIPTION OF YOUNG BULL MOOSE.

Apparent age three years, September 29th.

The animal is a small, short, well-developed moose, evidently about three years of age. It differs from the Canadian moose in certain particulars, especially as regards size and coloration.



HEAD OF YOUNG BULL MOOSE

The sides and the superior aspect of the head and nose are dark gray, almost black in color, and the back is marked by a central band, 3 to 8 cm. in breadth, of slightly lighter, dark grizzly hair. The external surfaces of the thighs and legs are dark, but the internal surfaces of the extremities and the entire lower shanks are grayish white, in sharp contrast to the dark sides. In general the coloration is much darker than that of the Canadian moose taken at any time of the year.

The hair is coarse, but thick and well set over the sides; it averages from 4 to 6 cm. in length, while that over the hump measures 15.5 cm.

The animal is characterized by its short barrel, pronounced hump, and its generally less ponderous appearance as compared with the eastern moose. Estimated weight, 400 to 500 pounds.

The "bell" is long, cylindrical, and very dark in color. The tail is short and the bone extends to its very end. The head is proportionately less heavy than in the ordinary moose, and the nose is distinctly less flat.

The antlers are small and rudimentary. The right presents only a two-pronged anterior extension, the anterior branch measuring from tip to its insertion in the skull 34 cm., and the posterior, similarly measured, 33.5 cm. Both antlers present at their base

the usual nodular projections, but without the slightest indication of palmation.

The left antler presents three prongs; the two outer branches correspond with those on the right, while the other is centrally situated. The tip of the forward prong is slightly broken and measures 31 cm. in length. The middle branch measures 23 cm. and the last or posterior spike 33 cm. Greatest spread of antlers from tip to the most extreme tip, 62 cm. There is absolutely no palmation indicated on either side. The skin is mostly eroded from the horns, though they are still somewhat soft, particularly at the tips, for a few shreds are still attached to either horn, principally near the bases. Distance between antlers at their insertion, 18 cm. Circumference of left antler at insertion, 18 cm.; of right antler, 19 cm.

GENERAL MEASUREMENTS.

Total length from tip of tail over back, hump, base of skull, and nose to mucous membrane of upper lip	210	cm.
From tip of tail to crest of hump	118	"
From crest of hump to antler line	32	"
From antler line to mucous membrane of superior lip	60	"
Circumference, body at juncture with hind quarter	175	"
Circumference at juncture with fore quarter	190	"
Circumference of neck at juncture with body	105	"
Circumference of neck just back of ears	77.5	"
Total length of tail	14	"
Circumference of head just anterior to eyes	74	"
Length of ears (right and left)	29	"
Greatest breadth of ears (right and left)	12	"
Length of nose, measured over top from antler line	60	"
Length of nose, measured alongside of head from antlers	49	"
Length of bell from insertion to tip of hair	22	"
From crest of hump to tip of anterior hoof	181	"
From glenoid cavity to tip of hoof	143	"
From top of sacrum to tip of rear hoof	160	"
From head of femur to tip of hoof	142	"

Circumference of foreleg at humero-ulnar articulation	30.5	"
Circumference of fore shoulder at juncture with body	58	"
Circumference of rear extremity at femoro-tibial articulation	42.5	"
Circumference rear shoulder at juncture with body	94.5	"

The hoofs are jet black in color and are notably more pointed than in the ordinary moose.

MEASUREMENTS OF HOOFS.

Anterior Hoof.

Greatest width	9.7	cm.
Greatest length	12	"
Dew claw to base of hoof	9	"

Posterior Hoof.

Greatest width	9	cm.
Greatest length	11	"
Dew claw to base of hoof	9	"

The skeletal myology shows no obvious alteration.

The omentum is long, extending over the entire abdominal contents and deep into the pelvis. It is moderately rich in fat. Both omentum and intestinal mesentery show numerous hæmolymph glands in addition to the usual lymph nodes.

The stomach and intestinal coils present no anatomical peculiarities.

The rumen is found to be completely filled with lacerated leaves and twigs of bayberry, quaking asp, and willow, the latter only in small amount; a few berries and leaves of a species of sumach are also present. Some of the twigs are of considerable size, measuring as much as 6 cm. in length and 5 to 6 mm. in diameter.

The reticulum is similarly filled with the same food particles, but more finely comminuted and mixed with considerable water.

The omasum similarly contains a more divided food material of the same character.

The material contained in the abomasum is very finely comminuted, mixed with mucus, and shows well-marked digestive changes.

The entire material present in the stomach was carefully examined without finding any materials aside from those mentioned.

The kidneys are large, perfectly normal in appearance, each weighing approximately twelve ounces. Eight pyramids are present in each organ.

The internal genitals present nothing notable.

The spleen is large; it is attached by its internal surface to the wall of the rumen. Approximate weight fourteen ounces.

The liver has an approximate weight of five pounds.

The lungs present no anatomical deviations; the right presents three lobes and the left two.

The heart has an approximate weight of three pounds. It presents no anatomical peculiarities.

The anatomical findings in this animal are practically identical with those of a previous specimen which I dissected some time ago. In this instance the animal was evidently a young adult, probably four or five years old. The antlers showed absolutely no indication of palmation, and presented four prongs on one side and five on the other. The spread was not measured, but approximated about 70 cm. In coloration and general form this animal closely resembled the one described above.



PHOTOGRAPH 1.—ASCENDING GOAT CREEK

MOUNTAIN GOAT HUNTING WITH THE CAMERA.

WITH OBSERVATIONS ON OTHER MAMMALS OF SOUTHERN BRITISH COLUMBIA.

By HENRY FAIRFIELD OSBORN.

IN August, 1905, I visited the Crow's Nest Pass region of southern British Columbia on the Elk River, which drains the western slopes of the Canadian Rockies, Lat. 50° north, Long. 115° west. The exact locality is in East Kootenay, 74 miles north of the international boundary and 88 miles east of the Kootenay Lake.

One of my chief objects was to observe and if possible photograph the animal which is popularly known as the Mountain Goat because of its purely superficial resemblance to the domesticated goat. For this purpose I took a Graflex Tourist camera,



PHOTOGRAPH 2.—THE LINE FOLLOWED BY THE HERD.

1. Six goats browsing at 12.30 P. M. 2. Goat standing guard 2.30 P. M. 3. Four goats appearing at top of cliff. 4. Edge of cliff where first and second series of photographs were taken. 5. Niche in cliff where third series of photographs were taken. 6. Snow-bank on ascending trail. 7. Summit of trail where goats disappeared.

4 × 5 plate, with a Goerz Series III, No. 2 lens, provided with a shutter capable of 1,000-second exposure, and film packs. I owed the selection of the country to the advice of Mr. Hornaday and the coöperation of his friend Mr. John M. Phillips, who has hunted and photographed in this region for several years, and through whom I secured the expert guidance of Mr. Charles L. Smith and Mr. R. M. Norboe, both trappers and hunters of many years' experience.

On August 29th, during the first five minutes' survey after reaching the summit north of Goat Creek—a small western tributary of the Elk—Mr. Smith directed my attention to a herd of six goats. This was the introduction to one of those rare pieces of good fortune which occasionally delight the naturalist. It occurred at 11.30 A.M., and between that hour and 5.30 P.M. I was able through continued good fortune to photograph these animals eighteen times. The photographs I consider only fairly successful, but they serve to illustrate a series of observations of the

behavior of these animals when protecting themselves and travelling out of the country.

This experience forms the chief subject of this article, and it may be introduced by a few words on the environment of these animals, geographical and zoological, and then upon their structure.

The elevations are from 4,000 to 10,000 feet above sea-level. The summers are short, moderately warm, and dry. The winters are long, moderately cold, with a heavy snowfall. The originally heavy forests of spruce and jack-pine have been largely destroyed by forest fires, undoubtedly disturbing the natural faunal conditions considerably. The active Carnivora, such as the puma and wolves, are rare. The goats mainly keep in the region at and above the timber line, where they are comparatively safe; but they also stray down to the lower streams, and we observed a mother and kid on the cliffs above Fording River, but little above the level of Elk River.

Zoologically, this parallel and district is extremely interesting as a neutral zone inhabited by both northern, boreal, and southern animals. Among these, the goat and the caribou are near their southerly limits; while the puma or cougar is near its northerly limits.

REPRESENTATIVE MAMMALS OF THIS REGION.

As this entire country is underlaid with valuable coal mines, and is rapidly being settled, the wild animals will inevitably be driven out, although it must be said that the game laws are admirable and that they are respected and enforced. Notes on the existing animals will in time be valuable. I owe the following chiefly to my guide Charles L. Smith, who is endowed with exceptional keenness as an observer, and has all the finer instincts of the naturalist. The list has been studied and a number of points added by my friend Director W. T. Hornaday, who followed me into this country. I am also indebted to Prof. J. A. Allen and Mr. W. K. Gregory for revising the list.

RODENTIA.

Among the Rodentia the beavers (*Castor canadensis*), which are now being protected, are again increasing in numbers. The yellow-haired porcupine (*Erethizon epixanthum*) is fairly abundant. The gray- and yellow-legged marmots (*Marmota pruinosa*) are numerous. Rats and mice are present in endless vari-

ety, among them the mountain rat (*Neotoma* [*Teonoma*] *cinerea drummondi*), attaining the size of the wharf rat, with a bushy and well-furred tail. The squirrels include the pine or chickaree squirrel (*Sciurus hudsonicus richardsoni*) and the ground squirrel (*Tamias quadrivittatus affinis*). Among the chipmunks is an extremely small variety known as the buff-bellied chipmunk (*Eutamias luteiventris*, Allen), which is found on the tributaries of the Elk and Bull rivers up to the timber line. The Columbia River ground-squirrel (*Citellus columbianus*, Ord) is very common throughout southeastern British Columbia, and is dug out of its burrows at timber line and consumed by the grizzly bear as a very welcome food item. It is known locally as the "gopher." There are also the varying hares (*Lepus americanus bairdi*), the gophers (*Thomomys* sp.), and the especially interesting "chief hare" (*Lagomys* [*Ochotona*] *princeps*). Smith called my attention to the little piles of plants which these animals were curing before taking into their burrows for their winter supply.

INSECTIVORA.

Among the Insectivora the water shrews (*Neosorex navigator*) are abundant. The most notable form is the dry-land shrew (*Sorex obscurus*), an extremely small animal about 2½ inches in head and body length, or 4½ in total length; a meat eater, and an enemy of the trapper because it destroys the bait in traps.

CARNIVORA.

The enemies of these smaller animals are chiefly among the Mustelidæ, which have been largely eliminated for their fur. The vertical distribution from the stream levels to the high goat and sheep country is the point of chief interest. Of these, beginning with the smallest, we find the ermine and the weasel.

The ermine (*Putorius* [*Arctogale*] *longicaudus*), assuming a pure white coat in winter with a black tip on the tail, is noteworthy from the fact that the males are much larger than the females, appearing almost like a different species in point of size. The weasel (*P. cicognanii* [Bonaparte's weasel]) is distributed from the level of the streams to far above the timber line, living chiefly on mice. Just over the summit of the Rockies is the larger, true mink (*Putorius* [*Lutreola*] *vison*), with longer and more bushy tail. These mink feed partly on crawfish, their habitat being along the streams only. The mink (*Putorius* [*Lutreola*] *vison*),



FIG. A.—SOLE OF GOAT'S FOOT.
(One-half Natural Size.)



FIG. B.—SIDE VIEW OF GOAT'S FOOT.
(One-half Natural Size.)

next to the marten in size, is quite common. It is locally known as the "cotton mink" or "cotton-tail mink," with a tail of medium length, hair short instead of bushy, with short and very thick fur in winter. Its hunting ground is in thick green timber and along the streams, and it is almost as much of a water animal as the beaver, being a great fish catcher.



First Series, Photograph 3.

The otter (*Lutra canadensis*) is now quite rare on the Elk River, and is exclusively a fish eater.

The pine martens (*Mustela americana abietinoides*) vary in color from a light buff to a dark chocolate brown with gray hair scattered along the back and tail or with a white tail tip. The brown and pale forms predominate; the dark ones, of highest commercial value, constituting not over five per cent of the whole number. Feeding on birds and small mammals from the grouse to the mouse, their range is mostly in the dark spruces just below the timber line.

The fisher (*Mustela pennantii*) is very rare. Smith has observed only one on the Elk River, and in a few cases the tracks of others. Strictly contrary to its popular name, it is a dry land, mountain-living animal, never approaching the water, never burrowing in banks and near streams, but living in hollow trees or old stumps. It is a great tree climber, its very sharp claws being quite as useful in climbing as in catching prey. In size it is halfway between the wolverine and marten, with dark brown back and sides. Its food con-



First Series, Photograph 32.

sists principally of rabbits, grouse, and squirrels. As compared with the wolverine it shows little cunning in avoiding traps, being very curious and having a voracious appetite. It was, therefore, probably exterminated very early by the trappers, but there is no evidence that it ever has been really plentiful. On the Pacific Coast in 1873 this animal was fairly abundant; even then seven or eight skins secured with marten traps would constitute a good winter's catch.

The wolverine (*Gulo luscus*) is the greatest enemy of the trapper. It is extremely cautious about traps, skilfully approaching and removing both the bait and the animal captured by the trap. It will remove a trapped marten, take it off some distance, bury it in the snow and foul the surface. It is a great traveller, following a line of traps, backward and forward, out of reach and out of sight of the trapper. It can be caught only by a very skilful combination of traps, one of which is used as a decoy.

The puma (*Felis concolor*) is rare here, and is not found farther north. A few have been taken on White River. The maximum length is seven and a half to eight feet over all. Smith secured one in 1904 near the Sulphur Pool in Elk River Valley. Another was killed on Pass Creek near Smith's cabin. Tracks are occasionally observed on Pass Creek and on the White River. The Canadian lynx (*Lynx canadensis*) is more abundant, ranging as far to the south as Colville River in Washington. It is also found to the south, especially in the White River country and in the foothills of the east side of the neighboring Rockies.

Among the larger Carnivora the Canidæ are represented by scattered coyotes (*Canis latrans*), the very rare gray or timber wolves (*Canis occidentalis*). The Ursidæ are represented by the black and grizzly bears.

PECORA.

The buffalo (*Bison bison*) were formerly in this country, and at one time even in this valley, as proved by a skull found near Smith's ranch in the valley of the Elk River. The last of the herd in this region were, however, exterminated in 1886 on the plains of Alberta.

The deer family were originally represented by the moose, the wapiti, the caribou, the mule deer, the white-tail deer, the mountain sheep, and the mountain goats.

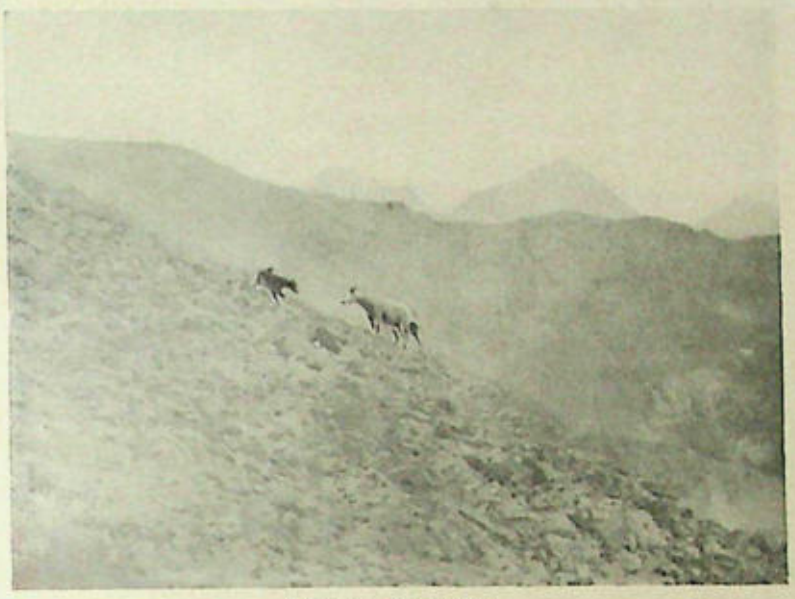
The moose (*Alces americanus*) are practically gone from this country. The last one seen by Smith was in 1901. Caribou of



First Series, Photograph 4.

the mountain type (*Rangifer montanus*) are found on the head of the St. Mary's River, a tributary of the Kootenay, ranging west to the Okanaga Valley and then north. St. Mary's River is probably their southern range.

The wapiti or elk (*Cervus canadensis*), formerly abundant, are now comparatively rare. About a hundred scattered individuals are still ranging on the Elk, Bull, and White tributaries of the Kootenay River, wintering in the lower valleys of the Bull and Elk and on the Steel Fork of the White River. The mule deer (*Odocoileus hemionus*) are about three times as numerous as the wapiti and cover about the same range. They are fairly abundant. The white-tailed deer (*Odocoileus virginianus macrourus*) are confined to the lower valleys of the White and Elk rivers in summer. They winter on the Kootenay River from Fort Steele to the Montana boundary. The mountain sheep (*Ovis cervina*) are distributed from the extreme head-waters of the Elk River through the Kanaskis Pass south to the head of the Flathead River. Their chief ranges are (1) on the Fording River, four miles west of the continental divide; (2) also on Sheep Mountain bordering Pass Creek, about fifteen miles farther south; (3) also south of Crow's Nest Pass, overlooking the railroad and about twenty miles north of Fort Steele. There are probably about



First Series, Photograph 5

200 head of mountain sheep in this country altogether. The largest pair of horns known to Mr. Smith was secured by Mr. John M. Phillips, the circumference being 18¼ inches at the base when first killed. Unlike the deer, these sheep have their winter and summer ranges within two or three miles of the same localities.

MOUNTAIN GOAT.

With the possible exception of the mountain sheep none of these animals compete with the mountain goat (*Oreamnos montanus*). Sheep and goats do not generally occupy the same mountain tops. Certain mountains are celebrated for sheep, others for goats. From the Elk Valley Smith notes that the goats range a short distance south of the Montana line, west to the Selkirks, southward into northern Idaho and northern Washington. They are very abundant in the mountains surrounding the headwaters of the Kootenay, White, Bull, Elk rivers. Among the young, Smith observes two kinds: one snow-white with very fine wool, the other kind with dark brown or sandy colored tail and scattering light brown hairs ranging up the back to the base of the skull. Both are represented in the specimens which have been sent to the New York Zoological Park, the male belonging to the first variety, the two females to the second variety.

The observations collected from various sources by Mr. Madison Grant in his article on the mountain goat, published in the Ninth Annual Report of the New York Zoological Society for 1904, include many of the main points in regard to the habits of these animals, and Smith considers Mr. Grant's paper absolutely correct except as regards the gland at the back of the horn. This gland in the rutting season becomes enlarged, and freely exudes an oil which softens the back of the horn, often causing a crease as if the result of wear. It is less developed in females.



Second Series, Photograph 6.

I believe it worth considering whether naturalists should not try to banish the misleading word goat for these animals, and substitute the term "mountain antelope," just as they are trying to banish the misleading word "elk" and introduce "wapiti." The animal is allied to the noble animals the Chamois, Goral, Takin, and Serow of Eurasia, which take their subfamily name *Rupricaprinæ* from the genus *Rupicapra* or chamois. The subfamily is an early, mountain-living offshoot of the Bovidæ.



Second Series, Photograph 7.

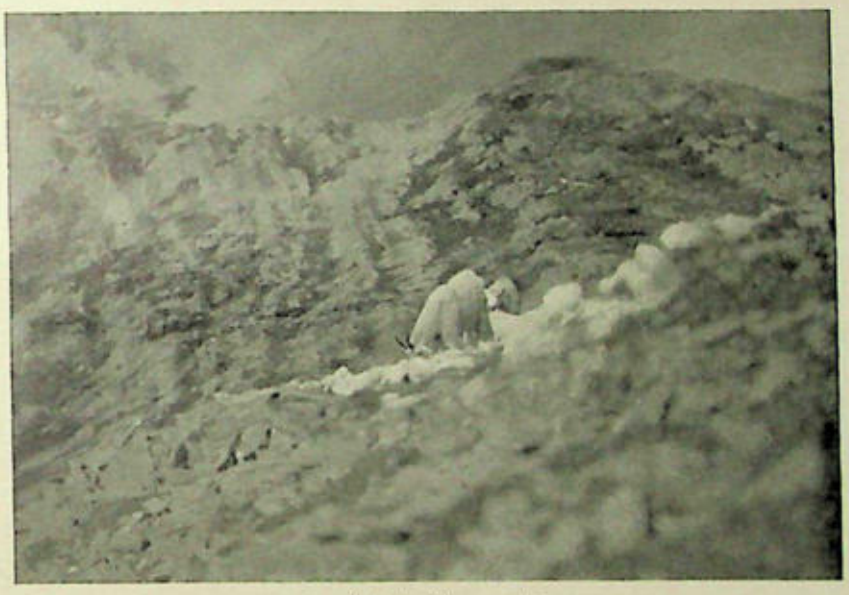
Unlike these Old-World forms, which present little external resemblance to the domestic goats, our mountain antelope certainly has the proportions, the shortness of limb, the beard, the long white hair, the slow movements, and the dignified air of the domestic "billy," as shown by my observations. It is an extraordinarily isolated animal, well protected by certain instincts which

are quite different from those of the mountain sheep; but some of these points will best be summarized after a narrative of my experience.

FOOT STRUCTURE OF THE GOAT.

The accompanying illustrations show the remarkably adaptive structure of the foot of the goat. Mr. Hornaday kindly secured this specimen for me by placing the foot of a freshly killed animal in dilute alcohol. The drawings are executed with fidelity by Mr. E. C. Christman.

The horny part of the foot surrounds only the extreme front. Behind this crescentic horn is a shallow concavity which gives the



Second Series, Photograph 8.

horny hoof a chance to get its hold. Both the main digits and the dew claws terminate in black, rubber-like, rounded and expanded soles, which are of great service in securing a firm footing on the shelving rock and narrow ledges on which the animal travels with such ease. This sole, Smith states, softens in the snow and water-soaked earth and wears away in the spring of the year, when the snow is leaving the ground, a fresh layer of the integument taking its place. The rubber-like balls with which the dew claws are provided are by no means useless; they project back below

the horny part of the hoof, and Mr. Smith has actually observed the young captive goats supporting themselves solely on these dew claws on the edge of a roof.* It is probable that they are similarly used on the rocks and precipices, since on a very narrow ledge they would serve favorably to alter the centre of gravity by enabling the limb to be extended somewhat farther forward.

ASCENT TO THE GOAT COUNTRY.

The ascent to the goat country up Goat Creek is very picturesque (Photograph 1), the forests being occasionally broken by talus and rock slides from the cliffs above. Soon after reaching the summit at the head of Goat Creek six goats were observed (Photograph 2) browsing along the bluff at the point marked 1. Probably disturbed by our scent, they moved slowly to the point marked 2 and disappeared from sight. This was at 12.30. Returning to the same point at 2.30, a single goat was seen sitting on its haunches like a dog, apparently keeping watch, although this may have been merely a resting pose following a feeding period. Norboe moved rapidly forward while I followed more slowly with the camera, and in a few moments four goats appeared descending the cliff at point 3 (Photograph 2); they saw me and scrambled up the cliff, passing out of sight.



Second Series, Photograph 9.

FIRST SERIES OF PHOTOGRAPHS.

Arriving at the top of the cliff I approached gradually and secured the first series of photographs. The sun was shining from the west (left in the picture) over the top of the cliff, so that the bodies of the animals in this series all appear in shadow, with sunlit outlines. The goat and kid are first seen (Photograph 3) at the edge of the precipice on the point of descending, while the

* Another observer, Mr. Owen Wistar, tells me that pads on these dew claws become worn off at the back as the season advances.

dog is hurrying forward to their heels. This was my first observation of a movement which was repeated several times; on each occasion that the mother sought the cliff the dog would rush forward, threatening her heels; the goat and kid would then wheel around, face the dog, charge from twenty to forty feet, and retreat to the edge of the cliff, seeking to descend; but in each case, by threatening either the mother or the kid, the dog stopped this movement. Approaching nearer, through a slight hollow, the goat (Photograph 3a) is seen ready for a charge, the head of the kid appearing under her throat. Approaching still nearer, an excellent view is obtained (Photograph 4), just after another attempted descent. The mother is standing at bay, while the kid is at her heels looking back over the edge of the precipice; the sun is shining on the front limbs of the goat and on the side of the kid, throwing the bodies partly into shadow. The proportions are clearly brought out, the bodies seem to be quite long; there is a decided hump over the shoulders, and the head extends outward from the ewed neck. Approaching still nearer, the distant mountains come into view (Photograph 5); the mother is just preparing for a third charge, and, turning, again offers a fine profile with the kid in the rear.



Third Series, Photograph 10.

SECOND SERIES OF PHOTOGRAPHS.

It appears every moment as if the pair would succeed in turning over the edge of the precipice, but after making a wide circuit in order to reach the sunny side of the animals they are still seen held up by the dog. Both animals are decidedly warm, less from their leisurely movements no doubt than from excitement, which is not in the least expressed by activity. The mother and the kid occasionally stamp with the forefeet and give a slight toss of the head and horns. The ears of both are continually moving to keep off the flies. The changed position brings the

typical goat-feeding grounds of the distant mountain into view (Photograph 6). The next photograph fails. The following one finds the mother in another attempt to escape over the edge of the precipice, and for the first time the kid is between the mother and the dog, which is hurrying forward to attack the rear again and prevent the descent. In Photograph 7 the kid is trying to descend the precipice and the mother is turning around for another charge; the actual charge is apparently too quick for the shutter, as the camera fails to get the details of the limbs. In the next view (Photograph 8), however, the beginning of



Third Series, Photograph 11.



Third Series, Photograph 12.

the charge is fairly well shown. The head is well lowered and threatening, bringing the sharp horns more nearly horizontal, but the kid appears exceptionally indifferent and tranquil.

The nearest approach (Photograph 9) which can be made yields an opportunity for observation at a moment when the dog is well tired out and the mother can be seen breathing rapidly

from suppressed excitement, since they now observe the man with the camera as possibly a new enemy.

A moment later I call off the dog and the pair immediately turn to the precipice and descend out of sight.

THIRD SERIES OF PHOTOGRAPHS.

Making a complete *détour* of the base of the cliff I find that quite a long descent had been made by the mother and kid in search of a niche in the cliff.

The pair are half concealed in this niche at a point which



Third Series, Photograph 13.



Third Series, Photograph 13a.

is entirely inaccessible to either man or dog, perhaps 150 feet below the top of the cliff and 40 feet above the base. Pushing along the base of the cliff, slightly below the level of the pair, the camera first finds the head of the mother coming into view (Photograph 10). Then a means of nearer approach is found (Photograph 11) in which the nature of the cliff is well brought out;

this is the sort of surface on which the mountain goat travels deliberately, but with perfect ease and in any direction.

After looking serenely down on the dog the mother begins to show a little curiosity about the approach of the man with the camera, and finally the kid's head is tempted out a bit (Photograph 12) at the side of the mother; and then (Photographs 13 and 13a) the forward half of the body of the kid appears in shadow looking down beneath the head of the mother. One cannot avoid the impression that both animals are amused at the ineffective efforts of the dog below.

After all the films are exhausted we leave the pair of animals in their safe niche and ascend the top of Ptarmigan Mountain. Another series of facts now come out; it proves that as soon as the pair consider that all danger was over they leave the cliff and seek the trail, and our knowledge of this fact came about in the following way: Passing over to the westerly side we come in view of the distant cliff, and Norboe's ear catches the sound of some falling rocks. Using our glasses we finally discover the four goats which had first escaped moving slowly up one of the goat trails. They stop at the edge of the snow bank (Photograph 2, point 6) to quench their thirst. then move leisurely along to the mountain top, where they turn, and, showing their profile against the sky along the crest of the ridge, descend into the valley beyond. This is at 4.30 P.M.; two hours before we had seen these same animals on the top of the precipice.

An hour later, namely, at 5.30, we happen to return to the same point. On examining the distant mountain with a spy-glass we are so fortunate as to observe the remaining pair, mother and kid, pursuing exactly the same trail. They had left the niche in the precipice and sought the nearest trail along the talus at the foot of the mountain. We see them at precisely the same point. They stop at the same snow bank to quench their thirst, and proceed along the same trail to the sky line, slowly moving up along the ridge, and then disappearing over to the other side.

Throughout these movements one fact stood out prominently—that is, that the precipice is sought by the mountain goat exactly as the burrow is sought by the rabbit. The fact that this is a deep-seated instinct is shown by the behavior of a kid which on another occasion we saw separated from its mother. The movements are always leisurely; even while charging the motions are not rapid, the dog easily backing off to a safe distance. The kid appeared quite indifferent to the attacks of the dog; both animals, in fact, exhibited perfect confidence in their ability to protect

themselves, and perfect *sang-froid*. The stamping of the fore-feet and the tossing of the head by the mother were amusingly imitated by the hornless and defenceless kid. At the top of the cliff in the second series, when the nearest approach was gained, the hard breathing of the mother betrayed considerable excitement and anxiety about the kid, so that the *appearance* of indifference may not have been real, but rather due to the slowness of movement and to absence of any external evidence of excitement.

The whole story proves that the first instinct of these slow-moving animals is to find security in a precipice near by, and that the second is to seek one of their old-established trails and go off into a distant feeding ground.

BY-LAWS

OF THE

New York Zoological Society

AMENDED TO FEBRUARY 1, 1905.

ARTICLE I.

MEETINGS OF THE SOCIETY.

SECTION 1. The office and place of business of the New York Zoological Society shall be in the City of New York, unless otherwise ordered.

SEC. 2. The Society shall hold its annual meeting for the election of Managers, and other business, on the second Tuesday of January, or such day thereafter during the month of January to which said annual meeting shall adjourn.

SEC. 3. Special meetings of the Society shall be called by the Secretary, upon the request of the President or the Chairman of the Executive Committee, or at the written request of ten members.

SEC. 4. Notices of all meetings shall be mailed to each member of the Society at least three days before such meeting.

SEC. 5. At meetings of the Society twenty members shall constitute a quorum.

SEC. 6. The order of business shall be as follows:

1. Roll call.
2. Reading of minutes not previously read.
3. Report of Executive Committee.
4. Report of Secretary.
5. Report of Treasurer.
6. Report of the Director of the Zoological Park.
7. Report of Director of the Aquarium.
8. Election of Managers.
9. Communications.
10. Miscellaneous business.
11. Reports and resolutions.

ARTICLE II.

BOARD OF MANAGERS.

SEC. 1. The Board of Managers shall consist of thirty-six members, together with the Mayor of New York and President of the Park Board, or Commissioner for the Bronx, who shall be members *ex-officio* of the Board.

SEC. 2. Nineteen Managers shall constitute a quorum, but ten managers may transact current business, and adjourn, subject to the subsequent approval of a meeting at which a quorum shall be present.

SEC. 3. The Board of Managers shall hold an annual meeting on the third Tuesday of January, or on such day thereafter to which said annual meeting shall adjourn. Regular meetings of the Board may also be called

by the Secretary on the third Tuesdays of October and April, upon the request of the President or Chairman of the Executive Committee. Special meetings of the Board shall be called at any time by the Secretary, upon the request of the President or Chairman of the Executive Committee, or at the written request of five Managers

SEC. 4. Notices of meetings of the Board shall be mailed to each Manager at least three days before such meetings.

SEC. 5. The successors to the outgoing class of Managers shall be elected by the Society at its annual meeting, but vacancies in the Board may be filled for the unexpired term by the Board of Managers, or by the Executive Committee.

SEC. 6. A Nominating Committee shall be annually appointed by the Executive Committee, and shall consist of three members of the Society at large, who shall nominate and post ten days before the annual election the names of twelve persons to succeed the outgoing class of Managers in a conspicuous place in the office of the Society.

SEC. 7. No person shall be eligible for election to the Board of Managers, except to fill vacancies, unless his name shall have been posted as a candidate by such Committee, or by not less than ten members, in writing, in a conspicuous place in the office of the Society ten days before the annual election. All candidates for election as Managers must be Life Members, Patrons, Associate Founders, or Founders of the Society.

SEC. 8. Any Manager who shall fail to attend three consecutive meetings of the Board, unless excused by vote of the Board, shall cease to be a Manager.

SEC. 9. The Board of Managers shall at its annual meeting elect a President, two Vice-Presidents, a Secretary, and a Treasurer, who shall hold office for one year, or until their successors are elected. The President, Vice-Presidents, and Treasurer shall be members of the Board.

SEC. 10. The Director of the Zoological Park, the Director of the Aquarium, and all other persons employed by the Society, shall be appointed by the Board or by the Executive Committee, and shall hold office during the pleasure of the Board.

SEC. 11. The Board shall, at its annual meeting, elect an Executive Committee and Auditing Committee, which shall hold office for one year, or until their successors are elected. The Board of Managers and the Executive Committee shall also have authority to appoint such other Committees or Officers as they may at any time deem desirable, and to delegate to them such powers as may be necessary.

SEC. 12. The order of business of the meetings of the Board shall be as follows:

1. Roll call.
2. Reading of minutes not previously read.
3. Report of Executive Committee.
4. Report of Secretary.
5. Report of Treasurer.
6. Report of Auditing Committee.
7. Report of Director of the Zoological Park.
8. Report of Director of the Aquarium.
9. Election of Officers.
10. Election of Committees.
11. Election of new members.
12. Communications.
13. Miscellaneous business.

SEC. 13. All reports and resolutions shall be in writing, and the ayes and nays may be called on any resolution at the request of one Manager

SEC. 14. Whenever the funds of the Society shall permit, the Board of Managers or the Executive Committee may award medals or other prizes for meritorious work connected with the objects of the Society.

ARTICLE III.

OFFICERS.

SEC. 1. The officers of the Society shall consist of a President, two Vice-Presidents, a Treasurer, a Secretary, and a Director of the Zoological Park. These officers, with the exception of the Director, shall be elected at the annual meeting of the Board of Managers, but any vacancy may be filled for an unexpired term by the Board of Managers, or by the Executive Committee, until the next annual election.

SEC. 2. The President shall preside at all meetings of the Board and of the Society, and shall be *ex-officio* a member of the Executive and Auditing Committees.

SEC. 3. The Vice-Presidents shall, in the absence of the President, perform his duties and possess his powers, acting in the order of their election.

SEC. 4. The Treasurer shall receive, collect and hold, subject to the order of the Board of Managers, or the Executive Committee, all dues, subscriptions, warrants from the City, fees and securities. He shall pay all bills as ordered by the Board of Managers or the Executive Committee, and shall report to the Society at its annual meeting, and to the Board of Managers at all regular meetings, and to the Executive Committee at each meeting. He shall keep all moneys and securities in some bank or trust company to be approved by the Board of Managers or Executive Committee. The books of the Society shall at all times be open to the inspection of the Managers.

SEC. 5. The Secretary shall be a salaried officer of the Society. He shall be present, unless otherwise relieved by the Board or Executive Committee, at all meetings of the Society, of the Board, and of the Standing Committees. He shall keep a careful record of all proceedings, shall have the custody of the seal, archives and books, other than books of account, and shall conduct the correspondence of the Society. He shall issue all notices and tickets, and shall perform such other duties as the Board may direct. He shall be a member *ex-officio* of the Executive, Aquarium, and Auditing Committees, and of the Scientific Council.

SEC. 6. The Director of the Zoological Park shall be elected annually by the Executive Committee at a salary to be determined by said Committee, and paid monthly from funds of the Society. He shall be the responsible administrative officer of the Park, and shall recommend to the Executive Committee candidates for the various positions in the Park. He shall also perform all such other duties in connection with the business, scientific, and literary administration of the Society as may be assigned to him by the Executive Committee.

SEC. 7. The Director of the Aquarium shall be elected annually by the Executive Committee, and shall hold office until removed or his successor is chosen by said Committee. He shall be the responsible administrative officer of the Aquarium, and shall recommend to the Executive Committee all candidates for positions in the Aquarium. The Director of the Aquarium shall be *ex-officio* a member and Chairman of the Aquarium Committee. He shall perform such other duties in connection with the Aquarium as may be assigned to him by the Executive Committee.

ARTICLE IV.

COMMITTEES.

SEC. 1. There shall be two standing committees, the Executive Committee and the Auditing Committee, which shall hold office for one year or until their successors are elected.

SEC. 2. The Executive Committee shall consist of seven Managers, together with the President and Secretary of the Society *ex-officio*. Four members shall constitute a quorum, and all meetings shall be called by the Chairman. The Executive Committee shall fill all vacancies in its own number and shall have the full powers of the Board of Managers, except so far as such delegation of power may be contrary to law.

SEC. 3. The Executive Committee shall have the control and regulation of the collections, library, and all other property of the Society, and shall have power to purchase, sell, and exchange specimens and books, to employ and control all officials and employees of the Society, Park, and Aquarium, and generally to carry out in detail the directions of the Board of Managers and the terms of any contract between the City, or Park Board, and the Society.

SEC. 4. All the rules and regulations for the examination of applicants for the various positions in the Park and Aquarium shall be made or approved by the Executive Committee.

SEC. 5. The Executive Committee may regulate the auditing and payment for all current accounts.

SEC. 6. The Executive Committee shall annually appoint an Aquarium Committee, whose duties and powers are set forth in Section 11 of Article IV of these By-Laws.

SEC. 7. The Executive Committee shall annually appoint a Nominating Committee, whose duties and powers are set forth in Sections 6 and 7, Article II, of these By-Laws.

SEC. 8. It shall also appoint a Scientific Council, whose powers and duties are set forth in Section 2 of Article V of these By-Laws.

SEC. 9. The Committee shall make a written report at each regular meeting of the Board of Managers.

SEC. 10. The Auditing Committee shall consist of three regular members of the Society, in addition to the President and Secretary, members *ex-officio*, and vacancies shall be filled by the Executive Committee. It shall be the duty of the Auditing Committee to audit, annually, the accounts of the Treasurer, of the Director of the Zoological Park, and of the Director of the Aquarium, and any other accounts of the Society, and shall report to the Board of Managers at its annual meeting.

SEC. 11. The Executive Committee shall annually appoint an Aquarium Committee, not to exceed eight members of this Society, who shall hold office until their successors are chosen. All vacancies shall be filled by the Executive Committee. The Director of the Aquarium shall be *ex-officio* a member and the Chairman of the Aquarium Committee, and such Committee may vest in him any or all of its powers. The Chairman of the Executive Committee and the Secretary of the Society shall also be *ex-officio* members of the Aquarium Committee. Three members shall constitute a quorum. The Executive Committee may delegate to the Aquarium Committee such powers as it may deem proper.

ARTICLE V.

SCIENTIFIC COUNCIL.

SEC. 1. The Executive Committee shall annually appoint a Scientific Council of not more than ten members, and shall fill all vacancies. Members of the Council shall hold office until their successors are appointed.

SEC. 2. The duties of the Council shall be to act as an advisory board in all matters pertaining to the scientific administration of the Society, and especially as to the scientific features of the Park, the promotion of zoology by publications and otherwise, and the preservation of the native fauna of America.

SEC. 3. Four members, including the Chairman, shall constitute a

quorum. The Chairman shall be elected annually by the Council. The Chairman of the Executive Committee and the Secretary of the Society shall be members *ex-officio* of the Council.

ARTICLE VI.

MEMBERS.

SEC. 1. The present members and such others as shall become associated with them, under the conditions prescribed by the By-Laws, shall be members of this Society as long as they shall comply with the By-Laws.

SEC. 2. Members failing to comply with these By-Laws, or for other good and sufficient cause, may be expelled from the Society by the Executive Committee.

SEC. 3. Candidates for membership shall be proposed and seconded by members of the Society. The name, occupation, and place of residence of every member so proposed shall be submitted for election to the Board of Managers or the Executive Committee, and such person, when elected, shall become a member upon payment of the annual dues, or of the fees as prescribed below.

SEC. 4. The annual dues shall be ten dollars, payable in advance, on the first day of May of each year, but the Executive Committee may remit the dues for the current year in the case of members elected between January 1st and May 1st of each year. The classes of membership shall be as follows:

SEC. 5. The payment of $200 at one time shall constitute any member a Life Member.

SEC. 6. The payment of $1,000 at one time, or in the case of a Life Member, of $800, shall constitute any member a Patron.

SEC. 7. The payment of $2,500 at one time, or in the case of a Patron of $1,500, or of a Life Member of $2,300, shall constitute any member an Associate Founder.

SEC. 8. Any member who shall donate to the Society $5,000, or property of equal value, or any Associate Founder who shall donate $2,500, or any Patron who shall donate $4,000, may be elected by the Board of Managers or Executive Committee a Founder.

SEC. 9. Any member who shall have donated to the Society ten thousand dollars ($10,000), or its equivalent, may be elected by the Board of Managers or the Executive Committee a Founder in Perpetuity. Such Founder in Perpetuity shall have the power to designate by a last will and testament his successor, who shall thereupon be entitled to all the rights and privileges of the original Founder in Perpetuity, including the right of designating in turn his successor.

SEC. 10. Any member who shall donate to the Society $25,000, or any Founder who shall donate $20,000, may be elected by the Board of Managers or Executive Committee a Benefactor. A Benefactor shall have all the rights and privileges of a Founder in Perpetuity.

SEC. 11. Persons who have rendered marked service in the science of zoology or natural history may be elected Honorary Members, but not more than three such Honorary Members shall be elected in any one calendar year.

SEC. 12. A resident member who shall have rendered marked scientific or professional services to the Society in any branch of its work may be elected by the Executive Committee a Life Member, Patron, Associate Founder, or Founder. A resident of New York who shall have rendered marked services in zoology or natural history may be elected by the Executive Committee a Permanent Fellow.

SEC. 13. Non-residents who communicate valuable information to the Society, or who have rendered marked service in the science of zoology or natural history, may be elected Corresponding Members.

SEC. 14. Benefactors, Founders in Perpetuity, Founders, Associate Founders, Patrons, Life Members, Honorary Members, Permanent Fellows, and Corresponding Members shall be exempt from annual dues.

ARTICLE VII.

PRIVILEGES OF MEMBERS.

SEC. 1. A member's ticket admits the member and his immediate family to the Park on reserve days, and to all lectures and special exhibitions, and may be used by the member's immediate family, and shall be good for the current year.

SEC. 2. Admission tickets to the Park and Aquarium on reserve days are issued to members for distribution, and are good for the current year.

SEC. 3. Each member of the Society is entitled annually to a member's ticket and to ten admission tickets.

SEC. 4. Each member shall also receive one copy of the catalogue or handbook, the report and official publications of the Society, and shall have all the privileges of the Library and Members' Building.

SEC. 5. No member shall be entitled to the privileges enumerated in this Article unless his annual dues shall have been paid.

SEC. 6. The Life Members shall have all the privileges of members and ten additional admission tickets.

SEC. 7. Benefactors, Founders in Perpetuity, Founders, Associate Founders and Patrons shall have all the privileges of Life Members, and shall in addition receive copies of all scientific works published by the Society.

SEC. 8. Any member who shall fail to pay his annual dues within three months after the same shall have become due, and after notice of thirty days, by mail, shall cease to be a member of the Society; subject, however, to reinstatement by the Board of Managers or Executive Committee for good cause shown.

SEC. 9. Any person elected to membership who shall fail to qualify within three months after notice of his election shall be considered to have declined his election; but such term may be extended by the Board of Managers or Executive Committee.

ARTICLE VIII.

FINANCES.

SEC. 1. The fiscal year of the corporation shall be the calendar year commencing January 1st and ending December 31st.

SEC. 2. Neither the Society nor any of its Managers or Officers shall contract any debt which, with existing debts, shall exceed in amount the funds then in the Treasury, except to meet expenditures for which the City is liable, and for which the Society will be reimbursed by warrants from the Comptroller's office.

ARTICLE IX.

AMENDMENTS.

SEC. 1. Amendments to these By-Laws may be proposed, in writing, at any meeting of the Board of Managers, and adopted by unanimous consent of the Managers present, or if such proposed amendment shall fail to receive unanimous consent, the Secretary shall, with the notices of the next meeting, send a copy of it to each Manager and state that it will be brought up for action at such meeting, when it may be passed by a majority vote.

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