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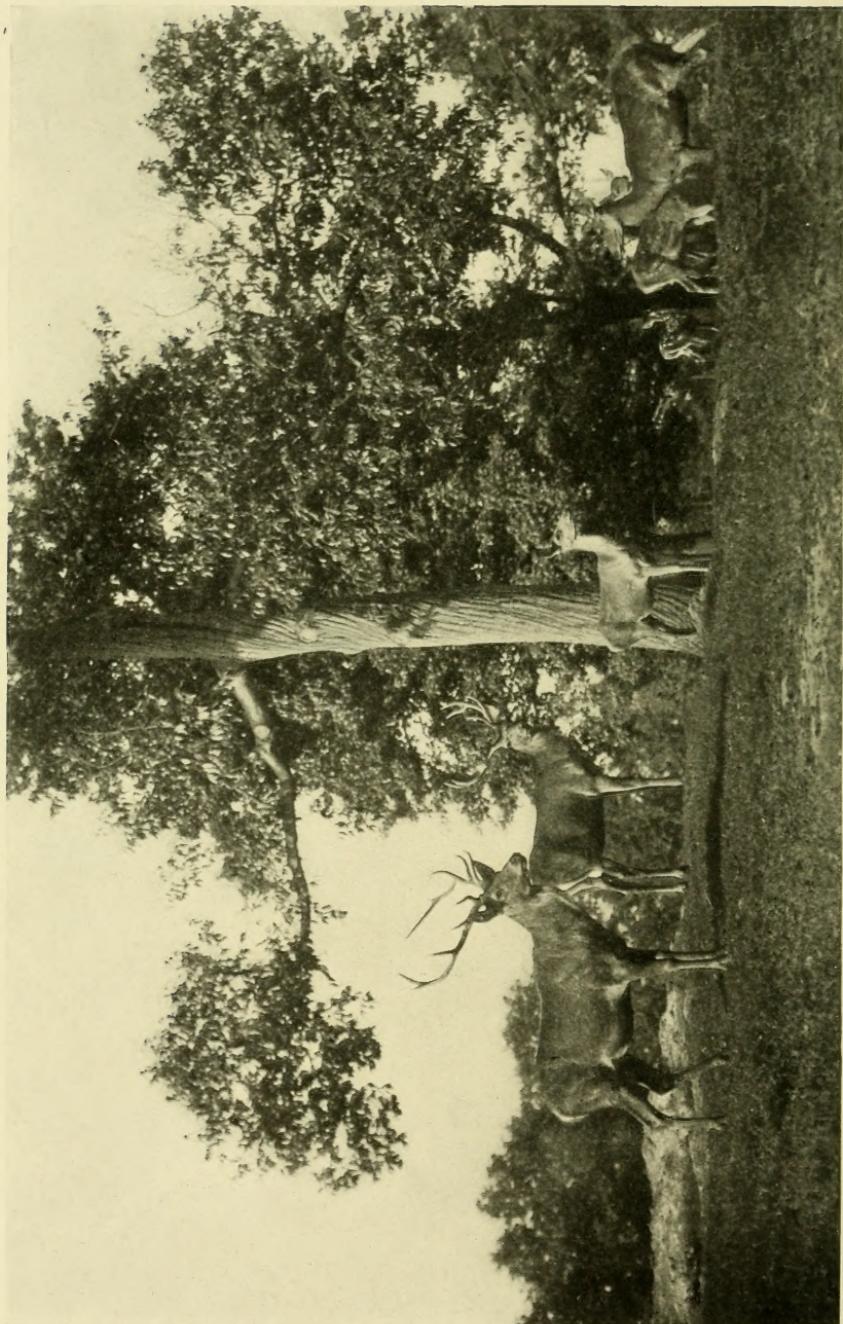
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PORTION OF THE RED DEER HERD.



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JANUARY, 1907

YANKEE
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BY JAMES M. TAYLOR

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New York

Contents

	PAGE
THE BOARD OF MANAGERS	9
OFFICERS OF THE SOCIETY	11
LIST OF MEMBERS	13
REPORT OF THE EXECUTIVE COMMITTEE	31
THE NATIONAL COLLECTION OF HEADS AND HORNS	41
TREASURER'S REPORTS	43
General Fund	43
Income Account	44
Animal Fund	45
Maintenance Fund	46
Ground Improvement Fund	47
Aquarium Improvement Fund	49
Aquarium Fund	50
REPORT OF THE DIRECTOR	<i>W. T. Hornaday</i> 53
AQUARIUM REPORT	<i>Charles H. Townsend</i> 83
THE CULTIVATION OF FISHES	<i>Charles H. Townsend</i> 89
LIST OF GIFTS	113
REPORT OF THE VETERINARIAN	<i>W. Reid Blair, D.V.S.</i> 127
A PECULIAR SKIN DISEASE	<i>W. Reid Blair, D.V.S.</i> 132
ACTINOMYCOSIS IN BLACK MOUNTAIN SHEEP	<i>W. Reid Blair, D.V.S.</i> 137
GROWTH OF THE ALLIGATOR	<i>Raymond L. Ditmars</i> 143
OWLS OF THE NEARCTIC REGION	<i>C. William Beebe</i> 157
LIST OF BIRDS	<i>C. William Beebe</i> 193
BY-LAWS	213
INDEX	219

List of Illustrations

	PAGE
PORTION OF THE RED DEER HERD	<i>Frontispiece</i>
POLAR BEAR	30
ARCTIC FOX	52
BOSTON ROAD ENTRANCE	65
SMALL-DEER HOUSE	70
NEW BOAT HOUSE	76
INTERIOR OF THE AQUARIUM BUILDING IN 1850	82
YELLOW PERCH	89
CRAPPIE	92
LARGE-MOUTHED BLACK BASS	93
LONG-EARED SUNFISH	95
CALICO BASS	96
CROSS-SECTION OF DAM	97
WHITE PERCH	100
ROCK BASS	101
ARTIFICIAL SPAWNING NEST	105
CATFISH	106
WHITE BASS	107
PRIMATE HOUSE	126
EAR OF AFRICAN ELEPHANT	133
SECTION OF SKIN OF AFRICAN ELEPHANT	133
ACTINOMYCOSIS, PLATE I	136
ACTINOMYCOSIS, PLATE II	138
THE ALLIGATOR POOL	142
ALLIGATORS IN THEIR SUMMER POOL	144
FLORIDA CROCODILE	145
ROUGH-EYED CAIMAN	148
HEAD OF FLORIDA CROCODILE	149
AMAZON CAIMAN	150
CAROLINA ALLIGATOR	151
YOUNG SCREECH OWLS	156
BARN OWL	169
SHORT-EARED OWL	170

	PAGE
LONG-EARED OWL	171
Eggs and Young of LONG-EARED OWL	172
YOUNG GREAT HORNED OWLS	173
YOUNG BARN OWL	174
BARRED OWL	175
GREAT GRAY OWL AND ELF OWL	177
SAW-WHET OWL	179
SCREECH OWL	179
GREAT HORNED OWL	181
SNOWY OWL	184
HAWK OWL	187
WESTERN BURROWING OWL	188
FERRUGINOUS PIGMY OWL	191

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 BRUCKER, CARL,
 BRUNN, JULIUS W.,
 BRYANT, DR. JOSEPH D.,
 BRYCE, MRS. WILLIAM,
 BUCHANAN, WILLIAM,
 BUCKNER, THOMAS A.,
 BUDD, HENRY A.,
 BULKLEY, EDWIN M.,
 BULKLEY, MRS. EDWIN M.,
 BULL, CHARLES LIVINGSTON,
 BULL, ROBERT MACLAY,
 BULL, WILLIAM L.,
 BULL, DR. WILLIAM T.,
 BUMPUS, PROF. HERMON C.,
 BURDEN, JAMES A., JR.,
 BURGESS, EDWARD G.,
 BURKE, B. J.,
 BURLEIGH, GEORGE W.,
 BURLEIGH, MRS. GEORGE W.,
 BURNHAM, MRS. DOUGLAS W.,
 BURR, WINTHROP,
 BURRAS, H. K.,

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- BURRILL, ALFRED C.,
 BUSH, JOHN S.,
 BUTLER, ARTHUR W.,
 CAESAR, HENRY A.,
 CALEF, AMOS H.,
 *CALHOUN, HENRY W.,
 CALMAN, ALBERT,
 CALMAN, HENRY L.,
 CAMMANN, EDWARD C.,
 CAMMANN, HENRY LORILLARD,
 CAMMANN, HERMANN H.,
 CANFIELD, GEORGE FOLGER,
 CANFIELD, RICHARD A.,
 CANNON, H. W., JR.,
 CANNON, JAMES G.,
 CADEZA, T. D. M.,
 CAREY, HENRY T.,
 CARPENTER, WILLIAM,
 CARPENTER, PHILIP,
 CARRERE, JOHN M.,
 CARROLL, ROYAL PHELPS,
 CARSTENSEN, MRS. JOHN,
 CARTER, MRS. MARGUERITE,
 *CASTREE, JOHN W.,
 CASWELL, JOHN H.,
 CATHCART, MISS JENNIE R.,
 CERERO, R. L.,
 CHABOT, THEODORE J.,
 CHAMBERS, FRANK R.,
 CHAMBERS, JAMES,
 CHAMBERS, JOHN A.,
 CHAMPOLLION, ANDRE,
 CHAPIN, MRS. ALFRED,
 CHAPIN, MISS MARIE BOWEN,
 CHAPMAN, HENRY OTIS,
 CHAPMAN, JOHN JAY,
 CHAUNCEY, ELIHU,
 CHENEY, GEORGE L.,
 CHESBROUGH, ROBERT A.,
 CHICHESTER, CHARLES DARWIN,
 CHILDS, EVERSLY,
 CHILDS, WILLIAM H.,
 CHISOLM, B. OGDEN,
 CHOATE, JOSEPH K.,
 CHURCH, CHARLES T.,
 CHURCH, E. D., JR.,
 CHURCH, FREDERIC E.,
 CHURCH, F. S.,
 CHURCH, THEODORE W.,
 CLAFLIN, JOHN,
 CLARK, D. CRAWFORD,
 CLARK, J. MITCHELL,
 CLARK, L. C.,
 CLARK, W. A.,
 CLARK, WILLIAM N.,
 CLARKE, E. A. S.,
 CLARKE, THOMAS SHIELDS,
 CLAUSEN, GEORGE C.,
 CLEARY, JOHN,
 CLEMENTS, G. H.,
 CLEVELAND, CHARLES D.,
 CLYDE, WILLIAM P.,
 COCHRANE, JOHN W.,
 COCKERFORD, 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.,
 CONTENT, HARRY,
 COMBE, T. GORTON,
 COOPER, THEODORE,
 CORBIN, AUSTIN,
 CORBIN, MRS. AUSTIN,
 CORNING, C. R.,
 CORWINE, WILLIAM R.,
 COSTAIN, EUGENE H.,
 COSTER, CHARLES,
 COSTER, EDWARD LIVINGSTON,
 COSTER, HENRY A.,
 COWDIN, WINTHROP,
 COWL, CLARKSON,
 COWLES, DAVID S.,
 COX, CHARLES F.,
 COX, JENNINGS S.,
 COX, MARK T.,
 CRAIGIE, ARCHIBALD WALPOLE,
 CRAM, MRS. KATHERINE G.,
 CRANE, ALBERT,
 CRAVATH, MRS. PAUL D.,
 CRAWFORD, THOMAS,
 CRAWFORD, DR. W. H.,
 CRAWFORD, WILLIAM,
 CRICKMORE, H. G.,
 CROMWELL, JAMES W.,
 CROMWELL, LINCOLN,
 CRONEMAYER, ROBERT,
 CROSS, GEORGE D.,
 CROSS, MRS. C. VANDERBILT,
 CROSSLEY, G. REGINALD,
 CRUICKSHANK, JAMES,

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CURTIS, EDWARD W.,
 CUTLER, CHARLES F.,
 CUTTER, RALPH L.,
 CUTTING, R. FULTON,
 CUTTING, W. BAYARD,
 DAILEY, GRANVILLE F.
 DALY, MRS. MARCUS,
 DAMION, WILLIAM E.,
 DANA, WILLIAM B.,
 DANIELS, GEORGE H.,
 DARDS, CHARLES A..
 DAVENPORT, PROF. CHARLES B.,
 DAVENPORT, MRS. IRA,
 DAVIDGE, WILLIAM H.,
 DAVIES, FREDERICK M.,
 DAVIES, J. CLARENCE,
 DAVIES, JULIEN TAPPEN,
 DAVIES, WILLIAM GILBERT,
 DAVIS, CHARLES H.,
 DAVIS, DANIEL A.,
 DAVIS, GHERARDI,
 DAVIS, HOWLAND,
 DAVIS, JOSEPH P.,
 DAVIS, M. B.,
 DAVIS, MORGAN,
 DAVISON, CHARLES STEWART,
 DAVISON, GEORGE HOWARD,
 DAY, ARTHUR M.,
 DAY, MRS. HENRY MILLS,
 DEAN, PROF. BASHFORD,
 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.,
 DELANOV, 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.,
 DIMOCK, GEORGE E.,
 DIXON, DR. GEORGE A.,
 DIXON, ROBERT NICER,
 DODD, ROBERT H.,
 DODGE, D. STUART,
 DODGE, MISS 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,
 DRAYNFELD, B. FERDINAND,
 DRAYTON, J. COLEMAN,
 DRAZ, FRANCIS,
 DRESEL, JOHN A. H.,
 DRUMMOND, I. WYMAN,
 DUANE, RICHARD BACHE,
 DUBoIS, CORNELIUS,
 DUBoIS, DR. MATTHEW B.,
 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.,
 DURYEA, HARRY H.,
 DURYEA, GEN HIRAM,
 DUTCHER, WILLIAM,
 EDGAR, D.,
 EDGAR, HERMAN L. R.,
 EDGAR, MISS JULIA L.,
 EDGAR, NEWBOLD,
 EDGELL, GEORGE S.,
 EDMONDS, JOHN W.,
 EGERTON, M.,
 EGGELING, OTTO,
 EGGLESTON, 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, LINCOLN,
 EMANUEL, J. H., JR.,
 EMERY, JOHN J.,
 EMIGH, MOTT,

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EMMET, C. TEMPLE,
 EMMET, MISS LYDIA F.,
 EMMET, ROBERT TEMPLE,
 ENDICOTT, ROBERT,
 ENGLISH, E. M.,
 ENO, JOHN CHESTER,
 EPSTEAN, EDWARD,
 ERBSLOTH, R.,
 ERDMANN, MARTIN,
 ETTLINGER, LOUIS,
 EUSTIS, JOHN E.,
 EVANS, MRS. CADWALADER,
 EVANS, RICHARD,
 EVARTS, A. W.,
 EVARTS, SHERMAN,
 FABBRI, ALESSANDRO,
 FABBRI, ERNESTO G.,
 FABBRI, MRS ERNESTO G.,
 FAHNESTOCK, HARRIS C.,
 FAHNESTOCK, WILLIAM,
 FAIRBANKS, HENRY P.,
 FALK, GUSTAV,
 FARGO, JAMES C.,
 FARNHAM, PAULDING,
 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-HANSEN, CARL,
 FISHER, L. G.,
 FISK, HARVEY EDWARD,
 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, THOMAS POWELL,
 FRASER, ALEX V.,
 FRASER, MRS. GEORGE S.,
 FRASER, MISS S. GRACE.
 FRASER, WILLIAM C.,
 FRENCH, DR. CECIL,
 FRENCH, DANIEL C.,
 FRIED, SAMPSON,

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.,
 GILBERT, CLINTON,
 GILLETT, DR. CURTENIUS,
 GILSEY, HENRY, JR.,
 GLAZIER, HENRY S.,
 GLEASON, MICHAEL,
 GLYN, W. E.,
 GOADBY, W. H.,
 GODFREY, MRS. E. D.,
 GODWIN, HAROLD,
 GOLDSCHMIDT, S. A.,
 GOODHUE, CHARLES E.,
 GOODHUE, MRS. S. C.,
 *GOODMAN, SAMUEL,
 GOODRIDGE, MRS. F. G.,
 GOODWIN, A. C.,
 GOTTHELF, CHARLES,
 GOTTHELF, HERMAN,
 GOTTHOLD, FREDERIC,
 GOULD, CHARLES A.,
 GOULD, CHARLES W.,
 GOULD, EDWIN,
 GOULD, GEORGE H.,
 GOULDEN, JOSEPH A.,
 GRANT, R. S.,
 GRAVES, WILLIAM L.,
 GREEFF, ERNEST F.,
 GREENE, GEN. FRANCIS V.,
 GREENOUGH, JOHN,
 GREENWOOD, ISAAC J.,
 GREER, CHARLES,
 GREGOR, ELMER R.,
 GRIFFITH, DANIEL J.,
 GRINNELL, GEORGE BIRD,
 GRISCOM, CLEMENT A., JR.,
 GRISWOLD, CHESTER,
 GROSS, FRANK,
 GUGGENHEIM, SIMON,
 GULLIVER, WILLIAM C.,
 GURNEE, WALTER S..

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*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.,
 Harvey, Ely,
 Haskell, George M.,
 Hasslacher, Jacob,
 Hastings, Mrs. Thomas,
 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.,
 Heinheimer, L. A.,
 Heintz, John C.,
 Heitemeyer, Clemens,
 Held, Dr. R. Johnson,
 Hencken, Hancke,
 Hendricks, Francis,
 Henkel, John,
 Henriques, Dr. H. A.,
 Hermann, Ferdinand,
 Herman, 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,
 Hirsch, Charles H.,
 Hiss, Philip,
 Hitchcock, Center,
 Hocart, J. H.,
 Hochschild, Berthold,
 Hodenpyl, Anton G.,
 Hoe, Richard M.,
 Hoe, Mrs. Richard M.,
 Hoe, Mrs. Robert,
 Hoffman, Mrs. E. A.,
 Holbrook, Mrs. F. S.,
 Holden, Edwin B.,
 Holden, George A.,
 Hollins, Henry B.,
 Hollister, H. H.,
 Holt, Henry,
 Homans, Mrs. Edward C.,
 Hooley, Edwin S.,
 Hoff, M. G.,
 Hoppin, Hamilton L.,
 Hoppin, Samuel Howland,
 Hoppin, William W., Jr.,
 Hoskier, H. C.,
 Howland, Henry E.,
 Howland, Mrs. Henry E.,
 Hoyt, Colgate,
 Hoyt, Walter S.,
 Hoyt, Gerald L.,
 Hoyt, Goold,
 Hoyt, Mrs. Jesse,
 Hughes, Charles E.,
 Humphreys, Mrs. Edward Walsh,
 Huntington, Rev. W. R.,
 Hupfel, J. Christopher G.,
 Hussey, William H.,
 Husted, Miss M. Katherine,
 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, Samuel,
 Ivory, L. C.,
 Jackson, Frederic Wendell,

*Deceased.

- JACKSON, DR. GEORGE THOMAS,
 JACKSON, R. G.,
 JACKSON, SAMUEL MACAULEY,
 JACOB, CHARLES,
 JACOB, LAWRENCE.
 JACOBI, DR. A.,
 JACOBUS, JOHN S.,
 JACQUELIN, HERBERT T. B.,
 JACQUELIN, JOHN H.,
 JAMES, ARTHUR CURTIS,
 JAMES, DR. ROBERT C.,
 JAMES, DR. WALTER B.,
 JANEWAY, DR. EDWARD G.,
 JENNINGS, FREDERICK B.,
 JENNINGS, PHILANDER R.,
 JENNINGS, WALTER,
 JESTER, CLAUDE W.,
 JOHNSON, MRS. F. COIT,
 JOHNSON, GUY B.,
 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,
 KEECH, FRANK B.,
 KELLEY, AUSTIN P.,
 KELLOGG, MRS. CHARLES,
 KELLY, EUGENE,
 KEMP, ARTHUR T.,
 KENT, EDWIN C.,
 KEPPEL, FREDERICK,
 KEUFFEL, WILHELM,
 KIDDER, JAMES HATHAWAY,
 KIMBALL, ALFRED R.,
 KING, EDWARD,
 KING, JAMES GORE,
 KING, MRS. LEROY,
 KING, N. K.,
 KING, WILLIAM F.,
 KINNEY, MORRIS,
 KITCHING, FRANK W.,
 KLAUW, MARC,
 KLEE, BENJAMIN,
 KNAPP, DR. HERMAN,
 KNAPP, JOHN M.,
 KNOEDLER, ROLAND F.,
 KOHLMAN, CHARLES,
 KOLB, GUSTAVE F.,
 KOPPEL, FREDERICK,
 KUHN, PERCIVAL,
 KUNHARDT, HENRY R.,
 KUTTROFF, ADOLF,
 LACOMBE, HON. E. HENRY,
 LADEW, MRS. EDWARD R.,
 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.,
 LANGLOTH, J.,
 LANGMANN, DR. GUSTAV,
 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.,
 LEITNER, JACOB,
 *LE ROY, ALFRED,
 LESHER, A. L.,
 LETKEMANN, H. V.,
 LEVY, EMANUEL,
 LEWIS, FREDERIC ELLIOTT,
 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.,
 LOGAN, WALTER S.,
 LONGFELLOW, MRS. FREDERICK W.,
 LOWELL, MISS CARLOTTA RUSSELL,
 LOWELL, JAMES R.,
 LUCKSINGER, JACQUES,
 LUEDER, A.,
 LUSK, PROF GRAHAM,
 LUTTGEN, WALTHER,

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LYMAN, FRANK.
 LYNDE, FRANCIS E. P.,
 LYNDE, ROLLIN H.,
 MCALAN, JOHN,
 MCALPIN, MRS. CHARLES W.,
 MCALPIN, GEORGE L.,
 MCCLURE, S. S.,
 MCCURDY, RICHARD A.,
 MCKIM, REV. HASLETT,
 MCKIM, JOHN, A.,
 MCKIM, LEROY,
 MCKINNEY, GLENN FORD,
 MCLEAN, JAMES,
 MCLEAN, MARSHALL,
 MCVICKAR, EDWARD,
 MACK, JACOB W.,
 MACLAY, MRS. ROBERT,
 MACY, GEORGE A.,
 MAGEE, JOHN,
 MAGER, F. ROBERT,
 MAHL, WILLIAM,
 MAIRS, GEORGE H.,
 MALL, 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,
 MEHLTRETTER, CHAS. F.,
 MELLEN, CHARLES S.,
 MEYER, THOMAS C.,
 MEYROWITZ, EMIL B.,
 MIDDLEBROOK, FREDERICK,
 MIKKELSEN, MRS. M. A.,
 deMILHAU, LOUIS JOHN,
 MILBANK, ALBERT J.,
 MILLER, MRS. CHARLES E.,
 MILLER, EDWARD F.,
 MILLER, ROSWELL,
 MILLIKEN, S. M.,
 MILLS, ABRAHAM G.,
 MILLS, ANDREW,
 MILLS, D. O.,
 MILMINE, C. E.,
 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.,
 MORGAN, MISS ANNIE T.,
 MORGAN, MISS C. L.,
 MORGAN, EDWIN D.,
 MORGAN, GEORGE E.,
 MORGAN, GEORGE H.,
 MORGAN, MRS. J. B.,
 MORGAN, MRS. J. PIERPONT,
 MORGAN, JUNIUS S.,
 MORGAN, MRS. JUNIUS S.,
 MORGAN, DR. THOMAS H.,
 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,
 MYERS, JOSEPH G.,
 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,
 NORRIE, A. LANFEAR,
 NOTMAN, JOHN,
 NOYES, MRS. HENRY D.,
 *OAKLEY, H. CRUGER,
 O'CONNELL, MICHAEL,
 OGDEN, CHARLES W.,
 *OGDEN, M. C.,
 OLcott, DUDLEY, 2D,
 OLSEN, CHARLES P.,
 OLYPHANT, ROBERT,
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 ONATIVIA, JOHN VICTOR,
 O'Rourke, JOHN F.,
 OSBORN, MRS. HENRY FAIRFIELD,
 OSTRANDER, MISS MARY M.,

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OTTEN, MRS. GERTRUDE,
 OUTERBRIDGE, DR. PAUL,
 OVENS, JAMES,
 OVERTON, DR. FRANK,
 PAINTER, DR. H. McM.,
 PALMER, S. S.,
 PANCOAST, RICHARD,
 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, STEPHEN H. P.,
 PELTON, FRANKLIN D.,
 PENDLETON, FRANCIS KEY,
 PENFOLD, WILLIAM HALL,
 PENNIMAN, GEORGE H.,
 PERKINS, GEORGE W.,
 PERKINS, ROBERT P.,
 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.,
 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, 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,
 RHINELANDER, 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.,
 ROBISON, WILLIAM,
 ROCKWOOD, WILLIAM H.,
 ROE, FRANK O.,
 ROE, IRVING L.,
 ROELKER, ALFRED,
 ROESLER, AUGUST,
 ROGERS, E. L.,
 ROGERS, JAMES H.,
 ROKENBAUGH, HENRY S.,
 ROMAINE, W. TYSON,
 ROOSEVELT, W. EMLEN,
 ROOT, ELIHU,

*Deceased.

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,
 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,
 SAMPSION, ALDEN,
 SAMPSION, CHARLES E.,
 SAUTER, FREDERICK,
 SCHAEFER, HENRY,
 SCHANCK, GEORGE E.,
 SCHANG, FREDERICK,
 SCHAUER, 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.,
 SCHUYLER, MISS LOUISA LEE,
 SCHWARZ, HENRY F.,
 SCOTT, HON. FRANCIS M.,
 SCOTT, WILLIAM,
 SCRIBNER, ARTHUR H.,
 SCRYMSER, JAMES A.,
 SEARES, 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.,
 SHEFFIELD, JAMES R.,
 SHELDON, GEORGE R.,
 SHELDON, WILLIAM C.,
 *SHERMAN, GARDINER,
 SHIPWAY, JOHN H.,
 SHURTLEFF, ROSWELL MORSE,
 SEIGEL, 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.,
 SOLTZMAN, E. G.,
 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.,

*Deceased.

STERN, ISAAC,
 STERN, VESTY J.,
 STEVENS, ALEXANDER H.,
 STEVENS, FREDERIC W.,
 STEWART, WILLIAM R.,
 STILLMAN, JAMES A.,
 STILLMAN, T. E.,
 STIMPSON, 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 C.,
 STRAUSS, FREDERIC,
 STREAT, JAMES,
 STREETER, D. D., JR.,
 STURGES, HENRY C.,
 STUVESANT, RUTHERFURD,
 SULLIVAN, MRS. JAMES,
 SUPHEN, JOHN S., JR.,
 SWAYNE, FRANCIS B.,
 SWENSON, S. J.,
 TABER, MISS MARY,
 TAFT, HENRY W.,
 TALCOTT, JAMES,
 TATHAM, CHARLES,
 TATUM, A. H.,
 TAYLOR, DWIGHT W.,
 TAYLOR, GEORGE,
 TAYLOR, MRS. HENRY OSBORN,
 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,
 THACHER, MRS. GEORGE W.,
 THATCHER, 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.,
 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,
 TRAVER, A. P.,
 TRASK, SPENCER,
 TROTTER, WILLIAM,
 TROWBRIDGE, FREDERICK K.,
 TRUAX, HON. CHARLES H.,
 TRUSLOW, T. BROOKS,
 TUCKERMAN, ALFRED,
 TUCKERMANN, PAUL,
 TURNURE, MRS. ARTHUR,
 TURNURE, GEO. E.,
 TWEDDELL, WILLIAM H.,
 UNDERWOOD, WILLIAM LYMAN,
 UPMANN, CARL,
 VALENTINE, DR. WILLIAM A.,
 VAN CORTLANDT, AUGUSTUS,
 VANDERBILT, ALFRED G.,
 VANDERPOEL, MRS. JOHN A.,
 VAN DER SMISSSEN, DR. G. J.,
 VAN EMBURGH, D. B.,
 VAN NEST, MRS. ALEXANDER T.,
 VAN NEST, G. WILLETT,
 VAN NORDEN, THEODORE LANGDON,
 VAN NORDEN, WARNER M.,
 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, H. WM. C.,
 WAGNER, OTTO,
 WAGSTAFF, C. DU BOIS,
 WAINWRIGHT, J. HOWARD,
 WALCOTT, FREDERIC C.,
 WALKER, GEORGE L.,
 WALKER, GEORGE W.,
 WALKER, ROBERT, JR.,
 WALSH, SAMUEL A.,
 WANNINGER, CHARLES,
 WARBURG, PAUL M.,
 WARD, ARTEMAS,
 WARD, MRS. GEORGE CABOT,
 WARD, HENRY C.,
 WARD, J. Q. A.,

*Deceased.

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,
 WELLING, R. W. G.,
 WELLS, OLIVER J.,
 WENDELL, EVERT JANSEN,
 WENDELL, MRS JACOB,
 WERTHEIM, H. P.,
 WESTOVER, M. F.,
 WETMORE, EDMUND,
 WHEELER, EVERETT P.,
 WHEELOCK, DR. GEORGE G.,
 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.,
 WILLETS, JOHN T.,
 WILLIAMS, MRS G. G.,

WILLIAMS, MRS. PERCY H.,
 WILLIAMS, RICHARD H., JR.,
 WILLIAMS, THOMAS,
 WILLIAMS, WALDRON,
 WILLS, CHARLES T.,
 WILSON, DR. EDMUND B.,
 WILSON, GEORGE T.,
 WILSON, HENRY R.,
 WILTSEE, ERNEST,
 WINANT, FREDERICK,
 WINKELBACH, L. O.,
 WINTHROP, EGERTON L.,
 WINTHROP, EGERTON L., JR.,
 WINTHROP, ROBERT DUDLEY,
 WISNER, CHARLES,
 WITHERBEE, FRANK S.,
 WITTHAUS, DR. RUDOLPH A.,
 WOLFF, EMIE,
 WOOD, ARNOLD,
 WOOD, GILBERT CONGDON,
 WOOD, WALTER J.,
 WOOD, WILLIAM CONGDON,
 WOOD, WILLIAM H. S.,
 WOODCOCK, EDWIN,
 WOODHOUSE, J. S.,
 WOODWARD, JAMES T.,
 WRIGHT, J. DUNBAR,
 WRIGHT, MRS. J. HOOD,
 WRIGHT, JOHN HOWARD,
 WRIGHT, MRS. MABEL OSGOOD,
 YOUNG, A. MURRAY,
 YOUNG, FREDERICK STAFFORD,
 YOUNG, GEORGE W.,
 YOUNG, JOHN ALVIN,
 YOUNG, JOHN W.,
 YOUNG, RICHARD N.,
 ZABRISKIE, ANDREW C.,
 ZINSSER, AUGUST.

Corresponding Members

BARBOUR, MRS. S. E.,
 BROWN, HERBERT,
 BROWN, WILLIAM HARVEY,
 *CORNISH, C. J.,
 ELROD, M. J.,
 GOLDING, CAPT. THOMAS,
 GRIFFITH, WILLIAM A.,
 STONE, ANDREW J.,
 WILSON, T. E.

Summary of Membership

Benefactors	5
Total number of Founders	20
" " Associate Founders	10
" " Patrons	44
" " Life Members	195
" " Annual Members	1,293
Total of all classes	1,567

*Deceased.

Qualifications for Regular Membership

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

Form of Bequest

I do hereby give and bequeath to the "NEW YORK ZOOLOGICAL SOCIETY," of the City of New York,.....

.....

.....



POLAR BEAR.

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 that during the year 1906 continuous and satisfactory progress has been made toward the completion of the Zoological Park and the Aquarium. The scientific work of the Society still remains somewhat in the background pending the completion of the large amount of construction still going on at the Park. The most important events of the year have been: The development of the North End of Baird Court and the Concourse; and the new and important approach to the terminus of the subway system at West Farms now practically completed. This new entrance involved a restudy of our original plan for this part of the Park and a large amount of road-building and planting, together with the construction of a Pavilion and gates, and of the large Boat House on Bronx Lake. The building for small deer has also been substantially completed, although not yet opened. Plans have been made for the remainder of the buildings in the Park, and the end of 1908 should see the end of construction on a large scale, provided the City continues to maintain its present liberal attitude towards the Society.

During the past year the attendance at the Zoological Park reached the total of 1,321,917, being an increase of 88,390 over the attendance of 1905. These figures relate to the fenced portion of the Park, and do not include the visitors to the area lying east of Boston Road and to Bronx Lake, which has become a favorite resort for visitors during the summer.

The attendance at the Aquarium for the year 1906 has been the largest in the history of that institution, and reached the enormous figure of 2,106,569, which is 380,399 more than last year, and represents an average daily attendance of 6,040. Since the original opening of the Aquarium, it has been visited by 17,103,328 people. The total annual cost to the City for the maintenance of the Zoological Park and for the Aquarium is about 5½ cents per visitor.

The membership of the Society on January 1, 1907, was as follows:

Benefactors	5
Founders	20
Associate Founders	10
Patrons	44
Life Members	195
Annual Members	1,293
	<hr/>
	1,567

FINANCES.

Animal Fund.—During the year the Animal Fund has been increased by gifts amounting to \$10,250.00 and by \$14,204.64 from the Park privileges. This last account would have been greater except that a large portion of the proceeds from Park privileges has been retained in order to supply the equipment needed for the new Boat House. During the year there was expended for animals the sum of \$23,039.71, leaving a balance of \$1,355.16 on January 1, 1907.

Income Account.—The Income Account still remains insufficient to meet the increasing needs of the general purposes of the Society. There appears to be no way in which this fund can be increased except by the establishment of an Endowment Fund, which the Committee hopes will ultimately be provided. An increase in the membership list would also result in an increase in the Income Account, and it is hoped that all the members of the Society will do what they can to accomplish this.

General Fund.—The General Fund shows a balance of \$6,039.32, and has been but little used during the current year. It is hoped that this fund will be increased during the year by some substantial gifts of money available for the general purposes of the Society.

Ground Improvement Fund.—There has been expended during the year from the Ground Improvement Fund \$163,479.09, leaving a balance available of \$313,580.32, most of which will be used to construct the Elephant House. With the approval of the Mayor, an application has been made to the Board of Estimate and Apportionment for a bond issue of \$500,000, \$250,000 to be issued during the year 1907, and \$250,000 to be used during 1908.

Maintenance of the Zoological Park.—The amount provided

for the maintenance of the Park for 1906, \$144,965, has been barely sufficient to maintain the Park during the year. The needs of the Park during 1907, owing to the completion of the Small Deer House, and the opening of the new Entrance Pavilion, and to the general increase in the Collections, will tax the resources of the Society heavily, as the City has seen fit to decrease the amount appropriated by \$3,406.25, leaving as maintenance for 1907 only \$141,558.75. Your Committee is not informed of the reason of this decrease, but assumes it was due to a lack of adequate knowledge of the needs of this Society.

Maintenance of the Aquarium.—The amount appropriated for the maintenance of the Aquarium for 1906 was \$45,000, which has proved sufficient with close economy to maintain that institution during the year. The same amount has been provided for 1907.

Aquarium Improvement Fund.—During the year the Aquarium Improvement Fund was drawn on to the extent of \$8,622.89, and it now appears probable that we can complete the necessary alterations to the Aquarium and have a small balance on hand.

In the Treasurer's report, detailed statements of the different accounts are set forth at length.

IMPORTANT GIFTS TO THE PARK.

The most important gifts during the year have been: One hippopotamus, presented by Mr. Samuel Thorne; an African rhinoceros, presented by Mr. Frederick G. Bourne; five sea-lions, presented by Mr. Jacob H. Schiff; one pair of black bears, presented by Mr. Emerson McMillin; one pair of black bears, presented by Mr. E. H. Harriman; one pair of black bears, presented by Dr. A. B. Duel; one pair of jaguar cubs, presented by Mrs. Arthur Curtiss James; two manatee and two Florida crocodiles, presented by Mr. A. W. Dimock; five buffalo and five elk, presented by Mr. T. D. M. Cardeza. A number of smaller gifts have also been received during the year, a full list of which will be found on page 113 of this report.

PUBLICATIONS.

During the year the Annual Report and four quarterly Bulletins have been published and sent to all the members of this Society, together with an edition of the Guide Book. An entire new Guide Book, brought fully down to date, is now being pre-

pared, and will be published and sent to the members early during the year.

NEW BUILDINGS AND INSTALLATIONS.

The Glass Court, which is really an addition to the Bird House, was completed during the year, filled with small birds, and opened to the public early in October, 1906.

The Small-Deer House, occupying the site of the old Antelope Range, west of the Antelope House, is nearly completed and in all probability will be occupied about May 1.

Baird Court.—The western and northern boundary walls, balustrades and approach steps to Baird Court have been entirely completed, and the sloping Italian Garden will be prepared and planted during the Spring. Contracts for the pavilions and gates at the entrance to the Concourse itself were awarded during the year. The work is now under way and will be completed early in the Spring.

The Feed-Barn and enclosing fence have been completed and the work shops and storage yards are now entirely screened from view.

At the Boston Road entrance, the retaining wall and plaza, the entrance pavilion, and all the walks connecting with the Antelope House and Buffalo Range have been completed, together with a large amount of planting. The Public Comfort Building on Boston Road was partly finished, but owing to an irregularity in the contract between the City and the contractor, work was suspended. The building, however, will be completed during 1907.

The Boat House has been finished and will be ready for use early in the Spring. The upper floor of this building will be used for a restaurant, and will largely increase the receipts of the Privilege Account. A large amount of miscellaneous construction work has been done, the details of which will be found in the report of the Director of the Park.

PLANS FOR 1907.

The most important building remaining to be constructed in the Park is the Elephant House. Plans for the building have been carefully studied during the year and are now in the hands of the Park Department, and a contract for the construction of this building will be awarded at an early date.

Plans have been prepared for a zebra installation, to occupy

the site of the old Caribou Range, which will contain, when completed, a large collection of *Equidae*.

Plans for the Administration Building, to occupy the northeast corner of Baird Court, are nearly completed, and the contract for it will be awarded as soon as funds are available for this purpose. This building, when completed, will be the headquarters of the Society, and will contain a collection of paintings and a library available for public use, under proper restrictions. It will also contain the Collection of Heads and Horns referred to below.

Carefully studied plans for the Biological Laboratory, to occupy a site near the present Service Building, are now ready and only await the necessary funds to be placed under contract.

EAST SIDE EXTENSION.

Plans have been prepared for the newly acquired addition to Bronx Park to the east. These plans involve a series of roads and paths connecting with those of the Zoological Park. A re-adjustment of boundaries on that side of the Park will probably be necessary.

ANIMAL COLLECTIONS.

The animal collections at the Park have been greatly increased in numbers and in value, notably in the Department of Birds. At the close of the year the Park contained 3,624 specimens, being an increase of 753 specimens over the year of 1905. The total number of animals represents 808 species, while last year the total number of animals represented 656 species. The number of species and specimens in the different departments are as follows:

Mammals	620 specimens	189 species
Birds 2,104	"	491 "
Reptiles and		
Amphibians 900	"	138 "
Totals 3,624	"	818 "

At the very close of the year the Society received a young male African rhinoceros, purchased for the Zoological Society at Mombasa, East Africa, by Mr. Richard Tjader, and by him brought to New York.

MEDICAL DEPARTMENT.

The Medical Department during the year continued to show the results of its careful organization. The death rate has been held down to what appears to be its normal amount. There have been substantially no deaths among the important animals of the Park. Of course there is a certain amount of loss in any Zoological Park, owing to the fact that a considerable number of the specimens are naturally short-lived.

FORESTRY DEPARTMENT.

Under this head, reference must be made to the large amount of planting that has been done in the Park, amounting to 12,450 shrubs and 6,135 trees. Careful effort has been made to reproduce the original forest flora in the Zoological Park. Mr. James L. Greenleaf has continued to give this Society the benefit of his advice, and Mr. Merkel, the Chief Forester, has ably carried out the plans of the Committee. Efforts to save the chestnut trees were made during the year, but without notable success. In the other forested areas of the Bronx no efforts were made to control or eradicate that disease, and it is feared that the *Cytospora* will ultimately destroy all of our chestnut trees.

GAME PROTECTION.

The work for the protection of game, an important feature of the work of the Society, was done under the Department of Game Protection, with Mr. George O. Shields as chief game protector. A special report of the work of this department will be found elsewhere in this report.

The National Government has accepted the Society's offer of a buffalo herd, to be placed on the Wichita Forest Reserve. Fifteen thousand dollars was appropriated for fences and other improvements, and a contract for the work was closed in November. Active construction is now in progress, and the Range will be ready for occupancy early in the coming Summer. The buffalo presented by the Society will be shipped next Autumn.

THE NATIONAL COLLECTION OF HEADS AND HORNS.

The Executive Committee has determined to establish, under the auspices of the Society, a National Collection of valuable or record heads and horns, realizing that the time is fast approach-

ing when it will be no longer possible to obtain notable specimens of heads, antlers and horns of our large game animals. This collection will be located in the new Administration Building. As a nucleus, Mr. Hornaday has presented his entire collection, which is the result of many years' careful work and numbers 131 specimens, as follows:

Sheep	19
Ibexes and Goats.....	8
Caribou, Moose, and Deer.....	36
Antelopes	44
Bison, Buffaloes and others.....	21
Tusks, etc.,	3

131

It is hoped that the members of the Society, and sportsmen generally, will from time to time present to the Society notably fine specimens, which will be properly exhibited. It is the intention of the Society to show a complete set of each type of heads of each species of large American game.

PRESERVATION OF BRONX RIVER.

During the year the Society obtained the appointment of a Commission to consider the possibility of the preservation of the entire Bronx Valley from Bronx Park to Kensico Dam, under the Chairmanship of the Secretary of this Society. This Commission has reported to the Governor in favor of the proposed parkway, and expects to obtain during the year of 1907 legislation which will make possible the creation of a parkway fifteen miles long, affording complete protection to the river and its banks. This done, Bronx River can be saved for the uses of the Zoological Society for all time.

NEW YORK AQUARIUM.

During the year the work of improvement at the Aquarium was continued. New boilers and a ventilating system were installed, and the long continued work of replacing the rusted out iron pipe with new lead lined pipe went on. As soon as the new lead lined pipe is completely installed, the storage reservoir can be placed in commission and this much needed improvement made available.

The most notable addition during the year were two Manatees, a 400-pound Loggerhead Turtle, seven specimens of the Giant Snapping Turtle of the lower Mississippi River, averaging 80 pounds each, two large Tarpons, which were taken in pound nets in New York Harbor.

The exhibits of fishes and other forms of aquatic life were as extensive as the number of tanks in the building permitted. Owing to the use of all the available space, no further addition to the collections is possible.

The fish-hatchery was operated as usual as a fish-cultural exhibit, and large quantities of young fry were turned over to the State Fish Commission.

OBITUARY.

The Committee has lost during the year two of its Patrons, Mr. A. Newbold Morris, who had maintained for many years his interest in the Society, and Mr. Philip Schuyler, who was a member of the Executive Committee from the beginning, and whose loss was felt all the more keenly because his death was the first break in the ranks of the founders and organizers of the New York Zoological Society.

The action taken by the Executive Committee upon the loss of Mr. Schuyler follows at the end of this report.

ACKNOWLEDGMENTS.

The Committee desires to express its appreciation of the continued devotion to the interests of the Society of the Director of the Zoological Park, and of the Director of the Aquarium. Mr. Hornaday's serious illness during the year, from which he is now happily fully recovered, brought home to the Committee the full appreciation of his importance and value to this Society. The staffs of both the Park and the Aquarium have been loyal and devoted to their work, and the Committee desires to take this opportunity to express its sense of appreciation. The Committee desires also to acknowledge the courtesy and interest shown by the Mayor, Hon. George B. McClellan, and by the Comptroller, Hon. Herman A. Metz, and to the Hon. Moses Herrman, President of the Park Board. 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 Commissioner Joseph I. Berry, to Mr. Martin Schenck, Chief Engineer; Mr. William P. Hennessy, Assistant Engineer, and Mr. G. K. Ackerman, Chief Clerk, who have continued to be helpful and friendly, and this Society desires to record its appreciation of their co-operation.

Respectfully submitted,

CHARLES T. BARNEY, *Chairman.*

HENRY FAIRFIELD OSBORN,
MADISON GRANT,
JOHN S. BARNES,

PERCY R. PYNE,
WILLIAM WHITE NILES,
SAMUEL THORNE,

LEVI P. MORTON, *ex-officio.*

January 1, 1907.

In Memoriam.

By the tragic death of Mr. Philip Schuyler on Thanksgiving Morning, November 29, 1906, we have lost one of our oldest, stanchest, and most beloved friends; a member of the Society from its organization; elected on May 14, 1895, a member of the original Board of Managers, and elected a member of the Executive Committee soon after its organization; serving on the Committee for eleven years; loyal and confident of success, even in the early days of doubt and difficulty, his memory deserves our gratitude, and the gratitude of the City of New York. May he always remain fresh in our minds and hearts as a perfect example of a Christian gentleman, public spirited, and devoted to his country, his city, and his friends.

THE NATIONAL COLLECTION OF HEADS AND HORNS.

NOTWITHSTANDING the existence of game laws, and the constant efforts of many persons who believe in the protection of wild life, it is an undeniable fact that, in nearly all parts of the world that yet are inhabited by large animals, the creatures of horn, hoof, and claw are rapidly disappearing. In Alaska, the finest hunting ground possessed by this nation, we regretfully admit that the existing game law appears to have availed very little in checking the appalling slaughter of moose, caribou, and mountain sheep.

Although in Africa the English are doing their utmost to conserve their remaining stock of large hooved mammals, in the best game districts it is practically certain that the various species are being killed more rapidly than they breed.

But for the timely and thoughtful efforts of the Duke of Bedford, Père David's deer, of Manchuria, would have been completely exterminated, actually before our eyes, five years ago. To-day, not one living specimen remains save in the Woburn Park herd of His Grace.

In view of facts such as the above, it has seemed to the Secretary of the Society, and the Director of the Zoological Park, the imperative duty of American sportsmen, zoologists, and taxidermists, that a complete and perfect collection of the heads and horns of the world's ungulates should be formed in America, without delay. In viewing the whole situation, it has seemed desirable that the Zoological Society should accept the ownership of such a collection, in case it is formed, and assume the duty of maintaining it acceptably and in perpetuity.

Accordingly, the creation of a great collection, to be national in the scope of its founding, has been seriously proposed; and the title chosen for it is "The National Collection of Heads and Horns." It is believed that the sportsmen and naturalists of America will be found willing to form the collection; and the New York Zoological Society, by a formal resolution adopted on December 20, 1906, by the Executive Committee, has decided to accept, maintain, and suitably exhibit the collection. On the date mentioned, Mr. Hornaday presented to the Society, as a

nucleus for the proposed collection, his private collection of 131 heads and horns, representing 108 species. A list of the species contained in this gift is published herewith.

As an evidence of his keen interest in the success of this undertaking, Mr. Charles T. Barney, Chairman of the Executive Committee, purchased and presented to the Society (at a cost of \$2,500), the magnificent pair of world's record elephant tusks which reached the Zoological Park on February 4, 1907. In length they far surpass all other tusks ever known to have come from any living species of elephant, and in curve and symmetry they are remarkably beautiful. The longest tusk measures eleven feet, five and one-half inches, the other eleven feet, and the weight of the pair is 293 pounds. They are from an African elephant, and it is reported that they once were owned by King Menelik, of Abyssinia, who presented them to a European political officer. They were offered for sale in the London ivory market, were bought by Mr. Rowland Ward, from whom they were purchased by the order of Mr. Barney.

In every respect these astounding specimens—which scarce can be credited until seen—are fit to start a national collection.

It is proposed that the collection to be formed shall include two series of specimens, one to be arranged zoologically, the other geographically. It is intended to collect not only heads, horns, and tusks, but also game records and photographs. At first the collection will be installed in the picture gallery of the Administration Building, and exhibited under proper restrictions, but it is reasonable to suppose that later on it will be housed permanently in a building specially erected for it.

Naturally, the standard of acceptance will be made sufficiently high that only particularly fine specimens will be admitted to the exhibition collections, so that any sportsman may fairly regard it as an honor to be represented in the National Collection.

M. G.

W. T. H.

Treasurer's Reports.

FOR THE YEAR ENDING DECEMBER 31, 1906.

The annual expenditure of the various funds is shown in the appended statements.

General Fund.

Cash in Treasury, January 1, 1906..... \$9,856 00

RECEIPTS.

Sale of Aquarium Publications 172 44

\$10,028 44

EXPENDITURES.

Aquarium Publications \$210 64

Income Account (Transfer) 3,000 00

Architects' Commissions 778 48

Cash Balance, December 31, 1906 6,039 32

\$10,028 44

H. R. MITCHELL,
Chief Clerk.

PERCY R. PYNE,
Treasurer.

January 1, 1907.

Income Account.

Cash in Treasury, January 1, 1906	\$1 12
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RECEIPTS.

Life membership	\$3,200 00
Annual dues	12,110 00
Stokes' bird fund	135 00
Aquarium	5 00
Aquarium publications	236 52
General fund (transfer)	3,000 00
	<hr/>
	\$18,686 52
	<hr/>
	\$18,687 64

EXPENDITURES.

Stationery and office supplies	\$795 59
Annual report	2,429 58
General office expenses	1,881 05
Library	319 16
Mailing circulars	774 67
Miscellaneous expenses	2,534 26
Photographs and slides	923 16
Wichita buffalo herd	112 49
Treasurer's office expenses	510 29
Secretary's salary	4,000 00
Office furniture	59 50
Museum supplies	48 13
Game protection	1,240 26
Interest	821 62
Bulletin	951 14
Employers' insurance	439 88
Publications for members	36 82
Audit of Accounts	150 00
Insurance	253 23
Cash balance, December 31, 1906	\$18,280 83
	406 81
	<hr/>
	\$18,687 64

H. R. MITCHELL,
Chief Clerk.
 January 1, 1907.

PERCY R. PYNE,
Treasurer.

Animal Fund.

Cash in Treasury, January 1, 1906.....	\$2,940 23
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RECEIPTS.

Special Subscriptions:

Oliver Payne	\$1,000 00
Samuel Thorne	3,000 00
DeWitt C. Blair	250 00
George W. Baker	1,000 00
Levi P. Morton	500 00
C. F. Dieterich	250 00
Cleveland H. Dodge	500 00
Lispenard Stewart	250 00
George C. Clark	250 00
Morris K. Jesup	250 00
	\$7,250 00

Receipts at Park:

Admissions	8,132 35
Checking	39 65
Rents	673 97
Miscellaneous	291 17
Boating	1,525 00
Sale of animals	1,042 50
Privilege account	2,500 00
	14,204 64
	21,454 64
	<hr/>
	\$24,394 87

EXPENDITURES.

Purchase of Animals:

Mammals	\$14,269 27
Birds	5,237 00
Reptiles	1,505 36
Traveling and other expenses	\$21,011 63
Express and other charges	444 64
Cash balance, December 31, 1906.....	1,583 44
	\$23,039 71
	1,355 16
	<hr/>
	\$24,394 87

H. R. MITCHELL,
Chief Clerk.
 January 1, 1907.

PERCY R. PYNE,
Treasurer.

Maintenance Fund.

RECEIPTS.

Received from the city on account of main-	
tenance appropriation of \$144,965 for the	
year	\$127,910 31
Balance due from the city on account of main-	
tenance	17,054 69

	\$144,965 00

EXPENDITURES.

General administration	\$13,396 92
Maintenance of buildings and care of animals	39,475 46
Maintenance and care of grounds	40,959 49
Tools and hardware	3,164 94
Paints and oils	2,418 05
Office supplies and printing	876 36
Repairs	449 92
Telephone service and tolls	844 22
Postage, telegraph and express	997 70
Food for animals	26,269 18
Fuel	4,904 66
Drugs and medicines	257 21
Lumber	1,450 63
Miscellaneous supplies	432 36
Plumbing supplies	824 17
Electric lighting	297 41
Office furniture and fixtures	300 51
Fencing and netting	711 13
Engineering supplies	37 61
Janitor's supplies	432 25
Glass and glaziers' supplies	146 69
Sanitation	499 39
Horses and vehicles	975 97
Telephone and electric supplies	31 77
Rubber hose	280 50
Ice	314 56
Medical attendance (employees)	248 50
Nursery supplies	142 61
Nursery stock and seeds	105 53
Medical attendance (animals)	460 00
Mats and floor covering	61 78
Uniforms and badges	932 25
Park baskets	175 00
Surgical instruments and appliances	83 42
Sand	165 00
Park benches	755 25
Trap rock	992 00
Signs and labels	94 60

	\$144,965 00

H. R. MITCHELL,
Chief Clerk.

PERCY R. PYNE,
Treasurer.

January 15, 1907.

Ground Improvement Fund.

RECEIPTS.

Unexpended balance of appropriation No. 3, brought forward,		4,106 42
Appropriation by Board of Estimate and Apportionment:		
Available July, 1904	\$275,000 00	
Available May, 1905	275,000 00	
Available May, 1906	250,000 00	
Premium on bonds, to December 31, 1906.....		
	<u>800,000 00</u>	
	<u>10,183 70</u>	
		<u><u>\$814,290 12</u></u>

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. Schaefer, Jr., Co., Baird Court	67,000 00
Contract, Guidone & Galardi, two Toilet Buildings	8,385 00
Contract, Peter Kiernan, Camel House....	2,800 00
Contract, Wright & Son, Feed Barn.....	15,316 00
Contract, J. J. Buckley, Public Comfort Building	5,600 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
Contract, David E. Kennedy, Installing Electric Cables	1,999 00
Contract, Leslie McHarg & Co., Terrace Wall and Plaza Steps	4,770 00
Contract, Guidone & Galardi, Boat House	34,235 00
Contract, John V. Schaefer, Jr., Co., Con- course Entrance	22,108 00
Contract, John V. Schaefer, Jr., Co., Con- course and West Approach to Baird Court	36,271 50
Miscellaneous Expenses, Park Depart- ment	4,568 88
	<u><u>\$303,683 35</u></u>

By the Zoological Society:

Pheasants' aviary	\$2,113 42
Reconstruction of walks	16,706 67
Forestry and planting	38,536 03
Guard rails	4,429 25
Ostrich and mammal house walks and yards	1,757 30
Carried forward	<u><u>\$63,542 67</u></u>

Carried forward	\$63,542 67
Miscellaneous ground improvement items...	14,680 50
Electric conduits	393 83
Baird Court boundary and concourse.....	1,300 00
Small Deer House Walks and Yards.....	8,684 49
North End of Baird Court	7,961 31
Improvements North of Lake Agassiz.....	6,276 99
New Walks	15,774 61
Southern Boundary Fence	5,060 12
Lion House roof	1,400 00
Public Comfort Station east of Bronx River	2,033 56
Bird House	3,943 45
Sea Lion pool	2,655 64
Buffalo range grading and seeding	2,363 14
Improvements east of Bronx River	99 09
Excavating Lake Agassiz	2,615 60
Grading Elk range and filling pond.....	2,573 93
Tortoise yards	1,461 08
Beaver Pond pipe line	2,316 73
Maral Deer Shelter	294 23
Moving Buffalo House and corrals.....	5,918 56
New shops	1,053 12
Western range fences	6,811 30
Subway Entrance Plaza	9,005 75
Restaurant steps	1,294 11
Landscape architecture	5,164 79
Boston Road Public Comfort Station.....	935 49
Feed barn and yard	7,714 91
Camel House yards and fences	1,630 53
Small Deer house	1,981 54
Boat House	1,019 55
Flood Gates	768 65
Service Road extension	2,760 08
West Farms block	2,085 93
Water line to bear dens	1,163 33
Antelope Shelter	1,615 84
Concourse Entrance	672 00
Balance available for expenditure, December 31, 1906	197,026 45
	313,580 32
	\$814,290 12

H. R. MITCHELL,
Chief Clerk.

PERCY R. PYNE,
Treasurer.

January 1, 1907.

Aquarium Improvement Fund.

RECEIPTS.

Balance of \$40,000 Appropriation as per Report of 1905....	\$8,694 64
Premiums account sale of bonds.....	1,289 02
	<hr/>
	\$9,983 66

EXPENDITURES.

Through Park Department:

Lead Lined Pipe Co., Lead-lined pipe.....	\$5,995 00
W. J. Olvany, Measurements of pipes.....	200 00
Barney & Chapman, Commissions.....	299 75
Francis K. Ford, Survey.....	20 00
W. J. Lawlor, Installing pipe.....	190 00
White & Eisenmann, Bolts, etc.....	12 50
White & Eisenmann, Bolts, etc.....	157 62
John Spence, Jr., Plumbing and installing lead-lined pipe.....	1,097 00
Barney & Chapman, Commissions.....	54 85
Abendroth & Root, Grate bars.....	125 00
John Fox, Repairs to water heater.....	463 00
Pay-roll, Chief Engineer.....	210 90
Balance available for expenditure.....	<hr/> \$8,827 62
	1,156 04
	<hr/> \$9,983 66

E. R. SAMPSON,
Disbursing Clerk.

January 1, 1907.

Aquarium Fund.

RECEIPTS.

Received from New York City on account of Aquarium Appropriation for 1906.....	\$45,000 00
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EXPENDITURES.

Pay-rolls	\$30,178 57
Coal	5,397 01
Alterations and Repairs	2,693 51
General Supplies	1,056 33
Fish Food	1,830 77
Live Specimens	1,407 35
Incidental Expenses	425 96
Gas	771 66
Electric Light	308 60
Telephone Service	146 30
Ice	54 56
Stationery and Printing	63 05
Uniforms and Caps	90 50
Furniture	143 88
Cartage (Fish, cans and debris).....	416 06
Books for Library	3 60
Balance unexpended	12 29
	<hr/>
	\$45,000 00

January 1, 1907.

We certify that the foregoing statements showing the condition of the various funds of the New York Zoological Society on December 31, 1906, are true exhibits of the accounts.

The items comprising the expenditure of \$303,683.35 on the Ground Improvement Fund No. 4, as well as the items amounting to \$8,827.62 under Aquarium Improvement Fund, were disbursed by the Park Department. As this money did not pass through the books of the Society, the items have not been verified by us.

THE AUDIT COMPANY OF NEW YORK.

New York, February 14, 1907.



ARCTIC FOX, WINTER PELAGE.

REPORT OF THE DIRECTOR OF THE ZOOLOGICAL PARK.

DURING the past twelve months, the progress and prosperity of the Zoological Park have continued unbroken. The usual number of permanent improvements were made, the attendance was the largest yet recorded, the animal collections were notably increased, the health and longevity of the animals surpassed all expectations, there were no epidemics, no accidents to visitors, and only one accident to a keeper.

If the same degree of progress in internal improvements continues for two more years, the public will then be treated to the unusual spectacle of a great zoological institution practically completed within ten years from its inauguration. In succeeding pages will be found a full list of the improvements completed during 1906, and another of the new works begun.

During the four months' illness and absence of the Director, from April 25 to September 1, the admirable management of the Zoological Park was a most effective testimonial of the personal efficiency and loyalty of the entire corps of officers.

ATTENDANCE.

The attendance of visitors during the year showed the usual increase, and reached the highest point yet attained. Even yet, however, there appear to be a vast number of people in New York City who are not aware that the Subway to West Farms is the best means of reaching the Park. Thousands of visitors who desire to go to the point nearest the Zoological Park are landed at the Botanical Gardens.

The attendance for the past two years is shown by months in the following table.

Month.	1905.	1906.
January	23,788	48,721
February	20,969	44,500
March	48,508	52,754

Month.	1905.	1906.
April	126,611	141,636
May	179,590	165,942
June	139,361	148,564
July	147,596	154,358
August	152,961	151,383
September	133,146	220,804
October	144,542	85,795
November	720,994	75,875
December	43,722	31,585
 Totals	 1,233,528	 1,321,917
Increase for 1906	88,389	

HEALTH OF THE ANIMALS.

One year ago, it was stated that the extremely small list of deaths during 1905, must be regarded as unusual, and that so light a record of mortality could not reasonably be expected in succeeding years. Fortunately, it is possible to repeat that statement, and apply it to the year 1906. During the past twelve months, the most valuable animal lost by death was a Markhor, worth \$500, after which the other losses sank in value to very small figures, per capita.

In the Lion House, there were no deaths. In the Primates' House the most serious loss was a newly-arrived baby chimpanzee. In the Antelope House, which contains a collection worth to-day at ruling values, at least \$41,000.00, there was not one death. In the Ostrich House, we had the misfortune to lose two ostriches and two cassowaries. Among the smaller birds, of which the number on hand is very great, the deaths of the small and short-lived species were seemingly numerous, but in reality the daily average for such a collection was very low. Among birds, as among mammals, the largest, the most important, and most valuable specimens are the ones which live longest.

SIZE OF THE ANIMAL COLLECTION.

The close of 1906 found us in possession of 3,624 living creatures, of which 620 were mammals, 2,104 were birds, and 900 were reptiles and amphibians. The total number of species represented was 818. In view of the number of rare and zoologically important species included in these figures, it is reasonably certain that to-day there exists but one zoological garden whose animal

collections as a whole surpass those of the New York Zoological Park. While this institution was founded and dedicated to zoology in no vain-glorious spirit to out-do existing institutions of a similar character, we may at least be allowed to rejoice in the fact that the Zoological Society's plans to do justice both to the people of New York City and the living creatures of the world, have been prospered to the extent described. In view of the war of annihilation that is now being waged nearly everywhere against the wild creatures that still inhabit this gun-cursed earth, it is impossible for zoological gardens and parks to become too numerous, or too great.

DEPARTMENT OF MAMMALS.

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

Early in 1906, the Mayor, the Board of Estimate and Board of Aldermen approved the Society's application for funds for an Elephant House, and without delay steps were taken to secure the animals which it will accommodate. To-day the Antelope House is half filled with the elephants, rhinoceroses, a hippopotamus and tapirs, which presently will migrate to the new building, and a corresponding number of valuable African antelopes are temporarily crowded out.

As in many other matters pertaining to our supply of animals, the Society has been exceedingly fortunate in securing rarities for the Elephant House, precisely when it most earnestly wished to have them. It is our understanding that despite the constant demands of showmen and zoological gardens, during the past ten years only four African rhinoceroses have reached the northern hemisphere alive, and of these two were secured last year by our Society. Both our animals were captured very near to the south-eastern arm of Lake Victoria Nyanza, which is called Speke Gulf. The first specimen, a fine female born in the early summer of 1905, was purchased of Mr. Louis Ruhe, of this city, at a cost of \$5,000.00

Our second specimen, a lusty male born in July, 1906, was purchased for us in Mombasa by Mr. Richard Tjader, of New York, and by him landed in New York, in excellent health, on December 31, 1906. The cost of this specimen was \$4,531.50, and it is the gift of Mr. Frederick G. Bourne. On the journey from Africa, this animal was very skilfully managed and cared for by Mr. Herbert O. Laing, of the American Museum of Natural History, who is entitled to much credit for his success in bringing

his odd charge across the Atlantic in midwinter, and landing it in perfect health. There is good reason to expect that this pair of rhinoceroses will eventually breed here.

During the summer of 1906, our female rhinoceros developed a swelling in the muscle of its left lower jaw, which eventually became so obstinate and troublesome that a severe operation was necessary to open the affected part quite to the bottom. The operation was entirely successful, and did not in any way affect the health of the animal. In January, 1907, the drainage opening closed naturally, and the whole affected part is now healed.

A fine young male hippopotamus, now three years old, was purchased of the Park Department of the Borough of Manhattan, and safely installed temporarily in the Antelope House, wherein a pool had been provided to meet just such a contingency. This very desirable specimen is the gift of Mr. Samuel Thorne, and its arrival is most opportune. With the addition of a pair of young East African elephants, which will be delivered during the coming spring, the collection of animals for the Elephant House will be quite assured.

The flock of five white mountain goats, procured in British Columbia, in October, 1905, remains intact, and in perfect health. All of these animals are growing about as rapidly and satisfactorily as wild animals of the same age, and unless the low altitude, and the dense, salty air of New York eventually causes a premature physical breakdown, they soon will be sufficiently mature to breed. The buffalo herd, the European bison, the elk herd and all the Asiatic and tropical deer are, without exception, in fine condition. The Asiatic deer are breeding so rapidly as to cause some embarrassment, for it is difficult to sell the increase as rapidly as it is produced. The following is a list of the most important births in the Mammal Department during the year:

MAMMALS BORN IN 1906.

1 Grizzly Bear.	3 Axis Deer.
1 Syrian Bear.	3 Sika Deer.
3 Buffalo.	5 Red Deer.
1 Grant's Zebra.	2 Fallow Deer.
1 Angora Goat.	4 Mule Deer.
2 Spanish Ibex.	2 Barasinga Deer.
3 Elk.	1 Malay Sambar Deer.
1 Altai Wapiti.	1 Indian Sambar Deer.
1 Eld's Deer.	5 Eskimo Dogs.

40 Specimens.

A summary of the mammals living in the Zoological Park on December 31, 1906, is as follows:

Primates	30 species.	83 specimens.
Carnivora	60 "	149 "
Pinnipedia	1 "	2 "
Rodentia	26 "	123 "
Ungulata	61 "	236 "
Marsupialia	9 "	23 "
Edentata,	2 "	4 "
<hr/>		
Total	189 "	620 "

DEPARTMENT OF BIRDS.

C. William Beebe, Curator.

In this department the leading event of the year was the assembling of a large collection of North American song-birds in an addition to the Large Bird House, which is known as the Glass Court. The thirty-nine large cages of that structure provided accommodations for a great number of passerine birds, and they were promptly filled. The song-birds previously quartered in the noisy parrot-room of the main building, and handicapped by their screaming neighbors, were removed to the new cages, where they were able to exercise their powers of song. Of the nineteen families in the Order Passeres, eighteen are represented by living specimens, the majority of which are ranged, by Families, in zoological sequence.

There is cause for satisfaction in the fact that on December 31, 1906, the Zoological Park contained living examples of 26 Orders of Birds out of the total 31 Orders. The net increase over the bird collection of 1905, is 136 species, and 549 specimens, making a grand total of 2,104 specimens. The birds of the United States are represented by about 170 species, of which about 70 belong to the Order of perching birds.

Throughout the year, the collection of wild geese was made a special feature. A representative series was installed in the Ducks' Aviary, for which large descriptive labels were prepared and displayed. The series contained seventeen species out of the world's total of thirty-five species, and it attracted much attention.

The owl collection was enriched by the addition of a fine pair of giant eagle owls, and also tawny, Cape eagle, horned, and grass owls, and European little owl. Other important additions

consisted of five young frigate birds from Mexico, weka rails from New Zealand, several rufous tinamous, brush turkeys from Australia, quail doves, Wonga-Wonga pigeons, thicknecks, maribou storks, red kites, a bataleur eagle, chattering lory, alpine chough and Himalayan finch.

The most serious loss of the year was the old California condor, which died from swallowing a rubber band, administered by some visitor. By great good fortune, a second specimen had been purchased and received in the collection a few days previous to the tragedy. The new bird, "General," which, from the egg up, was studied and photographed by Mr. W. L. Finley, is now protected from the treacherous public by two screens of wire mesh.

In September, First-Keeper Stacey arrived from London with a very fine consignment of birds, chiefly in exchange from the London Zoological Society's Gardens, and it is hoped that other exchanges with that institution may be effected.

Among the gifts received during the year, special mention should be made of five flamingoes from Mr. James McLaughlin, ten Curacao birds from Captain Edgar A. Holmes, a white gyrfalcon from the captain of the steamer "Furnessia," and a European curlew from the captain of the steamer "Oscar II."

The Curator of Birds has greatly advanced the labeling of the bird collection as a whole, by the production of many descriptive labels of large size, and maps of distribution. For some of the latter, a special copper frame has been designed and made by our workmen, with very satisfactory results. A series of twenty-two large descriptive labels of important avian Families has been printed and framed, the majority of which have been placed in the Glass Court.

The health of the birds generally has been excellently maintained. It is well understood that, in every vivarium which contains hundreds of small and delicate birds, many deaths must occur each year. As with the mammals, however, the largest and most important specimens are the ones which live longest; and the deaths among the tiny species are not noticed by the public.

The general extent and richness of our bird collection is well shown in the following summary:

LIST OF BIRDS ON HAND DECEMBER 31, 1906.

Orders	Species.	Specimens.
Rheiformes,	Rheas	1 2
Struthioniformes,	Ostriches	2 2
Casuariformes.	Emeus and Cassowaries.	2 2
Tinamiformes.	Tinamous	2 5
Galliformes,	Quail and Pheasants.....	58 189
Columbiformes,	Pigeons and Doves.....	31 111
Ralliformes,	Coots and Gallinules.....	7 20
Podicipediformes,	Grebes	1 1
Lariformes.	Gulls and Terns	11 36
Charadriiformes.	Plovers and Sandpipers..	7 19
Gruiformes.	Cranes, Seriema	9 17
Ardeiformes,	Ibis, Storks, and Herons	22 76
Palamedeiformes,	Screamers	1 3
Phoenicopteriformes,	Flamingoes	2 9
Anseriformes.	Swans, Geese, and Ducks	45 333
Pelecaniformes.	Cormorants and Pelicans.	9 25
Cathartidiformes.	New World Vultures.....	5 12
Accipitriformes,	Hawks and Eagles; Old- World Vultures	10 40
Strigiformes,	Owls	15 20
Psittaciformes,	Parrots, Macaws, and Cockatoos.....	46 101
Coraciiformes.	Kingfishers and Horn- bills	2 5
Trogones,	Trogons	1 2
Coccyges,	Cuckoos	2 2
Scansores.	Toucans	4 5
Piciformes,	Woodpeckers	3 3
Passeriformes,	Thrushes, Sparrows, and all Perching Birds.....	184 1,053
26 Orders	491	2,104

DEPARTMENT OF REPTILES.

Raymond L. Ditmars, Curator.

The Lizard and Tortoise Yards at the eastern end of the Reptile House, and the extra-hot compartments within, have proven very successful. Throughout the warm weather of the year this installation was a favorite feature with visitors. Here were exhibited outside, during the warm months, the big tropical lizards

and various species of tortoises, the latter ranging in size from specimens six inches long to the ponderous giant tortoises from the Galapagos and Aldabra Islands. Here, for the first time in the Park, it was possible to properly exhibit the iguanas, monitors, and tegus which, even in the best indoor cages, are comparatively dull and listless. Placed outside they soon become quite different creatures, rushing about at surprising speed, and displaying all the ferocity, cunning, and hunting instincts of the warm-blooded beasts of prey. When naturally and unreservedly displayed, their habits are in marked contrast to many former records of these creatures, from which it would seem as if many of those records had been based on theories, only. In our sunny yards, with the large iguanas enjoying practical liberty, we have noted that they are by no means "largely herbivorous." They are markedly carnivorous, sometimes even inclining toward cannibalism; and for this reason we are careful to stock our yards with specimens of almost uniform size.

To add to the natural aspect of the Lizard and Tortoise Yards, a small cedar tree was planted in the iguana enclosure; and on sunny days it was decorated with clusters of the South American and Mexican tree iguanas, singularly striking in their display of various shades of green. Some large cacti and other plants of a similar nature furnished hiding places for the smaller species that live chiefly upon the ground. During the cold months all the lizards and tortoises are kept in the glass-covered annex of the east end of the Reptile House, where a generous supply of heating pipes, and diffused sunlight throughout the day, maintain a high temperature.

The collection of crocodilians has grown substantially, not only in the number of individuals and species exhibited, but in the size of the specimens. Observations on the growth of these reptiles have been of much interest, and that subject is treated at length elsewhere in this volume. The ten-inch alligators installed in the Reptile House at the opening of the Park, over seven years ago, have constantly and rapidly increased in growth. The specimens first outgrew their section of the turtle crawl, after that a lobby cage, then a double lobby cage, and finally the large tank at the east end of the Reptile House on the main floor.

Last summer they were placed outdoors, in the rock-bound pool formerly occupied by the sea-lions. In this commodious pool they basked in the hot sun, and grew until the approach of frosty weather, when an embarrassing situation was presented. It was discovered that these alligators had outgrown all available ac-

commodations, and as a last resort a sort of mezzanine floor, of wire, was hung in the northern end of the large alligator pool in the Reptile House. Fortunately, a few of the individuals have attained such size and strength as to enable them to hold their own among our largest crocodilians, and through these our main exhibit of large specimens has been materially strengthened.

While no species of special importance have been added to the collection of non-venomous snakes, a considerable number of poisonous serpents, new to our collection, have been placed on exhibition. Among these may be mentioned a representative series of African vipers, which, while strikingly sinister in form are generally decorated with the strangest of patterns, combined with the richest colors imaginable. Two of the most interesting of these African snakes were brought to this country from the Congo Free State, by Mr. Samuel P. Verner, who transported one of them in an ordinary basket for a distance of about five hundred miles, despite the hysterical complaints of his superstitious black carriers.

REPTILES AND AMPHIBIANS ON HAND DECEMBER 31, 1906.

	Species.	Specimens.
Chelonia	34	194
Crocodilia	4	55
Lacertilia	16	156
Ophidia	69	312
Amphibia	15	183
Total	138	900

The total census of the Zoological Park collections at the end of 1906 is as follows:

SUMMARY OF COLLECTIONS.

	Species.	Specimens.
Mammals	189	620
Birds	491	2,104
Reptiles	123	717
Amphibians	15	183
Total	818	3,624
Increase over 1905	161	757

GROUND IMPROVEMENTS UNDER THE DIRECTION OF ZOOLOGICAL PARK OFFICERS.

Hermann W. Merkel, Chief Constructor and Forester.

The work accomplished under this head marked an important advance toward the final completion of the internal improvements of the Zoological Park. Several forces of men, under experienced foremen, were throughout the working season diligently employed in the very numerous tasks of miscellaneous construction which were of such a nature that they could not satisfactorily be performed by contract.

Completion of the Service Road.—The long-contemplated section of the Service Road between the Rocking-Stone and the Buffalo Entrance was at last undertaken, and carried to satisfactory completion. It is by far the best piece of road-making in the Park. In order to carry the route down the steep eastern slope of Rocking-Stone Hill, it was necessary to run through the Buffalo Corrals very near the north end of the Buffalo House. The engineering was very satisfactorily accomplished by Mr. Beerbower. To prevent washing on the steep hillside, flat concrete gutters, with a raised outside rim, were combined with tar-surfaced Telford macadam, and the finished result may well be taken as a model for park roads in such situations. Naturally, the new connecting link is of great advantage to the business interests of the Park, and in addition to that, it is used by a majority of our visitors, in preference to the stone steps near by.

The Buffalo Corrals.—The invasion of the original Buffalo Corrals rendered necessary a complete remodeling of the accommodations for our American bison—now numbering thirty-four head. To meet the new conditions, on a permanent basis, a spacious new corral and two small yards for ill-tempered individuals, were constructed immediately south of the old corral, and in front of the long, open shed hurriedly erected in 1905. Around these enclosures, and also around what remained of the old corrals, new fences were erected, on heavy steel posts. The unpaved surface of all these corrals and yards was covered with Telford macadam, thoroughly drained, and the whole system of yards was put on a first class and permanent basis. At the same time, advantage was taken of the opportunity to erect a chute in which to capture and crate animals that are to be shipped away.

Yards Around the Small-Deer House.—Owing to the many difficulties presented by the slope of the ground surrounding the Small-Deer House, it was deemed advisable to follow the same

course which had proven so satisfactory in developing the yards of the large Antelope House on ground equally difficult. The Executive Committee decided that it would be best, and also most economical, for all work in connection with the outer enclosures of the Small-Deer House to be performed under the daily personal supervision of the officers of the Park. Immediately upon the completion of the walls and roof of the building the grading began, and was completed in sufficient time that the concrete coping, and the macadam of the entire eastern series of seventeen yards, was finished before the arrival of freezing weather. Not only that, but all the steel posts for those yards were set, in order that the erection of the fence panels and gates could proceed during the mild weather of winter and early spring. At the earliest possible moment in the coming spring, work will begin on the western series of yards, and it is our intention that by July 1, or earlier, they also will be completed. Meanwhile, the completed eastern series will be occupied by animals now on hand, in storage.

Fences and Gates.—To meet the peculiar demands of the small hooved animals, the fences, partitions, and gates of the corrals described above demanded careful consideration. After much experimenting the Director and Chief Constructor finally produced two entirely new types of fences and gates, and it is believed that they will successfully meet the wants of this peculiar situation. The two fences consist of new combinations of netting, coiled spring wire, iron rods, and structural steel, designed to be satisfactory to the eyes of the visitor, safe for the captive animals, adequate protection against sharp horns, yet no obstruction to air currents in hot weather. At a later date these fences may be figured for the benefit of all persons who are interested for practical reasons.

Owing to the practical difficulties involved in making the iron-work to fit the sloping ground, and for other reasons, it has been found advisable to make all these fences in our own workshop. The metal work for the eastern series of yards has been produced both expeditiously and economically, and is now ready to erect.

The West Farms Entrance Plaza, excepting the cut-stone wall and steps, was constructed and paved by the Park construction force; and the stone for the retaining wall also was selected and delivered on the ground by our men. This improvement required 3,700 yards of filling, and 12,000 square feet of paving.

The brick wall around the Feed Barn and Service Yard was

erected partly by the Park force, and partly by James Henderson under a small contract for laying the brick. The walls, pilasters and gate-posts are capped with green tile to match the roof of the barn, and the whole effect is very satisfactory. The wall varies in height from seven to nine feet, and its total length is 800 feet.

The erection of the new barn rendered it possible to remove a large assortment of unsightly temporary sheds, after which all the ground surrounding the barn was macadamized, and surfaced with tar. The completion of the barn and its enclosing wall have made a great change in what previously was an unsightly spot.

Antelope Shed.—The temporary presence in the Antelope House of two elephants, two rhinoceroses, one hippopotamus, two tapirs, four zebras, and a wild ass, all belonging in other buildings, has had the effect of crowding out of that building a number of valuable antelopes. To carry the latter through the winter, it became necessary to erect in the Service Yard, with all possible haste, a shed about seventy feet long, and finish it before cold weather. This structure was rushed into existence, and is now serving a very important purpose. From end to end it is filled with valuable tropical animals which rightfully belong in the Antelope House, and which will return thither at the earliest possible moment.

Western Boundary Fence.—Early in the year a new boundary fence was erected along the western side of the Park, from Pelham Avenue to 182d Street, a distance of about 3,000 feet. As usual, this fence consisted of extra heavy steel wire attached to heavy steel T-posts set on the stone retaining wall, or in concrete.

Work on Baird Court.—The completion of the northern wall and steps to Baird Court rendered it possible to finish the surface work on the north end of the Court, above the Sea-Lion Pool and Fountain. The walks on all that area were paved with Telford macadam, and tarred on the surface. The grass plat was filled in with top soil and graded, and around the space which lies between the Lion and Primate Houses, about 650 feet of granite coping were set. The sloping garden received about 500 cubic yards of top soil.

Beaver Pond Pipe-Line.—The plan for supplying a good stream of water from the Bronx River into the head of the Beaver Pond, undertaken in 1905, was completed in 1906 by the erection of a stone dam across the old raceway below the waterfall, and laying from it to the hydraulic ram about fifty feet of twelve-inch cast-iron pipe. When this was finished, the ram was



PLAZA AT BOSTON ROAD ENTRANCE.
View Directly South, Before Planting Was Completed



PLAZA AT BOSTON ROAD ENTRANCE.
View Directly South, After Planting and Terrace Wall were Completed.

immediately started pumping a three-inch stream of water into the head of the Beaver Pond; and this has continued automatically ever since, save in midwinter. The result is a great improvement in the quality of the water in the Beaver Pond, and the creation of a desirable running brook traversing the lower end of Beaver Valley.

Water Supply at Bear Dens.—For several years past, the supply of water for cage-washing purposes at the Bear Dens has been very inadequate, due to a feeble source of supply on 182d Street. To remedy this difficulty permanently, a line of two-inch pipe 400 feet long was run from the four-inch water main in front of the Reptile House eastward to the Bear Dens, by which there has been secured at the latter point a pressure of forty-five pounds per square inch against thirteen pounds per inch previously. This also gives an increased supply of water at the Restaurant and Buffalo Corrals.

Tar Surface on Walks.—Our method of tar-coating the surface of walks has been found so successful and satisfactory we have resolved to treat all our macadam walks by that process. In 1905 it was not possible to apply tar to the surface of all the walks that were constructed during that year. The process is necessarily somewhat slow, and can not be hurried with acceptable results. This branch of work was taken up as early as the season would permit and continued throughout the year. To facilitate the work, a surface burner was purchased and used as occasion demanded. During the year 28,000 square feet of walks were surfaced with tar and half-inch stone, and rendered properly smooth, frost-proof, permanently dry, and free from an objectionable quantity of dust.

With the important thoroughfare known as Osborn's Walk, from which the whole surface of fine screenings had been worn off, leaving the walk unpleasantly rough, a new experiment was tried. The walk was swept free from dust, a coating of hot tar was applied upon the irregular surface, the half-inch stone was applied in a thin coat, and it was saturated with tar. The bond thus made proved quite effective, and the success of this experiment will lead to other work of a similar kind. The principal walks re-built, or re-surfaced, were Osborn's Walk, Pheasants' Aviary Walk, and the two walks leading from the west and north to the new Boston Road Entrance.

Near the Service Building a new walk and road combined was built to connect Beaver Valley with the Service Road, at the Reptile House. This connecting link is much used by visitors.

"West Farms Block."—For convenience this name is applied to the recent addition to Bronx Park which was made at West Farms. Owing to the fact that its surface lies well below the level of the Boston Road, which bounds it on the west, a very considerable amount of filling is necessary to bring its surface up to an acceptable grade. During the year about 5,000 yards of soil were hauled to this spot and disposed of to the best advantage; but even with this, much more work remains to be done. Work on this feature will be taken up actively in the early spring. Much of the stone for the entrance walk that is to be built there is already on the ground.

The Large Buffalo Range, from which, as a sanitary measure, the top soil was removed to a depth of six inches, was worked over and seeded down with red-top—a grass which it is believed will be better for the buffaloes than the unwholesome mixture of old grasses which originally covered the range.

Miscellaneous Items.—Of the very large number of minor permanent improvements carried out during 1906, mention should be made of the following:—

Several thousand yards of top soil for the sides of the Concourse have been hauled and stored at the eastern end of Cope Lake.

A flight of steps forty feet wide was built at the Fordham Entrance, because of an important change in the level of the street.

Cages for breeding birds were built around the outside of the Breeding House, situated near the Aquatic Birds' House.

A water gate, of iron and wood, was built and hung under the Pelham Avenue bridge, to protect the interior of the Park.

A concrete root-cellars was constructed in the Nursery.

Two new drinking fountains were installed—near the Fox Dens and the Aquatic Birds' House.

Important alterations were made in the Pavilion lunch-room, at the Rocking-Stone Restaurant.

Concrete floors were laid in all the deer houses not previously provided with them.

The following figures give a summary of what was accomplished during 1906 on some of the lines mentioned above:

Walks surfaced with tar	28,000	square feet.
Walks resurfaced with stone.....	17,000	" "
New walks built.....	3,200	" "
Service roads built	3,600	" "
New fences erected	3,850	lineal "
Guard wires erected along walks....	17,300	" "

Planting.—The most important item of planting accomplished during the year was the screen of tall red cedars placed by contract between the Boston Road Entrance Plaza and West Farms, under the direction of Mr. James L. Greenleaf, Consulting Landscape Architect. Some very necessary planting was done on the islands and shores of Lake Agassiz. The rhododendron groups along Beaver Valley Walk were strengthened, and the border plantations along the western and southern boundaries of the Park were increased by the addition of many new conifers.

The summary of plantings for the year shows additions to the extent of 2,035 trees, 12,450 shrubs and vines, and 4,100 perennials. These are now generally in excellent condition.

Insect Pests.—During the year 1906, 11,194 tent caterpillar nests were found and destroyed, against 40,300 in 1905, a decrease of almost 75 per cent. Three hundred and fifteen cocoons of noxious insects were collected, against 700 last year. Oyster-shell, San Jose and other scales are now rarely found, due largely to the thoroughness with which spraying was accomplished by our machine.

The results obtained by spraying the chestnut trees were not so good, and it is now feared that all but a few of these trees—not only in the Zoological Park, but in all this section of the city—are doomed. The forester has kept close watch for immune trees, so that seed may be gathered from them, but so far he has been unable to find a single specimen.

Several egg-masses of the *Mantis religiosa*, or praying mantis, were hatched, and about eighty young specimens were liberated. Eggs and cocoons of other predaceous insects will be collected, and the insects liberated.

Forestry.—Six hundred and twenty-five trees, including the chestnuts, were pruned and treated. Thirty-five dead trees were cut out and removed, as against two hundred last year, apparently proving the value of previous care.

The general maintenance work of mowing lawns, edging the walks, the care of the thousands of newly planted trees and shrubs, and the mulching of lawns with about 400 loads of fertilizers, was also done by the forestry force. A larger number of men were employed this year than heretofore, and the improvement in the Park as a whole was noticeable.

Good Order.—Notwithstanding the fact that during the past year there were eight arrests and convictions for offenses and depredations committed in that part of the Park lying east of the Boston Road, the crowds that thronged that region during the

summer months were, as a rule, orderly and quiet. The boisterous element was not nearly so troublesome as heretofore.

Forest Fires.—The matter of forest fires is one which will have to be more vigorously dealt with in the future—probably by having more watchmen on crowded days, and also by securing the arrest and conviction of persons who either carelessly or maliciously cause fires to be started. In the dry days of autumn, it is not an uncommon occurrence for our force to be called upon to extinguish from twenty to thirty fires in one day, some of which are lighted with malicious intent.

Shooting.—The shooting of Zoological Park birds and squirrels now seems to be a thing of the past, as no arrests for this offense were made in our grounds during the year. On the whole, the problem of controlling the rowdy element seems to be satisfactorily solved. This is due in a great measure to the persistence and faithfulness of Special Officer Van Benschoten.

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. Hennessey, Asst. Engineer.

Small-Deer House.—The most important building erected in 1906, was designed to accommodate a large number of small tropical deer, antelopes, and gazelles, such as now are rapidly accumulating. It has become well nigh an impossibility either to house in winter or properly exhibit in summer the delicate, yet very interesting small hooved animals of the tropics and sub-tropics, without a special building. Accordingly a spacious structure 156 feet long by 46 feet wide was planned to occupy the open space immediately west of the Antelope House, originally known as the Prong-Horned Antelope's Range. A contract for this building, which is to be called the Small-Deer House, was let in 1905, to Guidone & Galardi, at a cost of \$41,543. Work began very early in the spring, and by the end of December the building itself was complete. The cage work of the interior is now going in, and the installation will be ready for use about May 1, 1907. As previously stated, all the work on the yards and fences surrounding the building is being performed by a force of men under the direction of the officers of the Zoological Park.

SMALL-DEER HOUSE.



Walls and Stairways of Baird Court.—This contract was let in 1905, to the John V. Schaefer Company in the sum of \$67,000, and a beginning was made in that year. Work was prosecuted throughout the working season of 1906, and the contract was completed in October.

The Feed Barn, erected by William H. Wright & Son, was completed in the summer of 1906, and immediately occupied. Its cost was \$15,316, and it forms a most valuable addition to the plant necessary for the economical maintenance of the Park.

The Glass Court, which is really an addition to the large Bird-House, specially designed for American song birds, was completed by the George L. Walker Company, at a cost of \$24,-199, and occupied in September with a very full collection of birds.

Two Toilet Buildings, east of the Bronx River, were completed early in the spring, by Guidone & Galardi, at a cost of \$8,385.

The Public Comfort Building on the Boston Road, near the Boat House and new entrance, suffered a misfortune. In the belief that the contract awarded to Mr. J. J. Buckley in 1905 was generally satisfactory, Mr. Buckley promptly began active operations, without waiting for the formal approval of the contract by the Law Department of the City. After a considerable amount of work had been performed, the Corporation Counsel decided that because of the adjournment for one week of the meeting of the Park Board on the date set for the opening of bids, the contract was invalid, and a reletting was necessary. This unfortunate circumstance delayed the erection of this building for an entire year. It stands to-day as it was left by Mr. Buckley when the contract was disapproved; but a new contract was let in January, 1907, and work will recommence early in the spring.

The Entrance Pavilion at the new West Farms Entrance was not completed in 1906, but it will be ready for use early in the opening of 1907. This contract is with William Horne & Company, and the amount, without the registering turnstiles, is \$5,008.

Pelham Avenue Entrance, Concourse, and Western Approach to Baird Court.—A contract in the sum of \$58,379.50, which was awarded in October to the John V. Schaefer, Jr., Company, embraces three important improvements, which, when completed, will mark the practical finish of the northern end of the Zoological Park. The new entrance is intended to admit carriages and automobiles, as well as pedestrians, to the Concourse, by which to approach the broad stairways at the north end of Baird Court.

The new western approach leads from Bird's Valley Walk to the stairs which rise to the level of Baird Court at the western end of its transverse axis. All three of these very indispensable improvements should be completed in 1907.

The Granite Steps at the Bear Dens, leading up to Rocking-Stone Hill, were completed by John Fury in the autumn of 1906, and are a very satisfactory piece of work.

The Retaining Wall and Balustrade, a massive structure of cut stone to support a terrace about seven feet high, was constructed across the north end of the West Farms Entrance plaza, by Leslie McHarg & Co., at a cost of \$4,770, and completed promptly in 1906. As noted elsewhere, the construction and surfacing of the plaza itself was performed under the direction of the officers of the Zoological Park, by the Park improvement force.

MAINTENANCE.

Mr. H. W. Merkel, Chief Constructor; Mr. E. H. Costain, Asst. Forester and Captain-of-the-Watch.

As the size of the whole Zoological Park establishment increases and the number of buildings and collections multiply, the demands for maintenance become more numerous and more urgent. Thanks to the fact that, with few exceptions, all the improvements made have been of the most substantial and permanent character, thus far the annual outlay for repairs to buildings has been small. The time will come, however, when the annual budget for repairs will require consideration.

The work of keeping the whole Zoological Park in clean and acceptable condition is really very great. Necessarily it requires a large force, and in that force we may fairly count quite two-thirds of the men and boys employed in the Park. Aside from the immense amount of hard labor involved in caring for the animals, and in keeping their quarters clean and wholesome, the labor of mowing, and of sweeping and clearing up the litter left by great crowds of visitors, is really very great. In order to lessen the cost of handling waste paper, dry straw, and luncheon refuse, it seems absolutely necessary that a small crematory should be established in some central situation, to save the cost of the long haul to the nursery.

I regret to be obliged to report that the maintenance fund appropriated for the support of the Zoological Park during the

year 1907, is not sufficient to meet the demands that must be made upon it. The great increase that was made in the bird collections during 1906 has correspondingly increased the cost of the monthly food supply. In addition to this, another mammal keeper must be engaged forthwith, and two gatekeepers must be added to the maintenance force, early in the coming spring. The new Small-Deer House also involves expenditures which can not be evaded. Notwithstanding all this, however, the appropriation for 1907 is about \$3,500 less than that for 1906. I am unable to see how it will be possible to maintain the Zoological Park through the year 1907 with the funds available, and I fear a deficit of at least \$5,000.

In this connection we offer as an exhibit the following enumeration of features which require to be maintained for the uses of the public, all the year round; and we invite comparisons in maintenance requirements and expenditures with those of other public institutions, wherever found:

- 10 Large animal buildings, (all heated).
- 10 Small animal buildings, (4 heated).
- 12 Large groups of outdoor dens, aviaries and corrals.
- 3 Animal storehouses, for winter use, all heated.
- 2 Restaurants.
- 6 Public-comfort buildings.
- 8 Entrances.
- 234 Acres of Park lands.
- 30 Acres of lakes and ponds.
- 7.78 Miles of walks and roads.
- 10.55 Miles of fences.
- 3,624 Living mammals, birds, and reptiles.

It must be borne in mind that, despite the short period of its existence, the Zoological Park is to-day a very large institution. In extent of equipment, and in number of animals, we believe it is surpassed by only one other zoological establishment of a similar nature.

DEPARTMENT OF ADMINISTRATION AND PRIVILEGES.

H. R. Mitchell, Chief Clerk; Wm. Mitchell, Assistant.

Although the disbursements on account of Maintenance and Ground Improvement through this department did not materially

increase in 1906 over the previous year, all branches of the Privilege Department showed a gratifying increase in volume, and a corresponding increase in profits. For several years the privileges have been much in need of further development, and the Society has only been awaiting the arrival of a more favorable period in construction work to put them upon a new and better basis, fully up to the general standard set for the Zoological Park as a whole.

Several important steps in this direction will be taken during the coming season. The old, obsolete and unsightly soda fountains, which heretofore have been leased by the year, are to be replaced through the purchase of the latest and most improved Twentieth Century Sanitary fountains. For the purpose of making these and other improvements, all of which will add largely to the net income from privileges, the Executive Committee has authorized the expenditure of a considerable sum out of the net profits accumulated during the past season. The privileges, if legitimately developed within the limits demanded for the convenience and accommodation of visitors, will, we predict, within a year or two put the Animal Fund on a basis enabling the Society to purchase many desirable, rare, and expensive animals when offered without drawing from funds that should be devoted to other purposes.

Boat House.—Early in the year 1906 it was found that it would be impossible to get the Boat House completed in time to open it this season, and the boating privilege was therefore re-let to the former lessee for another year, for the sum of \$1,525. Work on the building was begun during the summer, and proceeded rapidly. At the close of the year it was practically finished, and will be turned over to the Society about March 1st.

It has been decided to open this building in April, 1907, with a combined restaurant and lunch-room service. The north room will be fitted up as a dining-room, with a seating capacity of about one hundred. In the south room, adjoining the serving-room, a popular-priced lunch room will be opened. This will comfortably accommodate about eighty persons. The large fireplace at one end of this room will be a pleasing and attractive feature, especially in winter, when the lunch-room will be kept open for the accommodation of skaters, and visitors to the Park generally.

In the extreme south end of the building, there are two serving-rooms, in one of which there is to be a lunch counter, and in the other a modern soda fountain of large capacity.

A new thirty-foot electric launch has been purchased, and will be put in commission on Bronx Lake at the opening of the next boating season, to make regular trips between the Boat House and Bronxdale landing. Ten cents will be charged for a trip of more than a mile, and stop-over checks will be given at the upper landing. To this will be added the ordinary business of boat-letting, which always has been profitable. New and up-to-date boats will be purchased and added to the present equipment as rapidly as circumstances seem to demand them. We confidently expect this business, as a whole, will prove to be one of our most popular and profitable privileges.

Rocking Stone Restaurant.—On the whole, the past year has been a very successful period for the Restaurant, and while the net profits did not quite equal those of last season, an increase would have been shown, but for the unfavorable weather in the month of October, when the attendance fell off more than 50,000, as compared with that of the previous year.

An important improvement developed was the establishment of our own laundry, which, in addition to giving us better work than we were able to secure outside, saves us the constant annoyance of the slow and uncertain deliveries which we had experienced from independent laundries.

Soda Water.—The manufacture of our own ice cream, as inaugurated in 1905, was continued with increased success. Notwithstanding the enormously high prices we were obliged to pay for ice during the entire season, the profit from soda-water alone was \$4,032.76 as against \$2,946.07 in 1905. The net profits of the soda-water stands for the year, including the sales of candies and cigars, reached a total of \$5,414.08.

Souvenir Postal Cards.—The sale of souvenir postal cards was continued under the plan adopted in 1905, and but for an unavoidable delay in the delivery of stock ordered in the early part of the year, the sales would have doubled those of last year. This privilege netted \$1,295.55 for the Animal Fund in 1906 as compared with \$760.77 in 1905. Many new subjects were added to all series of cards. Our souvenir postal collection appears to be the largest and most complete in the animal line to be found anywhere, and new subjects are constantly being added. The increase in the sales of souvenir postal cards was so marked as to be worthy of special mention. In September they sometimes reached a total of more than \$50 per day.

Guide Book.—The completion of several important buildings and installations, and the large additions to the animal collections



NEW BOAT HOUSE.
Situated on Bronx Lake, near West Farms Entrance.

of the Park, both in numbers and species, made it absolutely necessary that the Guide Book to the Park be thoroughly revised, and considerably increased in size. The first issue of the Giraffe Edition was exhausted early in the year, and it was therefore necessary to get out a small issue of 7,000 copies of that Edition, and thereby postpone the revision of the Guide until the spring of 1907. The profits for the year were \$1,335.75.

Souvenir Books.—It has long been our desire to increase the size of our small book of views to twenty-four subjects, and make other improvements in the illustrations which would make it still more attractive. On that basis an order was placed for an edition of 5,000 copies, and they will be delivered early in the spring. The large books of Park views, which sell at fifty cents and one dollar, were sufficiently popular that the supplies were exhausted before the close of the season, and orders were placed for a revised edition of each size. The profits realized for the season from the souvenir books were \$368.37.

Riding Animals.—The riding-animal establishment now has a well recognized popularity, and continually increasing patronage from children of all classes. Great care is taken to keep the ponies and vehicles up to a proper standard, and the attendants neatly uniformed. The business for the year showed a satisfactory increase over 1905, and profits reaching the sum of \$1,503.32.

Gate Receipts.—Since the opening of the Park, there has been a constant and gratifying increase in receipts for admission on closed days, with the single exception of the year 1904, when there was a slight falling off. The year 1906 was no exception to the general rule as will be shown by the following table, showing receipts by years.

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
1906	8,132.35

Feed Barn.—The Feed Barn which was under construction at the close of last year, was completed in 1906, and is proving to be a valuable factor in the economic handling of the constantly in-

creasing quantity of hay, straw, and feed required in the maintenance of our very large collection of hoofed animals. This building, in addition to providing stable facilities for a number of horses, as well as space for carriages and vehicles in the basement, has bins and storage space on the two upper floors for a supply of hay and grain sufficient to last several months.

Ice Manufacturing and Refrigeration Plant.—The difficulty experienced during the last season in obtaining the large quantity of ice that is now required in the general maintenance of the Park, for the preservation of the large amount of meat and food supplies continually on hand, the care of museum specimens while awaiting autopsy, as well as for the needs of the Restaurant and Soda Water Department, brought home to us very forcibly the absolute necessity of our being able to take care of our own demands for ice and refrigeration without depending on conditions beyond our control. In 1906 we were unable to harvest a sufficient crop of pond ice to fill our two small ice houses, but even had they been filled, their contents are now totally inadequate for our present needs. We urge the erection during the coming season of a building suitable for the storage of a liberal quantity of ice in one end, when a crop is obtainable, and the other end to be fitted with a combination refrigeration and ice-making machine of about ten tons capacity, thus placing us on a safe basis regardless of weather conditions.

CIVIL ENGINEERING.

George M. Beerbower, Civil Engineer.

The volume of engineering work continues as great as ever, and during the year it covered many different pieces of work. Of these the most important were the eastern end of the Service Road, the yards around the Small-Deer House, the Service Road from the Reptile House to the Beaver Pond, the wall and yards surrounding the new Barn, the West Farms Entrance plaza, and the site and yards of the Elephant House. Mr. Beerbower superintended the construction of the Feed Barn, which was designed by him, and furnished all surveys around the Boat House. He perfected the automatic turnstile invented by him last year, and it is now being manufactured for the Boston Road Entrance. The official map of the Zoological Park has been brought down to date, and engraved anew for the Guide Book under our engineer's direction.

During the coming year, much engineering work will be required in the western yards of the Small-Deer House, the Zebra Houses, and the Elephant House yards and walks.

PHOTOGRAPHY AND PUBLICATIONS.

Elwin R. Sanborn, Photographer and Asst. Editor.

Both in variety and importance, the duties of Mr. Sanborn constantly increase. The extent and scientific value of the Society's collection of more than 3,000 animal photographs is now becoming generally known, and its sphere of usefulness is rapidly widening. It is no exaggeration to say that the animal photographs made by Mr. Sanborn to serve the special purposes of zoology have fixed a standard of considerable value in such work. It is a fact, however, that even yet there are many persons who hold firmly to the belief that inexperience and an ordinary camera can, without any special facilities, secure good photographs of wild animals in captivity, provided a "permit" can be secured. For many reasons, it is a practical impossibility to permit every person who holds this belief to test it in the Zoological Park.

During the year Mr. Sanborn has made-up and put through the press the annual report and the regular numbers of *THE BULLETIN*, all illustrated from photographs made by him especially for those publications. His photographs of living amphibians were especially successful, and marked a great advance beyond all previous efforts with animals of that branch.

The coming year promises to be for Mr. Sanborn's department an unusually busy one. Aside from the regular publications there is to be issued the first number of a new publication on the National Collection of Heads and Horns, and a new and extended edition of the Guide to the Zoological Park.

ACKNOWLEDGMENTS.

The Director gratefully acknowledges the special devotion to duty of all the officers of the Zoological Park staff during his four months' absence in 1906 on account of illness. It is both a duty and a pleasure to assure the members of the Society that under Chief Clerk Mitchell, as Acting Director, the affairs of the Park were most admirably conducted, and in the administrative

machinery of the establishment there was not the slightest abatement of efficiency.

On the whole, the year 1906 may now be regarded with a feeling of satisfaction and gratitude. Our relations with the public and the city government were maintained on the basis of goodwill that has heretofore prevailed. The good reputation of the Zoological Park force has also been well maintained. Our pleasant relations with the officers of the Park Department for Bronx Borough are unchanged, and remain a constant source of benefit and satisfaction.

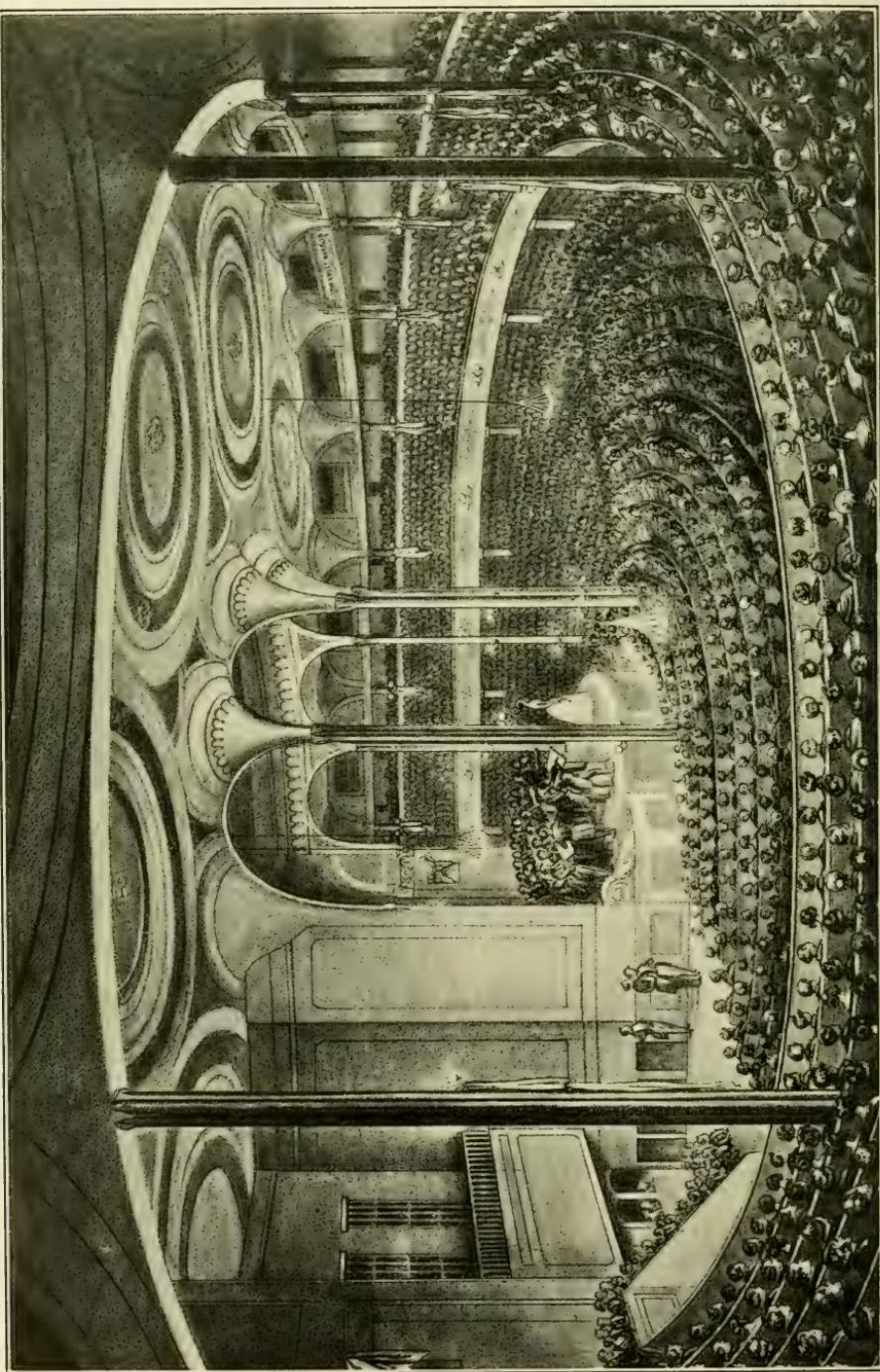
Respectfully submitted,

WILLIAM T. HORNADAY,

Director.

INTERIOR OF THE AQUARIUM BUILDING IN 1850.

First Appearance of Jenny Lind in America at Castle Garden, September 11, 1850.
From An Old Print.



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

IN DECEMBER, 1906, the New York Aquarium completed its first decade, with a record of over seventeen millions of visitors. Its patronage by the public has been astonishingly large and in the matter of attendance it is probably unequaled by any institution in the world. A building three times as large would be required to comfortably accommodate the visitors which throng it.

The Zoological Society, in the four years of its management of the institution, has been engaged in improving the building in various ways, the work of the past year having included new boilers and a new ventilating system. The tedious work of replacing worn-out piping with lead-lined pipe, which has been in progress for several months, is still going on.

In addition to the regular maintenance fund, the City has generously provided an improvement fund, which has made the work of the past four years possible, while the maintenance fund has permitted of a number of minor improvements each year. Another year's work should place the equipment of the building in such condition that its collections can be made more varied and interesting than heretofore.

The employees, most of whom have been in the Aquarium many years, continue to render good service, and may be considered experts in their line of work. Their duties are exacting and include cleaning and heating of the building, the care of the different water systems, the feeding and care of the collections and attention to the comfort of visitors. They have gathered by seining from local waters, practically all of the fresh and salt-water fishes now in the Aquarium.

It is not possible to create any further exhibition space in the present building, which is stocked to its fullest capacity, and additions can no longer be made without rejecting important species now on hand.

The collections do not change much from year to year, but interesting species are added as opportunity affords. The exhibits

are varied and include fishes, turtles, crocodilians, salamanders, frogs, marine mammals, and invertebrates, all of which are distributed according to the space available. The exhibits in general are larger and more varied than those of any other aquarium.

A small fish-hatchery, maintained as an exhibit of fish-culture, continues to be of interest to the public, and has been supplied annually with fish eggs by the U. S. Bureau of Fisheries from Government hatcheries.

The collection of tropical fishes from the West Indies receives some additions each summer, and annual exchanges of fishes are made with the aquariums at Detroit and Washington.

Among the larger animals received during the year were a 400-pound loggerhead turtle, seven specimens of the giant snapping turtle of the Lower Mississippi, two large tarpons, two manatees, three hawksbill turtles, and two sea-lions. The tarpons—accidental wanderers from the South—were taken in New York Bay and were objects of great interest during the summer.

The experiment of keeping sea-lions in the building has resulted satisfactorily. It was feared that these naturally noisy animals would be disturbing to visitors, but they have been trained to a condition of comparative quiet.

The collection of sea turtles is exceptionally fine, consisting of loggerheads—the largest weighing 400 pounds; green turtles—the largest weighing 313 pounds; hawksbills—the largest weighing 60 pounds, and a Pacific green turtle of about 50 pounds.

The floor pools available for large aquatic animals, being only seven in number, a definite limit is placed on exhibits of this class.

The work of photographing living fishes and other aquatic forms in the Aquarium has been continued as opportunity afforded, so that the best of illustrations of this character are now available.

ATTENDANCE.

For the past three years the attendance at the Aquarium has been increasing. The year 1906 has proved to be a record year, the total number of visitors having been 2,106,569—a daily average of 5,771. The increase over the year 1905 amounts to 380,399.

The summer attendance was exceptionally large; that of the month of August having been 369,547—a daily average of 11,921 for the month. The Sunday attendance during August varied from 20,000 to 27,000.

The following table shows the attendance at the Aquarium in 1906 by months:

January	Number of visitors	106,242	Daily average	3,427	
February	"	100,321	"	3,583	
March	"	121,197	"	3,909	
April	"	191,463	"	6,382	
May	"	210,027	"	6,775	
June	"	178,815	"	5,960	
July	"	261,376	"	8,431	
August	"	369,547	"	11,921	
September ..	"	267,799	"	8,926	
October	"	138,727	"	4,475	
November ..	"	100,184	"	3,339	
December ..	"	60,871	"	1,960	
<hr/>		<hr/>		<hr/>	
Total		2,106,569	"	5,771	

With the close of the year 1906, the Aquarium completes its tenth year. The total attendance for these ten years amounts to 17,103,328—a daily average of 4,685. This appears to be, from the data available, a world's record.

The attendance for the past ten years is shown in the following table:

1897*	Visitors	1,535,252	Daily average	4,480	
1898	"	1,689,471	"	4,628	
1899	"	1,841,330	"	5,044	
1900	"	1,585,584	"	4,344	
1901	"	1,644,856	"	4,506	
1902	"	1,700,453	"	4,659	
1903	"	1,547,873	"	4,240	
1904	"	1,625,770	"	4,554	
1905	"	1,726,170	"	4,729	
1906	"	2,106,569	"	5,771	
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Total		17,103,328	"	4,685	

*Includes twenty-one days of December, 1896.

AID TO SCHOOL TEACHERS.

For several years the Aquarium has supplied to teachers of biology in the City schools, specimens of marine invertebrates for class work and for small aquaria. This work was continued

during 1906. The number of schools in which aquaria were either installed or renewed was 104, some schools having two or more aquaria. They were supplied with specimens only at the request of the principal or the teacher, and in most cases delivery was made at the schools by a messenger from the Aquarium.

Inexpensive aquaria have been provided either by the Board of Education or by the teachers themselves. Sea-water has been supplied from the Aquarium with marine plants, in order that the school aquaria might be made self-sustaining or "balanced" by the necessary plant life, to secure oxygenation of the water.

Specimens have been sent to teachers in the kindergartens and in a few hospitals, as well as to those in primary and grammar schools. University professors have also used considerable material, consisting of both marine invertebrates and fishes.

Many classes, accompanied by teachers, have visited the Aquarium, the total number of pupils for 1906, as far as enumerated, being 5,503. They have had the freedom of the Aquarium laboratory, where living corals and other delicate organisms offer opportunity for natural history study.

Instruction in caring for small aquaria has been given constantly by Mr. Spencer of the Aquarium staff, who has also managed the delivery of specimens.

The Aquarium makes no charge for material or delivery, merely desiring to be of service to the teachers.

ACKNOWLEDGMENTS.

The United States Bureau of Fisheries has supplied most of the eggs of fishes required for the hatchery, which, as a practical illustration of the art of fish-culture, is an important feature at the Aquarium. Eggs of the smelt and yellow perch were furnished by the New York Fish Commission.

Mr. A. W. Dimock, of Marco, Florida, presented two manatees. The larger of these, a specimen ten feet long and weighing 910 pounds, was injured in capture and did not live long. The other specimen, six feet in length, is in fine condition after five months of captivity.

Both of these animals were transported free from Miami, Florida, to New York, through the kindness of Mr. Theo. G. Eger, Vice-President of the Clyde Steamship Company, and Mr. J. P. Beckwith, General Traffic Manager of the Florida East Coast Railway. The Zoological Society is also indebted to these gentlemen for the free transportation of specimens received in 1905.

Messrs. Wm. Currys' Sons of Key West, Florida, presented two unusually large specimens of the hawksbill or tortoise shell turtle, which had been living in a salt water pond at Key West for eight years.

Mr. Frederick H. Shelton of Philadelphia presented twenty-seven specimens of fresh-water turtles, representing five species, some of which were new to the Aquarium collection.

Mr. Emil Gottsleben of Rum Clay, Bahama Islands, presented a large hawksbill turtle.

Other important gifts of aquatic animals were received from Dr. Alfred G. Mayer, Director of the Marine Biological Laboratory at the Dry Tortugas, Florida: Capt. Paul Jacob, of the Hamburg American Steamship Graecia: Master Billy Clark, of New York, and Master Edward Redfield and Miss Bessie Redfield of Closter, N. J.

Captain Jacob presented to the Zoological Park, through the Aquarium, specimens of iguanas from the West Indies. Mr. Henry Bishop of Baltimore presented several Japanese goldfishes.

The late Mr. Philip Schuyler purchased and presented to the Aquarium a collection of excellent negatives of living fishes of Florida and the West Indies, which will be reproduced from time to time in the publications of the Society.

AN OLD PICTURE OF THE AQUARIUM BUILDING.

The frontispiece to the present report, showing the interior of the Aquarium building, formerly called Castle Garden, in 1850, is reproduced from an old and rare print.

Some of the older members of the Zoological Society will doubtless recall the occasion when Jenny Lind made her first public appearance in America, which it commemorates. The following historical note is reprinted from the Aquarium Information Circular as an accompaniment to the picture:

"The Aquarium building was erected in 1807 by the United States Government as a fort, called Southwest Battery, and after the war of 1812 was called Castle Clinton. It has a battery of 30 guns, the embrasures for which still remain in the outer wall, which is 9 feet thick. The old ammunition rooms are surrounded with walls of masonry 15 feet thick. In 1823 the building was ceded by Congress to the City of New York and used as a place of amusement called Castle Garden, which had a seating capacity of 6,000. It was connected with Battery Park by a bridge, the intervening space having since been filled in. General Lafayette

was received here in 1824; President Jackson in 1832; President Tyler in 1843; Louis Kossuth in 1851. Professor Morse, inventor of the telegraph, demonstrated here in 1835 the practicability of controlling the electric current. Jenny Lind began singing here in 1850 under the management of P. T. Barnum. Among other notables received here were President Van Buren and the Prince of Wales. The building was used as a landing place for immigrants from 1855 to 1890, during which period 7,690,606 immigrants passed through its doors. It was opened as an aquarium by the City on December 10, 1896, and on November 1, 1902, its management was transferred from the Department of Parks to the New York Zoological Society, a private scientific association with a membership of 1,644."

RECORD OF MONTHLY MEAN TEMPERATURES AND SPECIFIC GRAVITIES AT THE NEW YORK AQUARIUM DURING THE YEAR 1906.

(From daily observations made by Mr. W. I. De-Nyse).*

Months.	Temperature of Water.	Specific Gravity.
January	39	1.014
February	36	1.012
March	38	1.011
April	43	1.010
May	52	1.013
June	62	1.013
July	69	1.013
August	72	1.014
September	71	1.015
October	63	1.016
November	54	1.014
December	43	1.014

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



YELLOW PERCH.

THE CULTIVATION OF FISHES IN NATURAL AND ARTIFICIAL PONDS.

By C. H. TOWNSEND,

DIRECTOR OF THE AQUARIUM.

Formerly Chief of the Division of Fisheries, U. S. Fish Commission.

DURING the time that the writer has been responsible for the correspondence of the New York Aquarium, there has been frequent inquiry for information respecting methods of stocking and managing small fish ponds. The inquiries in general have related to the character of ponds, their water supply and management: the kinds of fishes desirable, their feeding, propagation, capture, and the sources from which they might be procured.

In some cases applicants were referred to the National or State fish commissions, while in others such information was given as was possible by letter, with references to book and articles that might be helpful.

Several ponds and lakes situated on the country estates of New York gentlemen who wished advice on stocking and caring for ponds, were visited by special invitation. These were both natural and artificial, large and small, deep and shallow, spring fed, and supplied by streams, with fish and without. Some of the ponds which contained fishes had never yielded much either in the way of sport or food. Most pond owners confessed entire ignorance of the subject and the writer's search for literature on pond culture, to fit the varying conditions met with, did not reveal as much as could be desired, especially that based on American conditions.

The professional fish-culturists of this country apparently owe the private citizen something more in the way of advice in home fish raising than he has yet received.

It would seem that notwithstanding the abundant literature relative to public fish-culture, which has been distributed freely in this country, there has been left almost unconsidered, a field of pond culture simpler and cheaper than that connected with our admirable system of stocking public waters, and with possibilities greater than have been realized. Wholesale methods in fish-culture, requiring artificial fertilization of eggs, hatchery buildings, and series of rearing ponds, are seldom applicable to the farm and the private estate.

The writer devoted considerable time to the study of small, natural and artificial lakes in the region about New York, with a view to ascertaining their possibilities for producing the commoner kinds of fishes with a moderate amount of expense and care. It is hoped that the present paper, relating merely to the *actual requirements* for success in home fish raising, will be of interest not only to members of the New York Zoological Society, but to the out-of-town public in general. It is presented as a primer on the subject, not as a general treatise, a brief list of works of the latter class being appended. Its publication will at least serve the original purpose of the writer—that of facilitating the handling of a portion of the correspondence of the Aquarium. As a good many years have passed since he served an apprenticeship at a government fish-hatchery, recent publications on fish culture have been used freely. Acknowledgments are hereby made to the authors of the works mentioned in this paper. The photographs of fishes published herewith, were made by Messrs. Elwin R. Sanborn and L. B. Spencer, from specimens living in the New York Aquarium.

Pond Culture in General.—It should be made clear that the in-

structions which follow will be of little use to those who suppose that the pond can be filled with fishes and left to take care of itself. To be made productive it will require intelligent care and considerable work. Those who are not interested to that extent may as well abandon the idea of raising fish and save the expense of stocking the pond.

For the encouragement of those who are disposed to make a trial it may be stated with perfect fairness that food fishes can be raised with no more difficulty than chickens or vegetables. All persons who have experimented with the poultry yard and the garden know that they demand attention. A neglected fish-pond may be compared to a neglected garden, and will eventually reach the same gone-to-seed condition.

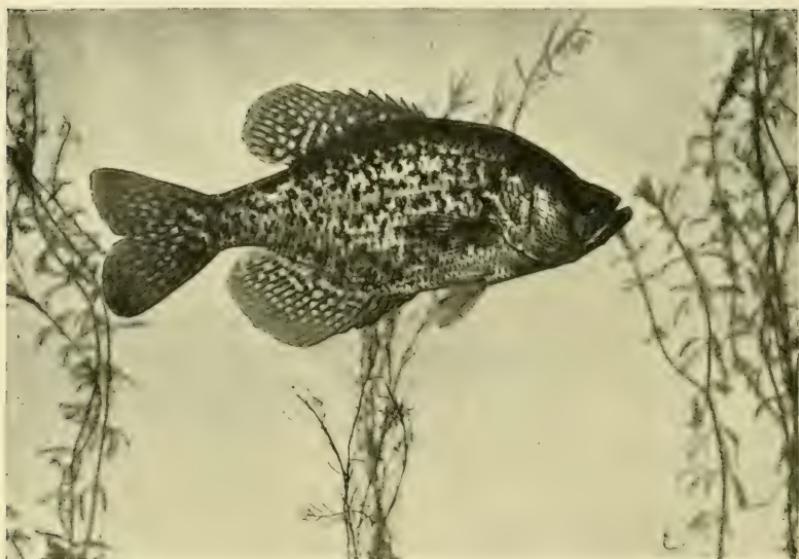
The raising of trout is not considered in this connection: Trout require special conditions of water supply and temperature and there are already in existence many volumes on the subject of trout breeding. While it is a fish that most owners of ponds hope to cultivate, it is essentially one that can not be managed except under naturally favorable conditions, and it demands more attention than it is likely to receive at the hands of the amateur. Trout culture is in active progress all over the land, and there are numerous commercial trout culturists from whom fry and yearlings may be purchased. Brown trout and rainbow trout, it should be stated, are more suitable for small lakes than brook trout, and will stand warmer water and grow considerably larger. The brook trout does not naturally inhabit waters having a temperature much above 60 degrees.

With the ordinary run of ponds in the New York region, where the water becomes rather warm in summer, it is necessary to restrict the list of available fishes to the basses, perches, and sunfishes to which they are adapted. This paper therefore deals with the commoner fishes only.

There are few sections of the country so lacking in native fishes that enough black bass, rock bass, yellow perch, white perch, crappie, blue-gill sunfish, long-eared sunfish, or catfish can not be procured for the purpose of stocking.

State fish commissions can not usually furnish fishes for private waters, and much of the fish stock supplied by the national commission for private waters has, through ignorance on the part of the recipient, been lost, washed away by floods into public waters, or consumed when mature, without the conditions necessary to propagation having been supplied.

Some of the above named pond-fishes occur in almost every



CRAPPIE.

county, and are to be found in the streams, lakes, and ponds of the region about New York City and on Long Island. A little preliminary personal effort in fish-catching and transporting on the part of the pond owner, will help to increase his interest and knowledge, and thus increase the chances of the pond getting some necessary attention later on.

Fishes already acclimatized are safer for stocking than those brought from distant points in the north or south. In transporting fishes all necessary changes in temperature should be made gradually. Changing to a lower temperature is safer than to a higher.

State fish commissioners are usually able to inform correspondents where desirable kinds of pond-fishes occur in each state.

In applying to the Fisheries Bureau at Washington for fishes, it is necessary to send full information respecting the extent, depth, summer temperature, etc., of the waters to be stocked, and to do the same through local representatives in Congress. Fishes will not be sent at once to a single applicant, but only after enough applications have been filed to warrant large shipments to each state. Long delays are therefore liable to happen.

It is possible to procure the fry of bass and some other species from dealers. If they can not be purchased it will be necessary to procure them from the nearest lake or stream, which can be



LARGE-MOUTHED BLACK BASS.

done, if necessary, with ordinary fishing-tackle. For transportation a couple of milk cans of the pattern used by dairymen will be most convenient and the cans will be almost indispensable in handling the fishes from the pond later on.

The fishes need not be injured by the hook, if they are unhooked carefully, and they will stand the trip in wagon or baggage car very well, if they are not crowded, and the temperature of the water is kept down with a little ice. A net over the top of the can is better than a close cover unless the latter be well punctured. Ice must be used sparingly and should be placed on the net cover—not in the water.

If a fisherman, who has a seine, can be hired, so much the better for the fish. The fishes wanted may very likely be found in one's own neighborhood, and it may only be necessary to subsidize the barefoot boy, who won't take long to find some stock for the pond. Beware, however, of the common sunfish, which is usually too small to be worth saving and becomes a positive annoyance when one is angling for something larger. Other species which it is well to avoid are the pike and pickerel on account of their voracity and destructiveness to other species.

Practice teaches one rapidly, but it is unwise to try to get along without study when helpful books may be had. If fish raising is to be merely a passing fancy it is just as well not to

attempt it, but interest in most things comes with learning about them, so the books should be read at the beginning—not after failures have led to discouragement.

Natural Ponds or Lakes.—It is assumed that the position of the natural pond is such that no arrangement can be made for drawing off the water. Its possibilities will therefore have to be considered separately. Its fish life moreover can never be brought under complete control.

If the character and abundance of the fish life in the pond are not known it is desirable that it be ascertained as far as possible by fishing or netting. If the pond is without any fishes it should, of course, be stocked at once, and the selection of fishes made with due regard to its natural conditions. The extreme depth, mid-summer temperature, plant life and character of the bottom of the pond should all be ascertained. The summer bottom temperature of deep ponds should be known. It can be taken by lowering the thermometer in a pail and allowing it to remain some time. If pulled up rapidly the temperature will not have time to rise materially. A series of bottom temperatures will serve to indicate the presence of bottom springs.

A wide area of shallow water in a pond not well supplied by springs or rivulets usually means great warmth in summer. If such a pond can be temporarily lowered and deepened in places, its conditions for fish life would be greatly improved as there is a decided difference in temperature between surface and bottom waters. Below six or eight feet the temperature decreases at the rate of about two degrees for each foot of depth. Increased depth would also give fishes an additional chance for life in winter when heavy ice diminishes their supply of air.

A small pond, supplied chiefly by rainfall, may be increased somewhat in water supply by leading to it ditches from adjacent fields; while its depth may admit of some increase by embankments. If water can be had by boring, an artesian well may make just the difference between a poor pond and a good one. Fish-ponds should have water plants to afford shelter for young fishes and harbor the various forms of aquatic life on which they feed. Several kinds of common pondweeds will serve for this purpose. The broad leaves of water-lilies afford shelter in summer for the larger fishes and should be introduced. If the pond be very small and unshaded, some floating boards will afford shelter. Too many large fishes in the pond are detrimental since they are consuming the food supply and are themselves going to waste. When such fishes can not be taken with the hook as sometimes happens, they



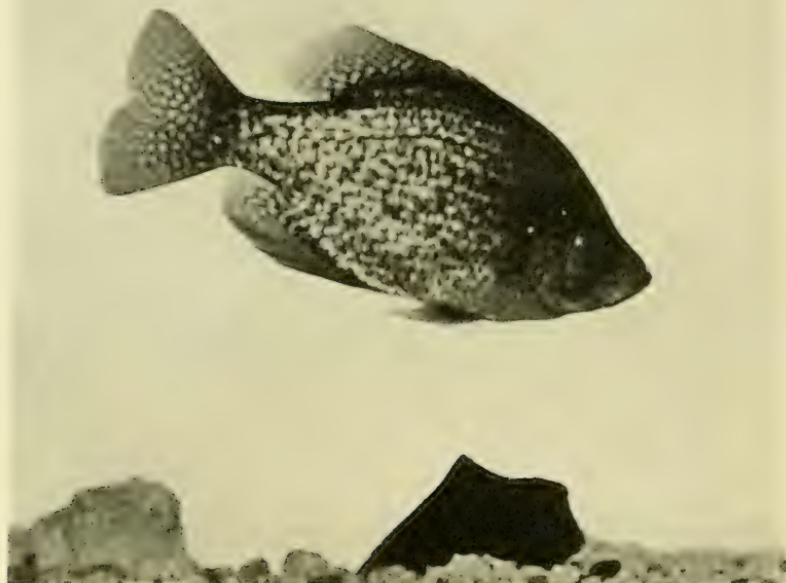
LONG-EARED SUNFISH.

should be removed with a seine if it is possible to do so, and marketed. It is important that the mature fish crop of a pond be utilized and the young of the year be given a chance to develop. The accumulation of large fishes serves no useful purpose, but results in overstocking, exhaustion of the food supply, cannibalism, and stunted growth.

If a natural lake or pond is already stocked with carp, which are not desired and can not be entirely removed, their further increase may be checked by the introduction of black bass which feed freely on young carp. Black bass will also keep other species in check by devouring their young, and thrive amazingly in the process.

If the waters contain black bass, or other fishes, which have become stunted from overcrowding and the exhaustion of the natural food supply, it is important to reduce their number by any methods of fish catching that will prove effective and to restore the food supply by introducing other species.

If numerous adult yellow perch are added their young will contribute to the food of the bass, and other large species. Experiments have shown that fishes stunted from overcrowding are not necessarily permanent dwarfs, but will attain a larger size if well fed or removed to more favorable waters. No fishes could be more stunted and worthless than those now swarming in the lakes of Central Park, yet we have succeeded in doubling the size of such fishes in two years: Stunted European rudd, transferred from Central Park to Prospect Park, began developing, and later, when we seined them out for exhibition at the Aquarium, it was



CALICO BASS.

found that their size compared favorably with that which they attain in Europe.

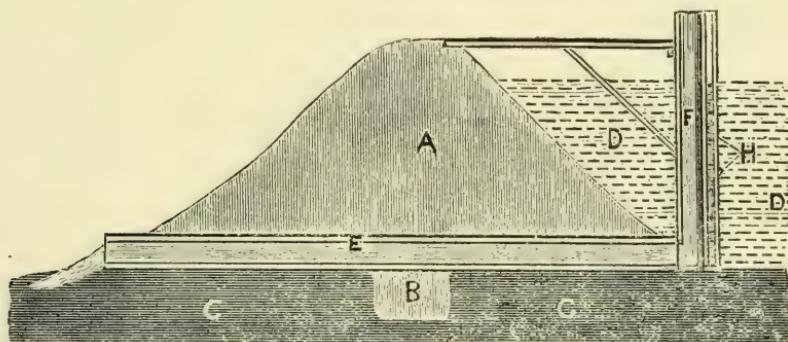
It has been shown at government fish cultural stations and elsewhere that a few adult carp placed in waters overstocked with bass do not increase in number, their young being wholly consumed each season. It is well to introduce only a limited number of carp, since too many of them, owing to their rooting habits, will not only destroy the water plants, but also make the water too roily. It has been found that the introduction of carp for feeding fishes, is also favorable in ponds containing crappie, the slight roiling of the water, which they cause, being beneficial to the latter rather than otherwise. It should not however be introduced into overstocked bass waters as a food supply until yellow perch or other species have been tried.

All ponds, whether natural or artificial, containing food-fishes should be stocked with brook-minnows, shiners, chubs, fresh-water killifish and other small species to constitute a food supply. The killifish and other small species, it may be noticed in passing,

are useful in small ornamental ponds in destroying the larvae of mosquitoes.

The full use of the fish crop of a large natural pond or lake can seldom be secured by ordinary fishing. It is necessary that seines and trap-nets be used. Experience has proved that such ponds usually contain many large fishes which will not take the hook.

A deep spring-fed lake on Long Island had for years furnished only moderately good bass fishing and no one imagined its wealth of fishes until the embankment which formed it gave way and distributed hundreds of good sized black bass on the flats below, many of them weighing from four to six pounds. It is possible that these fishes were so well fed on the small fry of their own



CROSS-SECTION OF THE DAM.

A—Embankment. B—Ground-Ditch. C—Solid Ground. D—Water. E—Drain.
F—Penstock. H—Sliding Water-Boards.

kind, as well as other species coming over the dam from the pond above, that what the angler could offer did not tempt them.

The introduction of new adult stock may be desirable in an old pond where there has been in-breeding, but overstocking is the main trouble, the remedies for which are thinning-out and re-establishing the food supply.

Owing to the customary preference for "game fishes," many excellent pond species, such as rock bass, calico bass, yellow perch, white perch, long-eared and blue-gilled sunfish and catfish, have been overlooked. Other kinds such as the warmouth or the white bass, inhabiting waters of the south or middle west, are equally desirable. All of these fishes increase rapidly, take the hook readily and are good food-fishes. They will multiply in

favorable waters with less care than probably any other native fishes. With the exception of the catfish, they will take the artificial fly and afford good sport. They are of considerable commercial importance since, according to government statistics, the quantity annually sent to market exceeds twenty-eight million pounds. Nearly all of them are known to attain weights exceeding two pounds.

Ponds Made by Damming Streams.—Ponds created in this way should on no account be completed without the placing of drain pipes and penstocks, so that the water can be lowered and the fish life controlled. There are marketable fishes going to waste in ponds everywhere for lack of simple facilities for getting at them. The deepest portion of the pond should be at the lower end, where the fish will gather when the water is drained down. Ditches dug in the bottom of the pond, leading to the deep hole or "kettle," will greatly facilitate the concentration of the fishes at that time.

Two or three ponds will be found to be much more satisfactory than one, since they will permit of the sorting of fishes according to size. Angling or other fish catching would then naturally be confined to the pond containing the large fishes. If properly managed, a series of fish-ponds will naturally yield a surplus for the market.

It is dangerous to construct a fish-pond in a narrow ravine as the dam is liable to be broken during spring freshets or exceptionally heavy rains, and the pond will gradually fill up with silt. Even if the embankment is not broken during high water it is difficult to screen it so that the fishes will not escape. A safe plan is to make the pond at one side of the stream, by excavation and embankments, leading the water to it through a ditch, and damming the stream sufficiently at the ditch-head to divert a portion of its flow. In case of freshets, the deep pool formed in the stream by the dam at the ditch-head, naturally receives the silt brought down stream; thus guarding against the filling up of the fish-pond. The ditch itself should be screened at both ends to prevent the ascent of fishes to the stream, and keep floating drift out of the ditch.

If the pond can be excavated in marshy ground, so much the better. A layer of clay on the bottom will render it more watertight than it would be otherwise. The embankment should be broad, and before it is thrown up, all sod should be removed so that there will be no subsequent seepage caused by the decay of vegetable matter. The earth used for the embankment should also

be free from sods or other matter liable to decay. The ground cleared for the embankment should have a ditch extending its full length into which the new earth will settle, thus increasing the stability of the dam.

The embankment of the dam if it is to be six feet high should be ten or twelve feet wide at the base and four feet broad on top. The earth used in its construction will naturally be derived from the bottom of the proposed pond, which will, of course, serve to increase its depth.

The overflow should be large enough to carry off the surplus, when the water is high, without danger to the dam and the outlets in general should be screened with wire netting to prevent the escape of fishes. The drain for drawing off the water should, of course, be put in place before the dam is thrown up. Earthen drain-pipes are risky, as no matter how closely the joints may be set and cemented, plant roots will eventually find their way inside and clog them up. Iron pipe of not less than four inches diameter, with the joints well soldered, is more reliable. A hollow log will serve the purpose of a drain-pipe, and wear well.

If the drain, or bottom outlet, is built of concrete and large enough to be conveniently cleared, it would be more effective in lowering a large area of water. The upper end of the drain should fit tightly into the foot of the upright penstock in the pond.

The penstock itself is merely an upright drain or sluice of planks or concrete, having about the same capacity as the drain-pipe itself. It is fitted on one side with short "water boards" sliding in grooves which can be removed one after another, to permit the escape of the water. A heavy plank should connect the head of the penstock with the top of the dam.

Before the new pond is filled, all roots, stumps, rocks and everything else that would prevent the free sweep of a net along the bottom, should be removed.

All ponds, whether natural or artificial, accumulate debris of which they can not be cleared, except when empty. A muddy pond will give the fish a muddy flavor. When the pond is being cleaned, it is necessary to remove the fishes from the deep hole or kettle. Any attempt to remove decayed matter and sediment, while fishes still occupy the deeper portions of a pond, may be fatal to them, as dangerous gases are then liberated among the crowded fishes. If the pond is very foul, it should be only partially lowered at first and the fishes removed with a seine.

With a reserve pond or two, it is possible, not only to thoroughly clean a pond, but to "winter" it: that is, leave the bottom



WHITE PERCH.

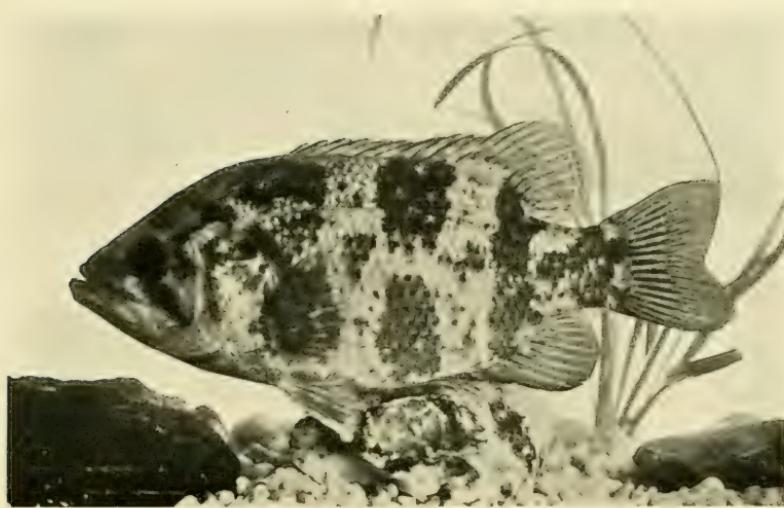
exposed for a time to the action of the sun and frost. It destroys excessive plant growth and kills out destructive water beetles and other enemies of young fishes and is approved by most professional fish culturists. With a series of ponds constructed at different levels, the overflow of the upper ponds will serve to feed those below. The more fall there is to the water the better will be its aeration—a matter of great importance to small ponds.

It is desirable that surface water caused by rainstorms be kept out of small ponds by banking up or ditching.

The following instances, among many which came under the writer's personal observation, will serve to show some of the difficulties in the way of successful management, where ponds are constructed without provision having been made for drawing down or seining:

A certain deep lake of about two acres in Connecticut, formed at great expense by damming a brook, is without any provision for drawing down. The conditions prevailing in it are unknown, and nothing but hook and line or some form of trap-net are available for ascertaining its contents, since its borders will not permit of the use of a drag net. In the meantime, snapping turtles kill the young ducks on it each summer, and there is no way of getting rid of them.

Another pond, which could not be lowered, was believed to be



ROCK BASS.

without fishes, until the use of a seine in one corner showed that the yellow perch fry introduced two years before had already attained good size. The presence of snags elsewhere in this lake prevented the use of the net. The management of this pond will always be difficult and unsatisfactory.

A lake in the Zoological Park, stocked with yellow perch fry in 1903, was represented to be without fishes, until the use of a seine, sent from the Aquarium a year later, showed it to be well supplied. The full utilization of this lake is however impossible, since its bottom has many scattered rocks which prevent effective seining. If the rocks had been removed originally, a good sized seine would sweep it from end to end.

Water Supply.—The water supply of the fish-pond is the most important thing to be considered. It must in fact be taken into consideration before the artificial pond is made. The flow of water should be abundant. About twice as much will usually be required as the beginner thinks is necessary.

Ponds fed by strong springs are excellent and are not subject to the dangers to which stream-fed ponds are exposed. Their temperature is naturally more equable throughout the year and they are less liable to heavy freezing in winter. In warm weather and in the winter time, pond-fishes avoid extreme temperature by frequenting the vicinity of bottom springs. Spring-water, however, contains less life available as fish food, and less air than

that from brooks. Its value for pond supply will be improved, if it can be led some distance as a rivulet.

Fish-life in small ponds with limited water supply will suffer from heavy ice in winter. The ice should be broken daily, and masses of brush and branches placed partly in the water will aid in keeping air holes open, especially if they are moved by the wind.

Extent and Depth of Ponds.—The extent and depth of ponds made by damming streams, will be governed somewhat by the nature of the situation available.

A pond of an acre or more in extent, and with eight or ten feet of water in the deepest part, will, if properly managed, give excellent results. It may be necessary to make it less than one-quarter of an acre in extent, but a small pond should have an extreme depth of not less than six feet, although it is quite possible with a strong water supply to raise fishes in very small and shallow ponds. This, however, means active cultivation, with daily feeding of the fishes, numerous ponds to permit of sorting, and all the details of a fish-cultural establishment. As a matter-of-fact, nearly all of the extensive fish-breeding carried on by the National and State fish commissions has been done in ponds of rectangular shape, averaging perhaps less than 100 feet in length and 25 feet in width, having depths of only three or four feet. Such ponds are worked in series, as nursery and rearing ponds, and there are generally two or more ponds of large size in which fishes of different growths can be held.

The following extract from the report of the fish commissioner of Indiana for 1903-04, is worth inserting in this connection:

"Mr. Carl H. Thompson, of Warren, Indiana, has a fish pond 60 x 120 feet in surface dimensions, and from four to six feet deep. In May, 1895, he placed in this pond four pairs of small-mouthed black bass. Fifteen months later he seined the pond and took therefrom, by actual count, 1,017 black bass averaging one pound each. In addition to the above he took between six and seven hundred yellow perch, weighing, according to his statement, 'not less than 250 pounds.' This makes the production of the pond amount to 1,267 pounds for a period of fifteen months."

The whole subject of fish-culture of this character—carried on in small excavated ponds, will be found, discussed at length, in the "Manual of Fish Culture," referred to later.

Ponds to be used for black bass and in fact most other fishes, ought to be several acres in extent and quite deep. In general,

fishes kept in small ponds do not attain the size of those in large ponds since their range and food supply are restricted.

Feeding.—If large numbers of black bass, rock bass and calico bass are removed for safety to smaller ponds where they may exhaust the natural food supply, it will be necessary to feed them. If they are put in small "nursery ponds" where they are crowded, feeding is imperative. The principal natural food of fishes is *fish*, which should be perfectly fresh. For young fishes it must be cut and boned, then rubbed through a fine wire screen. Fresh meat or liver must be prepared in the same way. For the details respecting the feeding of young fishes the reader is referred to the "Manual of Fish Culture," or some other work on the subject.

Adult fishes kept in restricted quarters will also require feeding. They may be fed largely on live minnows. Among the fish-foods used at the New York Aquarium, are live minnows, live shrimps, chopped fish, beef, liver and clams.

It is a mistake to suppose that fishes do not require an abundance of food. They may *live* without it but can not grow.

Water Plants.—About one-quarter of the ordinary pond should be as shallow as 10 or 12 inches and planted with pondweeds, such as *Potamogeton*, parrots-feather (*Myriophyllum*), watercelery (*Vallisneria*), hornwort (*Ceratophyllum*) and *Cabomba*. Suitable plants for the purpose may be found in most streams and ponds, and there are many others than those mentioned. Water plants that are satisfactory in some regions may, however, not be so in others farther north or south. Water-plants are necessary as shelter for young fishes, and greatly increase the various forms of small aquatic life necessary for their food. They also serve to aerate the water, which is most important in small and sluggish ponds. They may be planted by tying to stones and dropping them from a boat, or set in the ground after the water has been partially lowered. The slightly greater depths—from one to three feet, may be planted with water-lilies, while the more extensive and deeper portions should be kept clear of vegetation. If the vegetation becomes too thick it can usually be pulled out with a rake, but it is sometimes necessary to cut it with the scythe. Willow and other trees should be planted at some points to furnish shade.

Aquatic insects, crustaceans and mollusks, bred among pondweeds, constitute no small feature of the ponds food supply. It is recorded in the "American Fish Culturist," that an electric light over a certain pond was found to attract insects which fell in the water in such numbers as to supply an important quantity of

fish food. If the pondweeds, together with the brook-minnows, frogs, crustaceans and other small fry which are to establish the natural supply of food, can be introduced a year before the stock fish are put in, the conditions for success will be greatly improved.

Spawning Places.—Fish-ponds should be supplied with spawning conditions suitable to the fishes occupying them: Small-mouthed black bass, which make their nests in gravel, will require gravelly bottom: Large-mouthed black bass, which nest among the roots of plants, will find the conditions they require among the weeds of the pond. Yellow perch, which spawn among twigs under water, are easily accommodated—pieces of brush may be set firmly in the bottom where the water is shallow, in the branches of which they will deposit large whitish masses of spawn. If the brush tops extend several inches above the surface of the water, so that they will be swayed by the wind, and kept free of sediment, the hatching of masses of spawn will be greatly facilitated.

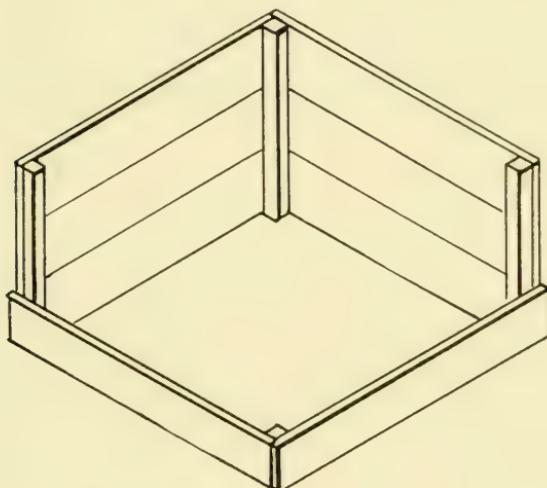
Rock bass and the various species of sunfish which, like the small-mouthed black bass, make their nests in gravelly places, will absolutely require places of that character if they are expected to increase and a few cartloads of gravel dumped around the lake in water about two feet in depth will furnish the necessary conditions.

Since ponds, to be successful, must have proper spawning conditions, some study of the habits of pond fishes is important and there are numerous helpful books available. It is now the custom with professional fish-culturists to supply artificial spawning nests in ponds containing small-mouthed black bass. These are small shallow boxes about two feet square filled with mixed gravel and sand, which early in the spring are placed everywhere in shallow water around the pond. They are at once appropriated by pairs of basses seeking spawning places. The boxes have boards nailed on two sides at adjoining corners, which extend about a foot higher, affording shelter for the basses similar to that which they naturally seek under the shelter of submerged logs.

Basses guard their nests for several days after the spawn has been deposited, and it is the custom at fish cultural establishments to place over the nest before the young fishes leave it, a light circular frame of iron covered with cheese cloth, one end of which protrudes above the water. This prevents the young fishes from wandering away from the nest, and makes it possible for them to be removed with the dip net to nursery ponds, where they

are safe from their enemies and the cannibalistic tendencies of their parents.

One of the numerous private ponds visited by the writer, a pond half a mile in length, was examined with great care and found to be totally lacking in gravel areas. Although it had been stocked several times with small-mouthed black bass, there had apparently been no natural increase. With a mud bottom it afforded no spawning surface whatever for this species. The writer recommended the introduction of numerous artificial spawning nests, or the introduction of the large-mouthed bass which would not require gravel beds, but could spawn among



ARTIFICIAL SPAWNING NEST.

the abundant water plants. It is probably unnecessary to add that there should be no fishing allowed during the spawning season, which with most of the fishes mentioned is in the spring months.

Number of Fishes Required.—In stocking waters it is not necessary to have a large number of adult fishes. For a pond of about an acre in extent, twenty pairs of black bass will be sufficient, and perhaps fifty pairs of any of the other kinds of fishes mentioned. These numbers will in fact suffice for still larger ponds and should be reduced for smaller ponds. When the conditions are right the progeny of the first year will usually stock



CATFISH.

the pond to the limit of its natural food supply. It should be borne in mind that heavy stocking serves no useful purpose, unless it is the intention to catch some of the adults the first year. It is just as well to stock with two or three kinds of fishes and time will show which species are the best adapted to that particular body of water. With black bass the yellow perch may be placed with safety, not only on account of the food it supplies to the former, but also on account of its own value as a food fish. It is remarkably prolific, and with a good start can usually take care of itself. The same may be said of the catfish. It is harmless, since the basses and sunfishes are active in guarding their own nests. The yellow perch and the catfish may also be introduced into ponds containing rock bass or calico bass. There is no reason why black bass, rock bass, and calico bass should not be kept together if the pond is of considerable size.

Commercial Importance of Certain Basses, Perches, etc.—The following figures relative to the annual catch and value of the fishes named, are derived from recent Government statistics and show only the quantity and value of fishes *marketed*. There are no means of ascertaining the catch of the same species made by anglers and other non-professional fishermen, although the aggregate must be very great. The catch is of course made in public waters:



WHITE BASS.

	Pounds.	Value.
Black Bass	1,939.571	\$150,471
Yellow Perch	7,071.220	181,504
White Perch	1,397.306	161,188
Crappie and Strawberry Bass.....	2,686.230	161,122
Sunfish (all kinds)	2,094.946	52,846
Catfish (all kinds)	13,103.706	534,425
<hr/>		
Total	28,292.979	\$1,141,556

*The Large-Mouthed Black Bass, (*Micropterus salmoides*)*. This species is one of the best for ponds. It grows faster and larger than the small-mouthed black bass, and will take the hook in winter when the latter will not. It is easier to cultivate and will thrive in warmer and more sluggish waters. While not so gamy, it can be depended upon, under ordinary favorable conditions, to furnish a good supply of fish-food for the table. Spawning as it does among the roots of water plants, a gravelly bottom is not essential unless other species are kept with it. In the south it reaches its greatest development, Florida specimens sometimes exceeding twenty pounds. In the north its average weight is less than four pounds.

*The Small-Mouthed Black Bass, (*Micropterus dolomieu*)* is generally considered the pluckiest of game fishes. If sport with

the rod is the main object, this is probably the fish to introduce. Its weight sometimes exceeds six pounds—two and a half being the average. Unlike the large-mouthed bass, it hibernates in winter. It requires gravel bottom for spawning.

Under the best conditions, with a good food supply and considerable area and depth of water either species of black bass may increase in size at the rate of about a pound a year. In lakes of several acres in extent they will do better than in small ponds.

Both species may often be taken with the trolling spoon when other lures fail.

The black bass spawn from March to June according to the climate. Their cannibalistic tendencies are strong, and the small fishes should be kept separate from the large ones.

Rock Bass or Red Eye, (*Ambloplites rupestris*). Next to the black bass this is one of the most satisfactory species to cultivate, especially in spring-fed ponds. Its natural range has been greatly increased by artificial introduction.

The rock bass increase rapidly and a pond of several acres properly stocked will soon fill up with them. It is an excellent food-fish, reaching, it is said, a weight of two pounds in some waters, but in most ponds a quarter of a pound would be nearer the average. The rock bass is one of the easiest fishes to catch, readily taking worms, pieces of fish, grasshoppers, and other baits. It will also take the artificial fly or small spoon either in casting or trolling and is a vigorous fighter on the line. It builds and guards its nest like the small-mouthed black bass, and in the pond may be provided for in the same way.

Yellow Perch, (*Perca flavescens*). If the pond is to be stocked with yellow perch there will be "something doing," since it is a remarkably prolific species, likely to take care of itself and reaches a good size. It is an ideal pond-fish, readily caught and good to eat. It has been introduced everywhere, and is therefore the most easily procurable fish for stocking. Although its weight in New York State sometimes exceeds three pounds, the average of those taken in ponds is not much more than half a pound.

Its flavor is best in spring and fall. In summer it should be skinned to avoid any muddy flavor, but with this fish, skinning is no more difficult than scaling. The largest fishes are to be found in the deepest water. The usual run of fish baits are effective in fishing for it, and it may be taken with the artificial fly or by trolling with spoon or minnow.

The yellow perch lays its eggs in masses in shallow water as

soon as ice is permanently off the water. When pieces of brush are placed in the water the fishes will deposit their whitish egg clusters among them. If the egg masses are removed in buckets of water to some place where they can be protected, the yield of small fishes will be greatly increased.

Calico Bass, (*Pomoxis sparoides*) and *Crappie*, (*Pomoxis annularis*). These fishes are highly recommended for ponds. They breed rapidly, are excellent pan-fishes, and do not disturb other species. The range of the calico bass is somewhat more northern than its near relative the crappie, with which it is often confused, but both species have been widely distributed by artificial means, and can be procured in most of the Eastern States.

They may be kept in ponds with bass, perch, or sunfishes, thrive with little care and will stand rather warm ponds. If the pond is large and the water deep, the size of the fish is apt to be larger.

Good baits for catching them, are live minnows, worms, crayfish, tadpoles, and crickets; cut bait is also effective. Both species are active on the line, and will take the artificial fly.

White Perch, (*Morone americana*). This is mainly a fish of coastal waters, ascending streams to spawn. It is frequently land-locked in fresh-water lakes and breeds there, and has, at times, been common in Prospect Park lakes in New York City. It is a first class food-fish attaining a weight of two pounds, but the average fish in fresh-water is not much over half a pound.

It spawns from April to June among weeds and brush. The usual baits are available in taking it, and it will give fair sport with the artificial fly and light tackle. White perch in bass ponds are liable to annoy the latter during the nesting season.

White Bass, (*Roccus chrysops*) and *Yellow Bass*, (*Morone interrupta*).—The white bass, inhabiting the Great Lakes and upper Mississippi region, and the yellow bass of the lower Mississippi, are both available for pond culture. The former has been introduced into many of the smaller lakes of New York and New Jersey, and has proved to be satisfactory as a pond-fish, making rapid growth the first year. Both species attain weights of as much as three pounds, take the usual baits of fresh-water fishes, and will rise to the artificial fly, the first being especially gamy.

Blue-Gilled Sunfish, (*Lepomis pallidus*). This is the largest of the sunfishes. It thrives in ponds and will live in as warm water as any native food-fish. It attains a weight of two pounds, although the average is less than one pound. It is highly recommended for ponds.

All the sunfishes are prolific, and like the basses make their nests

on gravelly bottom and guard them. All are good food-fishes, are caught with a greater variety of baits than most fishes and rise to the fly.

Common Catfish, (Ameiurus nebulosus). If you must have a fish-pond, and do not intend to give it any attention whatever, stock it with catfish. They will come as near to raising themselves as anything you can get except carp. If you want fish to catch and fish to eat, and perhaps some to sell, try catfish. There are several chances out of ten that they will grow without care, and they can be kept in ponds containing other fishes. Catfish for stocking can be found anywhere, are easy to transport, and there are several kinds from which to select. One of the best is the marbled catfish (*A. marmoratus*). They will weigh three-quarters of a pound when one year old, and three pounds when three years old. They can be caught with hook and line, and so easily that children will do most of the catching. Any kind of bait will do, and they can usually be caught in winter when other fishes are half torpid. When taken from a muddy pond they should be put in a tank of running water for a few days, when their flavor will be all right. All catfish should be skinned before cooking. They are as near boneless as any fish to be found, and if you have been falsely educated as to their edible qualities, just try them.

According to negro philosophy "a catfish on the line is worth two whales in the water."

A BRIEF LIST OF USEFUL WORKS ON FISH-CULTURE.

A Manual of Fish-Culture.—By fish culturists in the service of the United States Bureau of Fisheries. Original edition published in the Report of the U. S. Fish Commission for 1897, pages 1-340. Revised edition published separately in 1900. The most useful work on the subject, especially to professional fish culturists. Probably out of print. It may sometimes be found on the shelves of second-hand book dealers. Separate chapters on the basses, crappies, etc., distributed free by the Bureau of Fisheries, Washington, D. C.

Modern Fish-Culture in Fresh and Salt Water. Fred Mather. A useful work of 333 pages by an experienced fish culturist. Contains important matter on ponds and their management. New York, 1900.

The Habits and Culture of the Black Bass. Dwight Lydell. Published as follows: Bulletin of the U. S. Fish Commission for

1902, pages 39-44. *Transactions American Fisheries Society*, pages 45-57. Report Indiana Fish Commissioner, 1903-04, pages 320-331. An excellent paper on the subject.

The Propagation of the Small Mouth Black Bass. Seymour Bower. *Transactions American Fisheries Society*, 1896, pages 127-136. Very useful.

The Breeding Habits, Development and Propagation of the Black Bass. Jacob Reighard. Published as Bulletin No. 7 of the Michigan Fish Commission. Pages 1-73 (from 16th annual report); and also as Contribution No. 97 from the Zoological Laboratory of the University of Michigan. An excellent paper in which the subject is brought up to date.

Fish Hatching and Fish Catching. Seth Green and R. B. Roosevelt, Rochester, 1879; 245 pages. Contains useful matter on ponds, and on the habits of fishes.

Book of the Black Bass. James A. Henshall. Cincinnati, 1900; 463 pages. Contains much on the habits of bass that will be useful to the pond culturist.

Domesticated Trout. Livingston Stone. A standard work on trout culture, which contains more or less matter on ponds. The third edition, 1877, 367 pages. Later editions are available.

An Anglers' Paradise and How to Obtain It. J. J. Armistead, London, 1895, pages 1-304. An excellent work on trout culture, containing several chapters on ponds and their management.

The Carp and Its Culture. Rudolph Hessel. Published in the Report of the U. S. Fish Commission for 1875, pages 865-900. Contains much useful matter on the construction and care of ponds.

Utilizing Water by Fish-Culture. Paul Benecke. Published in the Report of the U. S. Fish Commission for 1883, pages 1101-1142. Contains abundant information on the management of natural and artificial ponds.

Pond-Culture. Carl Nicklas. Published in the Report of the U. S. Fish Commission for 1884, pages 467-655. A lengthy discussion of the subject, especially on the construction and management of ponds.

Notes on Fish-Culture in Germany. S. Jaffe and others. Published in the Bulletin of the U. S. Fish Commission for 1895, pages 311-324.

Fish-Culture on the Farm. J. J. Stranahan. A decidedly useful but rather brief paper published as follows: In *Transactions American Fisheries Society*, 1902, pages 130-135. In *American*

Fish-Culturist, May, 1904, pages 20-23, and in the Ohio Farmer. Not issued separately so far as known.

Construction of Ponds and Pond-Culture Methods. By J. L. Leary. A brief, but useful paper published as follows: In Transactions American Fisheries Society, 1904, pages 139-142. In American Fish-Culturist, January, 1905, pages 23-25, and in Report of Illinois Fish Commission, 1902-04; pages 41-43. Not issued separately so far as known.

Fish Culture for Farmers. By William E. Meehan. A useful paper. Published in the Report of the Pennsylvania Department of Agriculture for 1895, pages 115-134.

List of Gifts

TO THE ZOOLOGICAL SOCIETY.

(Complete from January 1, 1906, to January 1, 1907.)

- ASSESON, DR. ALICE, New York City:
Yellow-Shafted Flicker.
- AUSTIN, E. H., Gaylordsville, Conn.:
Horned Grebe.
- AYARS, WILLIAM STEWART, State College, Pa.:
Horned Grebe.
- BAKER, L. L., Steward, Yacht "Narada," New London, Conn.:
Golden Baboon.
- BAMBY, JOHN, New York City:
Alligator.
- BARBOUR, GEORGE, New York City:
South American Otter.
- BAUM, RICHARD, New York City:
Mockingbird.
- BENDA, WLADYSLAW T., New York City:
Slender-Billed Cockatoo.
- BENEDICT, CHARLES P., New York City:
Dipsas Tree Snake.
- BERGER, MISS ENA, Stapleton, Staten Island, N. Y.:
South American Turtle.
- BERRY, DR., New York City:
Yellow-Shafted Flicker.
- BLISS, MISS S. (*through Mr. J. Bardusch*), New York City:
Golden Pheasant.
- BOROVAC, M., West Seneca, Erie County, N. Y.:
Florida Gallinule.
- BOURNE, FREDERICK G., New York City:
African Two-Horned Rhinoceros.
- BOYD, MRS. G., Jersey City, N. J.:
Blue Jay.
- BRAY, GEORGE W., New York City:
Coati Mundi.
- BRESSLER, A. E., Athens, Pa.:
Fox Squirrel.
- BREY, MRS. F. W., New York City:
Box-Turtle (8 specimens), Cumberland Turtle.
- BROSEMANN, F. G., New York City:
Yellow-Headed Amazon Parrot.
- BROWN, CLARENCE D., New York City:
Muskrat.
- BROWN, EDWIN LEWIS, New York City:
Spotted Pond-Turtle.
- BROWN, HERBERT, Yuma, Arizona:
Diamond Rattlesnake, Gila Monster, Horned Rattlesnake.
- BURLEIGH, G. W., New York City:
Agouti.
- CADY, PIERRE, Bloomfield, N. J.:
Collection of Salamanders, Newt, Red Salamander (3 specimens),
Bull Frog, Salamander (74 specimens).

- CANAVAN, MISS JOSEPHINE, New York City:
Painted Turtle.
- CAPTAIN OF THE STEAMER "FURNESSIA," New York City:
Gyrfalcon.
- CAPTAIN OF THE STEAMER "OSCAR SECOND," Hoboken, N. J.:
European Curlew.
- CARDEZA, T. D. M., Germantown, Philadelphia, Pa.:
Elk (5 specimens), Buffalo (5 specimens).
- CATERSON, EDWARD, New York City:
Alligator.
- CHIEF ENGINEER OF THE STEAMER "EL CID," NEW YORK CITY:
Purple Gallinule.
- CHURCH, MRS. E., New York City:
Northern Yellowthroat.
- CLARKE, ALAN R., New York City:
Painted Turtle (2 specimens), Box Tortoise, Snapping Turtle.
- CLARKE, HAROLD, New York City:
Wood—"Turtle."
- COLLIER, ROBERT, New York City:
Red-and-Blue Macaw.
- CRUIKSHANK, ROBERT F., Big Indian, Ulster County, N. Y.:
Ring-Necked Snake.
- DAVIES, OLIVER M., Columbus, Ohio:
Black Hawk.
- DE ANDRADE, ALFRED, New York City:
Anaconda.
- DENGLER, OTTO, New York City:
Yellow-Fronted Amazon Parrot.
- DODGE, MARCELLUS HARTLEY, New York City:
Boa (2 specimens), Razor-Billed Curassow, Ocelot, Black Capuchin Monkey.
- DONNELLY, JOSEPH, New York City:
Crow (2 specimens).
- DORN, RICHARD, New York City:
Bull Frog, Wood—"Turtle."
- 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.: 6 Rattle-
snakes, 20 Garter Snakes, 2 Black Snakes, 4 Water Snakes, 3 Milk
Snakes, 9 Storer's Snakes, 3 Ring-Necked Snakes, 3 Green Snakes,
1 Ribbon Snake, 1 Hog-Nosed Snake. Total, 52 specimens.
- DUEL, DR. ARTHUR B., New York City:
Alaskan Black Bear (2 specimens).
- DUNTZE, G., New York City:
Great Horned Owl.
- DUREIN, THOMAS, New York City:
6 Cowbirds, 6 Indigo Buntings, Scarlet Tanager, 2 Baltimore Orioles,
2 Song Sparrows, Catbird, 2 Red-Winged Blackbirds, 3 Bobolinks,
2 Rose-Breasted Grosbeaks, Bluebird. Total, 21 specimens.
- DURIEUX, MRS. A., New York City:
Snapping Turtle, Wood—"Turtle."
- EICHLER, MISS ELSIE, New York City:
Alligator.
- ELIASON, CARL, Hollandale, Florida:
Coachwhip Snake, Scarlet Snake, Corn Snake, European Ring Snake
or "Ringelnatter."
- FICKINGER, WALTER, New York City:
Painted Turtle.

- FILLY, P. C., Islip, L. I.:
Crab-Eating Raccoon.
- FOLLETT, RICHARD E., Boston, Mass.:
Canada Porcupine.
- FRENCH, DR. CECIL, Washington, D. C.:
4 Bull Snakes, Water Snake, 2 Hog-Nosed Snakes.
- GAMMON, R. J., Bedford Park, New York City:
Alligator (specimen 4 years old).
- GANDIG & BLUM G., New York City:
Coyote (2 specimens).
- GARDINER, PRESCOTT, Ridgewood, N. J.:
Raccoon.
- GEER, P. W., the Davenport Farms, Morris Plains, N. J.:
Bob-White
- GILMOUR, MISS CARRIE E., New York City:
Alligator.
- GOETT, EDWARD, New York City:
Pine Snake, 2 Ribbon Snakes, Water Snake, Red Salamander, 7 Pond
Frogs, also a number of Water Newts.
- GOOKIN, A. S., New York City:
2 Canaries.
- GRAY, MISS HAZEL, New York City:
Guinea Pig.
- GUNDZEN, JOHN, New York City:
Alligator.
- HAIGHT, C. L., Yonkers, New York:
Slender-Billed Cockatoo (2 specimens).
- HALLEN, MISS LILLIAN, Highland Park, Ill.:
Alligator.
- HARRIMAN, E. H., New York City:
Alaskan Black Bear (2 specimens).
- HARTZOG, Second Mate, Steamer "Fulda," South Brooklyn, N. Y. C.:
Gallinule.
- HEDDEN, MRS. F. S., Philadelphia, Pa.:
Chipmunk.
- HEDRICH, HANS, New York City:
Green Snake, Milk Snake.
- HENFELD, D. C., New York City:
Alligator (3 specimens), Rubber Boa.
- HOLLISTER, MISS MARTHA, Mamaroneck, N. Y.:
Alligator (3 specimens).
- HOLMES, CAPTAIN EDGAR A., New York City:
3 Troupials, 2 Curacao Mockingbirds, Curacao Sparrow Hawk,
Curacao Ground Dove, Bare-Eyed Pigeon, 2 Blue-Headed Parrots.
- HOLMES, MRS. EDGAR A., New York City:
Yellow-Faced Parrakeet (2 specimens).
- HOLMES, WILLIAMS, New York City:
Worm Snake.
- HOOVER, MISS, New York City:
Screech Owl.
- HOWARD, D. W., New York City:
Jacobin Pigeon (2 specimens).
- HURTER, SR., JULIUS, Little Rock, Ark.:
Collection of Salamanders, comprising specimens of: *Desmognathus*
brimliorum and *Spelerves multiplicata*; also 2 Western Painted
Turtles, 4 Striped Swamp Snakes, Soft-Shelled Turtle, 2 Miter
Snakes.
- HURTZ, MRS. GEORGE A., Sound Beach, Conn.:
Alligator.

- HUSS, COLONEL HENRY, Mount Vernon, New York:
Common Macaque Monkey.
- IRELAND, AUGUST P., New York City:
Alligator (3 specimens).
- JACKSON, MRS. R. G., Yonkers, New York:
White-Fronted Amazon Parrot.
- JACOB, PAUL, Steamer "Græcia," New York City:
Rhinoceros Iguana (2 specimens).
- JAMES, MRS. ARTHUR CURTISS, New York City:
Jaguar (2 specimens).
- JOHNSON, W. J., New York City:
Moss Monkey.
- JONES, DR. J. S., Galveston, Texas:
Sapajou Monkey.
- JONES, L. Q., Newport, R. I.:
Raccoon.
- KENDAL, WILLIAM H., Binghamton, N. Y.:
Red Fox (2 specimens), Silver Fox.
- KENNEY, JOHN, Williamsbridge, N. Y.:
Banded Rattlesnake.
- KITT, T. G., Port Chester, N. Y.:
Sparrow Hawk (3 specimens).
- KLEINE, CHARLES, New York City:
Barn Owl.
- KRAUSE, THEODORE, New York City:
Sea-Gull.
- KROEMER, ARTHUR F., New York City:
Yellow-Faced Parrakeet.
- KUPER, KATHERINE B., New York City:
Alligator (2 specimens).
- KUTZURN, A., New York City:
Canary.
- LADD, JR., HENRY M., Rutherford, N. J.:
Agouti.
- LANDIS, ALFRED, New York City:
Canary.
- LAUDER, JR., GEORGE, Greenwich, Conn.:
Woodchuck (2 specimens).
- LINDEMANN, JOHN, Westchester, New York City:
Jackdaw (2 specimens), Magpie (2 specimens).
- LYNCH, MRS. F. P., New York City:
White-Fronted Amazon Parrot.
- MCCORMICK, J. K., New York City:
Marsh Hawk.
- MCCOY, GEORGE W., Garrison, New York:
Copperhead Snake.
- MCLOUGHLIN, JAMES, New York City:
American Flamingo (5 specimens).
- McMILLIN, EMERSON, New York City:
Black Bear (2 specimens).
- MACHENS, ROBERT, Purser of the Steamer "Flandria," New York City:
Rhinoceros Iguana (4 specimens), Spotted Cavy.
- MACKEY, WILLIAM H., New York City:
South American Tortoise.
- MARTIN, C. V., New York City:
Macaw.
- MAXON, WILLIAM R., New York City:
Central American Tortoise (3 specimens).

MAYERS, JOE, Highbridge, New York City:
Alligator.

MEADER, H. L., New York City:
Pine Snake.

METZGER, MRS. A., New York City:
Bluebird, Starling (3 specimens), Red-Winged Blackbird (2 specimens), Junco, Song Thrush.

MEYER, C. A., New York City:
Blue Jay (2 specimens).

MILLER, CHARLES F., East Orange, N. J.:
20 Water Snakes, 7 Garter Snakes, 3 Ribbon Snakes, 26 Brown Snakes, 10 Muhlenberg's Turtles, 6 Musk Turtles, 1 Red Salamander, 5 Sculptured Terrapins, 10 Spotted Turtles, 16 Box Tortoises, 1 Snapping Turtle, 7 Wood—"Turtles," 24 De Kay Snakes, 1 Blue-Tailed Lizard, 111 Frogs, 68 Newts and Salamanders of various species, 1 Wood Frog, 2 Bullfrogs, 4 Painted Turtles, 8 Pond Frogs, 20 Salamanders. Total, 351 specimens.

MILLER & BOOZE, Asbury Park, N. J.:
Alligator.

MILLS, OGDEN, Staatsburgh, Dutchess County, N. Y.:
Great Horned Owl.

MILNE, MISS KATHERINE, Long Island City, L. I., N. Y.:
Common Macaque Monkey.

MOLE, R. R., Port-of-Spain, Trinidad, B. W. I.:
The following Snakes and Lizards from Trinidad: 1 Tree Boa, 1 Coral Snake, 2 Striped Snakes, 1 Blind Snake, 1 Lira Snake, 6 Worm Lizards, 2 *Coluber variabilis*, 1 *Helicop angulatus*, 4 *Liophis cabella*, 1 *Oxybelis acuminatus*, 3 Geckos, 1 *Polychrus marmoratus*, 4 Tegu Lizards. Total, 28 specimens.

MORRIS, MISS CORA HEMEN, "Avylon," Westchester, N. Y.:
Red Fox (2 specimens).

MUNSON, DR. A. E., New York City:
Yellow-Shouldered Amazon Parrot.

NATHAN, E. J., New York City:
Chipmunk.

NICHOLSON, A. M., Orlando, Florida:
Rattlesnake, Garter Snake (2 specimens), Water Snake.

NOLAN, F. P., Kinderhook, Columbia County, N. Y.:
Milk Snake.

NOLL, DR. JOSEPH L., New York City:
Raccoon.

OGDEN, MISS FLORENCE, New York City:
Alligator.

O'HARA, CHARLES, Brooklyn, New York City:
Geographic Terrapin.

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.: 6 Rattlesnakes, 20 Garter Snakes, 2 Black Snakes, 4 Water Snakes, 3 Milk Snakes, 9 Storer's Snakes, 3 Ring-Necked Snakes, 3 Green Snakes, 1 Ribbon Snake, 1 Hog-Nosed Snake. Total, 52 specimens.

PICKERING, MISS M. H., East Orange, N. J.:
Golden-Naped Amazon Parrot.

PIERCE, HENRY CLAY, New York City:
Monkey.

POTTER, L., New York City:
Yellow-Headed Parrakeet (2 specimens).

- PRECHTAL, HANS, Chief Cook of the Steamer "Prince Eitel Frederic," New York City:
Hawk.
- REDMOND, GERALDYN, New York City:
California Quail (10 specimens).
- REEBER, JOHN, New York City:
Red Fox.
- REINHARDT, ROBERT F., New York City:
Red Fox.
- REISS, A., Bronxdale, New York:
Screech Owl.
- RENKELL, HEINRICH, First Officer of the Steamer "Flandria," New York City:
Murine Opossum.
- RESLER, ADOLPH, New York City:
Red-Backed Salamander (2 specimens), Spotted Salamander.
- ROBINSON, MRS. G., New York City:
Pig-Tailed Monkey.
- ROBINSON, MRS. G. RADCLIFFE, New York City:
Canary (2 specimens).
- ROSS, ALEXANDER, Wakefield, New York:
Painted Turtle.
- ST. GEORGE, CAPEL B., Tramore, Ontario, Canada:
Flying Squirrel (5 specimens).
- SALLEY, THOMAS PICKENS (*through Roundsman Francis J. Kavanagh*), Newport News, Va.:
White-Nosed Coati Mundi.
- SCRIMGEOUR, MRS. JOSEPHINE, Galveston, Texas:
Sapajou Monkey.
- SHAW, R. E., West Esmond, Va.:
Common Ring-Necked Snake, Pilot Black Snake.
- SHAY, MRS., Hoboken, N. J.:
Yellow-Headed Blackbird.
- SHEARER, MRS. KATE, New York City:
White-Headed Mannikin.
- SHELTON, F. H., Philadelphia, Pa.:
7 Diamond-Backed Terrapin, 4 California Terrapin, 2 Troost's Terrapin, 4 Cumberland Terrapin.
- SHERWIN, FRED., Terrace Park, St. Lawrence County, Morristown, N. Y.:
Flying Squirrel (6 specimens).
- SIMMIS, F. M., New York City:
Alligator.
- SMITH, C. E., South Norwalk, Conn.:
Bald Eagle.
- SMITH, R. H., New York City:
Fox Squirrel.
- SPEAR, JR., JAMES, Philadelphia, Pa.:
Mexican Boa Constrictor.
- STEEB, HAROLD, Sparkill, New York:
Water Snake.
- STEVENSON, MRS. PAUL EVE, Garden City, L. I.:
Blue-Headed Amazon Parrot.
- STOKES, MRS. HORACE, Hackettstown, N. J.:
Alligator (2 specimens).
- STRAUB, JOSEPH A., New York City:
Painted Turtle (2 specimens).
- STRYKER, EDWARD, New York City:
Painted Turtle.

- SULLIVAN, EDWARD J., New Brighton, Staten Island, N. Y.:
 Blue-and-Yellow Macaw.
- THORNE, SAMUEL, New York City:
 Hippopotamus.
- TOOMEY, JOHN, Bridgeport, Conn.:
 Gray Fox.
- TRAPP, F., New York City:
 Barred Owl.
- VAN DILLON, DAVID, Athenia, N. J.:
 Turkey Vulture.
- VAN TASSEL, ABRAM C., New York City:
 Amazon Parrot.
- VEAIL, IRA E., Columbus, Ohio:
 2 Newly-Hatched Loons, 2 Loon Eggs.
- VELTING, GEORGE, Van Nest, New York City:
 Male Purple Finch, Male Red-Winged Blackbird, American Crossbill.
- WALTER, ANTON N., New York City:
 Tarantula, Cuban Ground Boa.
- WATERBURY, STANLEY A., Woodhaven, L. I.:
 Fox Squirrel (5 specimens), Flying Squirrel (2 specimens).
- WERNER, MRS. ALINE, New York City:
 Australian Bush Cat.
- WETHERELL, G. H., New York City:
 Common Box Tortoise.
- WHEALTON, DR. A. W., Chincoteague, Va.:
 Military Macaw, Red-and-Blue Macaw.
- WIGGERS, A. F. A., New York City:
 Banded Rattlesnake (3 specimens).
- WILLIAMSON, THOMAS M., Erie, Pa.:
 King Snake.
- WILSON, GEORGE, Harrison, Westchester County, N. Y.:
 Sapajou Monkey.
- ZATTA, AUGUST J., Hoboken, N. J.:
 Paradoxure (2 specimens).

Miscellaneous List.

- ALLGOEVER, GEORGE, New York City:
 Terrarium.
- CRANE, WARREN C., New York City:
 A collection of admission tickets to the London Zoological Garden.
- HORNADAY, WILLIAM T., New York City:
 Collection of 138 heads and pairs of horns, representing 108 species
 of ungulates, given as the nucleus for a national collection of
 heads and horns. Described and listed in a special publication.
- TREVOR, MRS. J. B., Glenview, Yonkers, New York:
 Cycas Palm.
- WOOD, GEORGE S., Westchester, New York:
Ficus elastica.

Gifts to the Library.

- AMERICAN MUSEUM OF NATURAL HISTORY, New York City:
 Memoirs, Vol. IX, Parts 1 and 2.
- BROOKLYN INSTITUTE OF ARTS AND SCIENCES, Brooklyn, New York City:
 Six numbers of the Bulletin.
 Report for 1905.
- CARNEGIE INSTITUTE OF WASHINGTON, (*through Charles B. Davenport*),
 Washington, D. C.:
 Inheritance in Poultry. By C. B. Davenport.

- DEPARTMENT OF BOTANICAL RESEARCH, CARNEGIE INSTITUTE, Washington, D. C.:
 Recherches sur la Faune Parasitaire de L'Egypte, Première Partie,
 Par le Dr. Arthur Looss.
- Contributo Alla Entozoologia D'Egitto, Per il Dott. Prospero Sonsino.
- DEPARTMENT OF COMMERCE AND LABOR, BUREAU OF FISHERIES:
 The Golden Trout of the Southern High Sierras. By Barton Warren Evermann.
- GEOLOGICAL SURVEY DEPARTMENT OF CANADA, Ottawa, Canada:
 Annual Report of the Geological Survey of Canada, 1901, 1902-03.
- HAGMANN, DR. G., Zoologische Sammlungen:
 As Aves Brasiliacas. By Dr. G. Hagmann.
- NATAL GOVERNMENT MUSEUM, Natal:
 First Report of the Natal Government Museum, (1904).
 Annals of the Natal Government Museum, Vol. I, Part I.
- NEW YORK BOTANICAL GARDENS, New York City:
 64 Pamphlets on Zoological Subjects.
- PHILADELPHIA ACADEMY OF SCIENCES, Philadelphia, Pa.:
 Proceedings, Vols. LVII and LVIII.
- SCHLESISCHE GESELLSCHAFT FÜR VATERLÄNDISCHE CULTUR-BRESLAU.
 (*through Herrn Karl W. Heirsemann*):
 Dreieundachtzigster Jahres—Bericht der Schlesischen Gesellschaft für vaterländische Cultur, (1905).
- SMITHSONIAN INSTITUTION, Washington, D. C.:
 Annual Report, 1902, 1904 and 1905.
 A Contribution to the Oceanography of the Pacific. By James M. Flint.
- UNITED STATES COMMISSION OF FISH AND FISHERIES:
 Hydroids of the Hawaiian Islands, collected by the S. S. "Albatross" in 1902. By Professor C. C. Nutting.
- UNITED STATES DEPARTMENT OF AGRICULTURE, Washington, D. C.:
 Yearbook, for 1904 and 1905.
- UNITED STATES GEOLOGICAL SURVEY, (Dept. Int.):
 The Geography and Geology of Alaska. By Alfred H. Brooks and others.
- UNITED STATES NATIONAL MUSEUM, Washington, D. C.:
 Annual Report, 1902, 1904 and 1905.
 Proceedings, Vols. 30 and 31.
- UNIVERSITY OF MONTANA, Missoula, Montana:
 The Butterflies of Montana. By Morton J. Elrod.
- VON PLEYEL, JOSEPH:
 Die Schulsammlung. By Joseph von Pleyel.

Gifts to the Aquarium.

- AHRENS, MRS. WALTER, Jersey City, N. J.:
 Collection of Frogs, Newts and Turtles.
- ANDERSON, JOHN J., New York City:
 Box Tortoise and Spotted Turtle.
- AYER, MISS MARGARET, New York City:
 2 Alligators.
- BAKER, F. M., Staten Island, N. Y.:
 Painted Turtle.
- BEALE, FRED A., New York City:
 Crocodile.
- BISHOP, HENRY, Baltimore, Md.:
 12 Fancy Goldfishes.
- BLANK, WALTER, New York City:
 Horseshoe Crab.

- CARPON, HARRY, New York City:
 Alligator.
- CARSON, MISS, New York City:
 Horned "Toad."
- CASEY, WILLIAM, New York City:
 Turtle.
- CHASE, E. D., Brooklyn, N. Y.:
 2 Lizards from Kentucky.
- CLARK, MASTER BILLY, New York City:
 Box Turtle, 2 Wood—"Turtles," 13 Spotted Turtles, 2 Painted Turtles,
 16 Newts, 12 Crayfish, 1 Peeper-Frog, and frog spawn.
- CLYDE STEAMSHIP CO., (*through General Manager Theo. G. Eger*), and
FLORIDA EAST COAST RAILWAY, (*through General Traffic Manager
J. P. Beckwith*):
 Free transportation for two Manatees from Florida to New York.
- COCKRANE, W. W., Harpers Ferry, W. Va.:
 Large-mouth Black Bass.
- COTTE, S., New York City:
 2 Large-mouth Black Bass.
- COLUMBIA UNIVERSITY, New York City:
 2 Salamanders, 3 Leopard Frogs, 24 Newts, 3 Necturus, 1 Goldfish
- CURRYS' SONS, WILLIAM, Key West, Florida:
 2 Hawksbill Turtles.
- DIMOCK, A. W., Marco, Florida:
 2 Manatees.
- DION, J. G., 130 York Street, Jersey City, N. J.:
 Mantis Shrimp.
- EATON, MRS. E. C., Newark, N. J.:
 Alligator.
- EGBERT, MASTER RAE, Staten Island, N. Y.:
 Painted Turtle.
- EVANS, MISS FLORENCE ADELE, Montclair, N. J.:
 2 Alligators.
- FENDRICK, MISS KATHARINA F., New York City:
 Green Turtle.
- FREDWAY, C., Ridgebury, N. Y.:
 Box Turtle.
- GOTTSLEBEN, EMIL, Rum Cay, Bahama Islands.
 Hawksbill Turtle.
- GREENUS, MISS GRACE, Brooklyn, N. Y.:
 Chameleon.
- HANNIGAN, WILLIAM D., New York City:
 Alligator.
- HANNING, DR. J. H., New York City:
 Chameleon.
- HAYNER, A. D., New York City:
 Alligator.
- HOPSON, MRS. E. C., Brooklyn, N. Y.:
 Alligator.
- ININMAN, C. D., 1142 Franklin Avenue, Bronx, New York:
 Painted Turtle.
- JACOB, CAPT. PAUL, Steamship "Græcia," New York City:
 Collection of Hermit-Crabs, Inagua Island, Bahamas.
- JAMES, J. B., New York City:
 Pikefish.
- KANZOW, O. C., New York City:
 Hawksbill Turtle.
- KENT, MASTER SOLOMON, Brooklyn, N. Y.:
 Wood—"Turtle."

- KINNEAS, VANCE LINES, New York City:
Alligator.
- KRANT, MASTER LEON, New York City:
Painted Turtle.
- LINDABURY, MISS M. A., Wharton, Morris County, N. J.:
Alligator.
- LOHR, C. H., Brooklyn, N. Y.:
Box-Turtle.
- MATTOON, MISS LAURA I., Springfield, Mass.:
Alligator.
- MAYER, DR. A. G., Carnegie Institution, Dry Tortugas, Florida:
20 Land-Crabs, 3 Hermit-Crabs, lot of Loggerhead Turtle eggs.
- MORGAN, MASTER JOE WRIGHT, New York City:
3 Spotted Turtles.
- MORRISON, PAUL F., Ellis Island, N. Y.:
Alligator.
- MUNSON, HARRY, Munson, L. I.:
Alligator.
- MURRAY, L., New York City:
Turtle.
- NATIONAL ZOOLOGICAL PARK, Washington, D. C. (*through Dr. Frank Baker, Supt.*):
2,000 pounds quartz-rock for decorating exhibition tanks.
- NEWBAUER, GUS, Williamsburg, N. Y.:
Snapping Turtle.
- NEW YORK FOREST, FISH AND GAME COMMISSION, Albany, N. Y., (*through John D. Whish, Secretary*):
250,000 Yellow Perch eggs, 500,000 Smelt eggs.
- NEW YORK SHELLFISH COMMISSION, New York City, (*through Hon. B. Frank Wood, Supt.*):
Collection of Starfishes.
- NEW YORK ZOOLOGICAL PARK, New York City:
California Sea-Lion.
- NICHOLAY, W. A., Brooklyn, New York:
2 Alligators.
- NIEMAN, HANS, New York City:
3 Turtles.
- O'CONNOR, P. J., South Brooklyn, New York:
Spanish Snail.
- OLIVER, H. W., New York City:
Wood—"Turtle."
- PARKER, WILLIAM W., New York City:
Box-Turtle.
- REDFIELD, MASTER EDWARD and MISS BESSIE, Closter, N. J.:
4 Wood-Frogs, 1 Newt, 1 Mud-Minnow, 10 Snails, 18 Salamanders,
2 Box-Turtles, 3 Wood—"Turtles," 2 Spadefoot Toads, 2 Musk-Turtles,
4 Painted Turtles, 2 Muhlenberg Turtles, and a quantity
of frog spawn and wood mosses.
- ROOSEVELT, R. B., Jr., New York City:
Alligator.
- SALISBURY, MISS LILLIAN, New York City:
Diamondback Terrapin.
- SCHNEIDER, H., New York City:
Land Hermit-Crab.
- SCUDDER, CAPT. ED., Northport, Suffolk County, L. I.:
2 Sea-Anemones.
- SHELTON, FREDERICK H., Media, Pa.:
14 Painted Turtles, 6 Yellow-Bellied "Sliders," 5 Diamondback Terrapin and 2 Alligator Snappers.

- SHORT, MRS. E. L., New York City:
Alligator.
- STUART, MASTER LYMAN KNIGHT, Newark, New York:
2 Leatherback Turtles.
- STAUB, MASTER GEORGE, New York City:
Painted Turtle.
- UXEDO CLUB, (*through Edwin C. Kent*), Tuxedo, N. Y.:
4,000 eggs of Brown Trout.
- U. S. BUREAU OF FISHERIES, (*through Hon. George M. Bowers, Com'r.*), Washington, D. C.:
Fish eggs as follows: 500,000 Pike-Perch, 30,000 Whitefish, 5,000 Rainbow-Trout, 10,000 Brook-Trout, 10,000 Lake-Trout.
- USHER, MRS., Brooklyn, N. Y.:
Painted Turtle and Spotted Turtle.
- VAUGHT, JOHN N., New York City:
Mantis Shrimp.
- WATSON, MISS KATHARINE H., New York City:
Alligator.
- WEAVER, MASTER JOSEPH, New York City:
Alligator.
- WEEKS, C., New York City:
2 Alligators.
- WENZEL, H. D., New York City:
Alligator.
- WESTERVELT, MISS RACHEL, New York City:
Musk Turtle.
- WHITRIDGE, F. W., New York City:
Alligator.
- WOOD, MISS ETHEL CONSTANCE, Flatbush, L. I.:
8 Yellow-Bellied Salamanders.
- WRAY, MASTER ROBERT, Closter, N. J.:
Red Salamander.
- ZEPF, ALBERT E., Hyde Park, New York:
2 Alligators.

Exchanges.

- DETROIT AQUARIUM, Detroit, Mich.:
14 Whitefish, 29 Short-eared Sunfish, 33 Rock-Bass, 8 Sauger Pike, 13 Red-Horse, 10 Pike-Perch, 5 Stone-Roller, 1 Pickerel, 9 Crappie, 6 Channel-Catfish.
- FRENCH, DR. CECIL, Washington, D. C.:
3 Painted Turtles, 7 Red-Bellied "Sliders" and 8 Yellow-Bellied "Sliders."
- SHELTON, F. H., Philadelphia, Pa.:
3 California Turtles.

Purchases.

- STEAMER "ANGLER"—Collections from the "fishing banks" off the New Jersey Coast:
70 Codfish, 182 Sculpins, 12 Starfishes, 14 Rock-Crabs, 93 Mutton-Fish, 102 Dogfish, 92 Blackfish, 174 Sea-Ravens, 14 Anglers, 1 Flounder, 107 Skates, 12 Bergalls, 5 Sea-Bass, 3 Puffers, 1 Trigger-Fish, 10 Fluke, 3 Sea-Robins, 1 Conger-Eel, 1 Lobster, 2 Spider-Crabs, 1 King-Crab and numerous pieces of coral, mussels, etc.

JACOB SCHNOOR—Collections from the pound-nets at Port Monmouth, N. J.:
 2 Sturgeons, 1 Loggerhead Turtle, 1 Tarpon, 29 Weakfish, 1 Sand-Shark, 11 Yellow Mackerel, 5 Pilot-Fish, 4 Thimble-eyed Mackerel, 1 Tripletail Flasher, 21 Balloon-Fish, 25 Orange Filefish, 11 Pompano, 1 Moonfish, 2 Remora, 4 Sea-Bass, 8 Bluefish, 17 Massachusetts Filefish, 9 Redwinged Sea-Robins, 10 Puffers, 5 Skates, 1 Dogfish, 2 Flukes, 3 Shiny Toad-Fish, 5 King-Crabs, 4 Blue Crabs, 4 Menhadens.

TROPICAL FISHES—From Bermuda:

1 Octopus, 13 Spot Snappers, 15 Cowfish, 66 Angel-Fish, 11 Butterfly-Fish, 44 Surgeon-Fish, 8 Princess Rockfish, 12 Common Rockfish, 13 Nassau Groupers, 12 Spotted Morays, 4 Spiny Lobsters, 27 Coney, 54 Mud Parrot-Fish, 2 Strombus, 2 Tiger Rockfish, 3 Queen Trigger-Fish, 32 Yellow Grunts, 1 Black Grunt, 1 Striped Grunt, 34 Trunkfish, 2 Porcupine-Fish, 45 Sergeant-Major, 113 Four-eyes, 30 Hinds, 5 Salmon Rockfish, 36 Common Trigger-Fish, 97 Squirrel-Fish, 1 Striped Remora, 9 Hogfish, 3 Yellow-tails, 5 Red-finned Parrot-Fish, 8 Red Rockfish, 1 Brown Moray, 2 Green Moray, 3 Green Parrot-Fish, 16 Blue Tang, 4 Hogfish, 3 Red Snappers, 2 Gray Snappers, 1 Tom Tate, 3 Crawfish, 2 Ladyfish.

Other Purchases.

1 Green Turtle, 30 Sea-Horses, 2 Small Crocodiles, 1 Hawksbill Turtle, 4 Large Hellbenders, 6 Mud Puppies, 7 Starfishes, 26 Anemones, 26 Sea-Squirts, 36 Sand-Dollars, some Chiton, lot of coral, 1 Tarpon, 2 Harbor-Seals, 5 Alligator Snapping Turtles, 16 Leopard-Frogs, 9 Bullfrogs, 5 Yellow-Bellied "Sliders," 1 Red-Bellied "Slider."

Gifts to Aquarium Library.

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3 colored plates Crustacea of Hawaiian Islands.

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PRIMATE HOUSE.



REPORT OF THE VETERINARIAN.

By W. REID BLAIR, D.V.S.

ONE fact which has greatly impressed me in the study of the diseases of wild animals is that in order to obtain the best results, the statistical method should be used to a great extent. The collection of a large number of cases, with a careful analysis of recorded dates, can not but yield valuable conclusions.

In this connection we are gratified to note that the London Zoological Society is now engaged in the investigation of diseases of wild animals that die in their Gardens. With the work of the Philadelphia and Washington Gardens, where such investigations have been carried on for several years, we feel that we are no longer alone in this field, that the boundaries of comparative medicine will be constantly extended, and that the theories of the past may fall before the revelations of the future.

Pneumonia.—As in former years, a considerable number of deaths has been due to pneumonia. Most of the cases met with are well defined cases of lobar pneumonia. The animals most often affected have been the primates, the next in order being the hooved animals. A number of cases of broncho-pneumonia have been met with among the sea-lions and harbor seals. The pneumonic condition in these animals is invariably fatal. Pneumonia is also a frequent complication in animals suffering from gastro-enteritis and other diseases which tend to lower the resistance of the body forces.

We contemplate making a special study of pneumonia during the coming year, especially among the primates, where its ravages are most serious. Bacteriological investigations will be made to determine whether the pneumococcus is constantly present in these cases, or whether many other infective agents may not contribute to the disease.

Gastro-Enteritis.—Fewer deaths from gastro-enteritis have occurred during 1906 than in any previous year. Among the buffalo herd, where this disease has previously been so troublesome, no deaths are to be recorded. Throughout the past year the herd has been maintained in fine condition.

Among the mountain sheep there have been a number of deaths from gastro-enteritis. The chief etiological factor in the causation of this disease has been the grass growing upon their ranges. During the summer, the ranges were thoroughly denuded of grass, and covered with ashes. Since then there have been fewer cases of the disease, and it has been possible to keep the animals on exhibition most of the time.

At one time during the past summer there were as many as seven animals in the hospital suffering from gastro-enteritis, most of them from Mountain Sheep Hill. If the disease is taken in its earliest stages, the great majority of cases readily respond to treatment.

Cage Paralysis.—Deaths from this troublesome disease have been fewer in number than during any previous year. Our treatment of the disorder in the early stages, as outlined in previous reports, continues to give satisfactory results. There are at the present time several cases of cage paralysis in the Primates collection, that have been under treatment for over two years, and all of them show a considerable improvement in condition.

PARASITIC DISEASES.

Intestinal Parasitis.—But few deaths were directly due to intestinal parasitism, and those which took place were among animals of no great value, generally the small mammals. It is an interesting fact that a large percentage of the small mammals which come to our collections, harbor some type of intestinal parasite, which, if not speedily relieved, will result in setting up a fatal enteritis. The occasional administration of vermifuges to these animals greatly reduces the number of deaths which we would naturally expect from this condition.

Tape-Worm Cysts.—In the medical reports of past years, frequent mention has been made of the prevalence of tape-worm cysts in a large percentage of the animals dying in the Park. During the past two years there has been a great reduction in the number of cases met with, and especially in 1906, when the condition has been noted in only two or three instances.

Verminous Broncho-Pneumonia in Elk.—There have been no deaths from this disease during the past year; and the elk herd, generally, was never in such good condition as at the present time. The reasons for the improved condition of these animals were fully discussed in the last report of this department, and need no further comment at this time.

Unusual Parasites.—Two different species of abdominal filariae have been found in South America monkeys, both of which are apparently new to science. Several types of encysted parasites have been found in the intestinal walls of a number of Asiatic animals. A black ape, (*Cynopithecus niger*), from Celebes, died as a result of a hemorrhagic dysentery caused by the irritation and erosion of a great number of encysted worms, which had buried themselves in the mucosa of the large bowel. A more detailed examination will be made of these parasites at some future time.

Quarantine.—While it is to be expected that from time to time infected animals will creep into our collection, despite the most careful supervision, we are happy to say that no serious outbreak of infectious or contagious disease has occurred during the past year.

Distemper.—Three cases of this disease occurred during 1906. The introduction of the disease can be traced directly to several domestic dogs which were captured within the confines of the Park, and were temporarily confined in one of our hospital cages, awaiting the arrival of the S. P. C. A. wagon. The Eskimo dog "Bridge" contracted the disease, but after a prolonged illness finally recovered. The two cases, which resulted fatally, were among the coyotes which had been moved to the hospital cages while their dens were being painted, and were thus exposed to the contagion.

Distemper is a highly contagious disorder, and one with which medical treatment is often very unsatisfactory. The method which we endeavor to follow in regard to this disease, is to closely inspect those animals which are subject to the disease, when they first reach the Park, and to immediately quarantine sick animals upon the first suspicious symptoms of the malady. Unless the animal is particularly valuable, it has always seemed to us best to destroy it at once, and thoroughly disinfect the cage in which it has been confined. Owing to the large number of animals in our collection, which are directly susceptible to the contagion of distemper, no precautions, however stringent, could be considered unjustifiable. So long as such measures are strictly enforced we may feel reasonably safe from an epidemic of distemper.

Tuberculosis.—This disease has been confined almost exclusively to the animals in the Primates collection, the single exception being that of a binturong or "bear cat," (*Arctictis binturong*), which showed on autopsy an extensive pulmonary and lymphatic tuberculosis. This animal was in the collection only a few weeks.

Of the nine cases of tuberculosis occurring among the Primates, six of these died, or were destroyed, *while under quarantine control, and previous to their admission to the exhibition halls.* Of this number, the only specimen of value was a young chimpanzee, which had been deposited in the Park only a short time. Several monkeys have died of an advanced pulmonary tuberculosis within a few days after their arrival. These cases were in animals that had been in captivity for some time, and were received at the Park as gifts.

Fish Poisoning.—Several cases of this apparently unavoidable condition have occurred in our fish-eating animals. The large quantity of fish used, and the great difficulty we experience in demonstrating the toxic properties when present in the fish, make it practically impossible to entirely eliminate the danger arising from an exclusive diet of fish. However, every possible care is exercised in procuring, inspecting, and administering the fish.

Injuries.—Fortunately the number of deaths during the past year were not numerous, and may all be classified as unavoidable. Several fallow deer and one fine red deer buck were killed by corral mates, as a result of fighting. These accidents are due to the inevitable quarrels which occur between the males during the breeding season.

Unusual Diseases.—Among the rare conditions met with during 1906, the following cases may be mentioned: *necrotic inflammation of the bladder* in a buffalo, resulting in rupture and death from *Uremia*; malignant tumors of the lungs, with metastases in the intestines and kidney, in a red fox; *hypertrophy of the pyloris*, causing death by obstruction of the pyloric orifice in a young black bear; a *food toxemia* in a European reindeer.

REPORT ON 114 DEATHS AMONG THE MAMMALS DURING 1906.

	Primates.	Carnivores.	Rodents.	Ungulates.	Marsupials.	Edentates.	Total
Pneumonia.....	7	1	7	3	1	—	19
Gastro-enteritis	—	12	4	8	—	—	14
Tuberculosis	9*	1	—	—	—	—	10
Parasitic-enteritis	—	3	1	2	—	—	6
Gastritis	12	6	2	1	—	—	11
Distemper	—	2	—	—	—	—	2
Malnutrition and Atrophy.....	—	2	—	—	2	—	4
Rickets	—	1	—	—	—	—	1
Cage Paralysis	—	2	—	—	—	—	2
Fish Poisoning	—	2	—	—	—	—	2
Heat Exhaustion	—	1	—	—	—	—	1
Arsenical Poisoning.....	—	3	—	—	—	—	3
Uræmic Poisoning	—	—	—	1	—	—	1
Fungus Poisoning.....	—	—	—	1	—	—	1
Malignant Tumor of Lungs.....	—	1	—	—	—	—	1
Tumor of the Pyloris.....	—	1	—	—	—	—	1
Cirrhosis of the Liver.....	—	1	—	—	—	—	1
Nephritis.....	—	1	2	1	—	—	4
Fatty Degeneration of the Heart.....	—	—	2	—	—	—	2
Killed by Cage Mates.....	3	4	4	3	2	—	16
Accidental Deaths (Unavoidable).....	—	1	—	—	—	—	1
No Lesions to account for death...	4	2	5	—	—	—	11
Total	29	35	25	17	5	3	114

* It is to be noted that only three of these cases occurred in the exhibition collection. The others represented specimens recently received, and still in quarantine, and therefore might fairly have been omitted from this list.

Respectfully submitted,

W. REID BLAIR, D.V.S.

Veterinarian.

January 1, 1907.

A PECULIAR SKIN DISEASE IN AN ELEPHANT.

By W. REID BLAIR, D.V.S.

IN VIEW of the fact that diseases of the elephant have received but scant mention in any literature with which we are familiar, it has seemed advisable to make special mention of an infectious disease of the skin which recently affected our small East African elephant, "Congo."

ETIOLOGY.

The condition may be described as a *seborrhoeic folliculitis*, or chronic inflammation of the sebaceous glands and hair follicles, produced by localized infection with a coccus known as *staphylococcus pyogenes*. The fact that this organism is almost constantly present on the surface and in the sebaceous glands of the body accounts for the frequency with which it is found in surgical infections.

The occurrence of an injury, which may be trifling in extent, develops a point of lessened resistance in which the organism may find a suitable field for its development. If introduced into the circulation in sufficient numbers, this pathogenic organism gives rise to septicemia, or pyemia. It is of interest to note that this same coccus is frequently present in the human, where it produces the pustules of *acne*, and is concerned in the eruption of *smallpox*.

SYMPTOMS.

In this particular case the disease was indicated by the appearance of cutaneous pustules, which were painful on pressure, and which involved the entire thickness of the skin. The swelling of the skin gradually increased; cracks and fissures were formed, and the patches surrounding the pustules became necrotic. In some places this was only superficial, while in other parts it was very deep. In the former case, tough, tenacious scales were formed upon the skin, and in the latter the whole skin shriveled up right down to the subcutis, and was thrown off by suppuration. This severe condition, of large sections of skin suppurating, was particularly marked along the back and hips. Here numer-



EAR OF AN AFRICAN ELEPHANT, EXTERNAL SURFACE.
The pit-like depressions represent the healed pustules.



SECTION OF SKIN ON THE HIP OF AFRICAN ELEPHANT.
Two nodules with the wax-like pus adhering, and a number of healed pustules
are shown.

ous abscesses developed, which became confluent, forming large sloughs. The pustules or nodules, which were at first small, firm, and painful, later showed on their summit a dry, tenacious scab. From these nodules could be squeezed little tallowy or pus-like plugs, which left behind cup-shaped ulcers with jagged edges.

The disease was first confined to the back, neck, and loins, but gradually involved the entire surface of the skin. The further spread of the disease upon the animal resulted from rubbing or scratching, whereby the pustules were emptied of their contents and scattered over the body, the bacteria entering the hair follicles or excretary ducts of the sebaceous glands and thus setting up new foci of irritation. It may also have been spread by the process of "oiling," or by the earliest medication.

Excepting for the "hide-bound" condition of the skin there were no marked constitutional symptoms at any time during the course of the disease, which covered a period of several months, so that from the point of view of general health the prognosis is not grave, the chief functions being perfectly regular.

TREATMENT.

Owing to the thickness of the elephant's skin, and to the depth of the suppurating foci, antiseptic washes or ointments applied locally are of little or no benefit. The treatment of the affection is essentially surgical. The skin was thoroughly cleaned with soap and warm water, in which creolin to the extent of 1 per cent. solution was added. After washing and drying the skin, an ointment of zinc oxide and sulphur was applied, and well rubbed in. This was allowed to remain for twenty-four hours, when it was found that the scale-like scab on the summit of each pustule could be easily removed. The scab being removed, each nodule was pressed, the contents of the pustule evacuated, and the cavity washed out with creolin solution. When the nodules are emptied of the pustular plugs, the surface gradually cicatrices, and recovery takes place completely within a few weeks. The skin, however, remains somewhat lighter in color at the seat of the pustule, owing to the partial discoloration of the epidermis.

Sulphur was given internally for several weeks, and owing to this drug's alterative and stimulating effect on the skin, it was of considerable benefit in relieving the "hide-bound" condition.

During the treatment of this condition, no starchy food should be given; raw potatoes especially should be avoided. Warm bran mashes and boiled carrots may be given frequently.

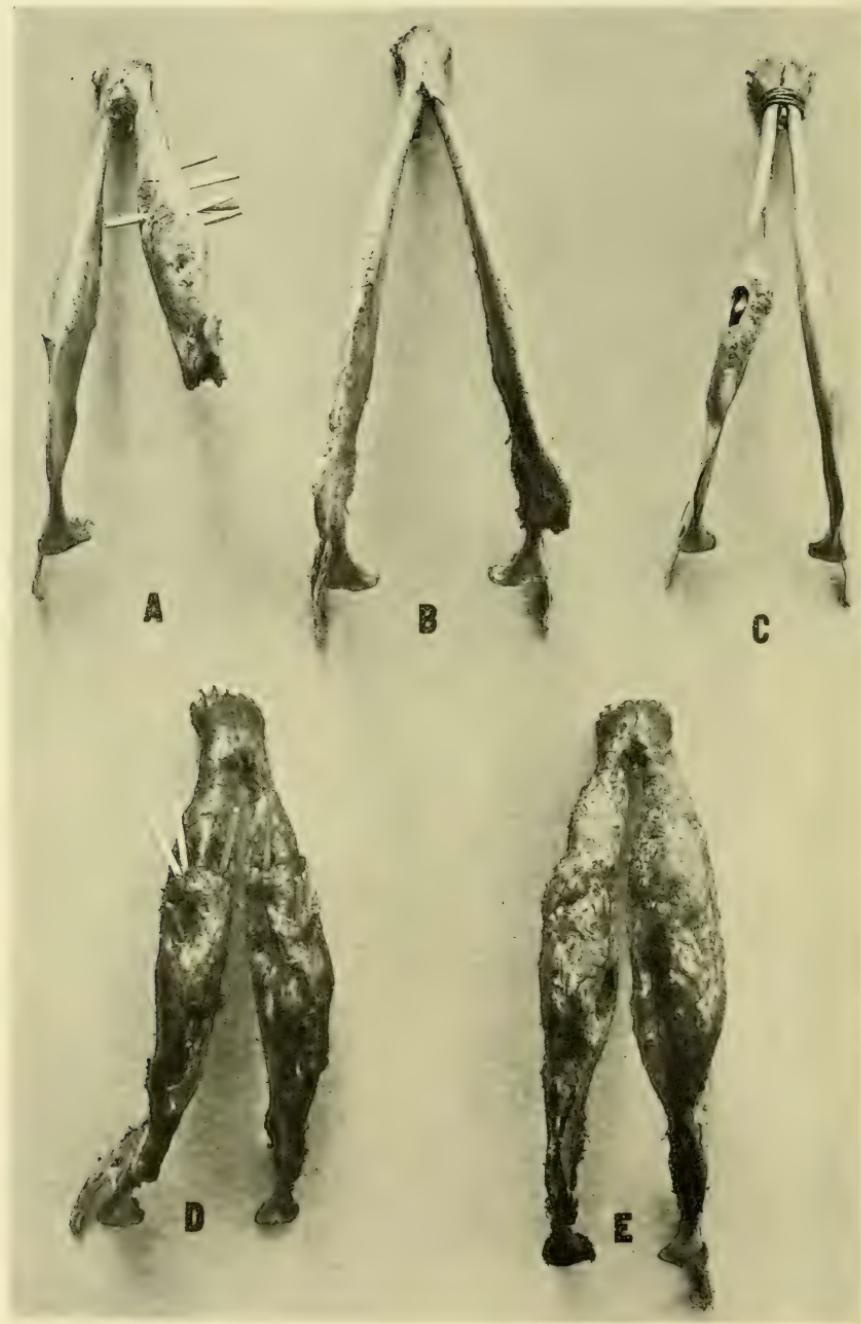


PLATE I.

A—Lower jaw of a Florida Deer, showing complete destruction of a portion of the left branch, and beginning erosion of the right. B—Normal lower jaw of a prong-horned antelope. C—Lower jaw of a prong-horned antelope, showing actinomycotic lesion. D—and E—Lower jaws of black mountain sheep, showing enlargement of the bone, and numerous fistulous openings.

ACTINOMYCOSIS IN THE BLACK MOUNTAIN SHEEP.

By W. REID BLAIR, D.V.S.

QUIETE recently, while examining several specimens of horned game which had been received from the Northwest by Mr. Fred. Sauter, taxidermist, of 42 Bleeker Street, New York, Director Hornaday's attention was called by Mr. Fred. Sauter, Jr., to a strange disease that was manifest in several fresh heads of mountain sheep. In a lot containing the heads of six black mountain sheep rams. (*Ovis stonei*), from the Stickine River country, northern British Columbia, the lower jaws of three revealed the presence of actinomycosis, or "lumpy-jaw," in a severe and far advanced stage. Two cases were particularly severe, and the jaws affected were at once placed by Mr. Sauter at our disposal.

The specimens referred to above were shot by Mr. Charles A. Cass, of Tyrone, Pa., "north of the Stickine River, and also north of the Sheslay, not far from a lake called Tach-sa-min-e."

The presence of this dread disease in wild animals far removed from contact with domestic ruminant animals of any kind from which it might have been acquired is very startling. The complete isolation of the black mountain sheep of the Stickine country from all domestic cattle, sheep, prong-horn antelopes, deer, and all other animals hitherto known to be infected by lumpy-jaw, forces upon us the conclusion, that in this instance it has developed independently of infection from domestic animals.

It is to be hoped that all the *Ovis stonei* now afflicted by this deadly disease will be killed by sportsmen before they have time to communicate it to all the hoofed animals of their region, and especially to the animals of their own species on the south side of the Stickine River. The result of this newly found menace to a very important and interesting wild animal will be watched with keen, and even painful, interest. It is entirely possible that we will witness within a few years the extermination of a large and vigorous species by natural causes.

Actinomycosis is a chronic infective disease which occurs in cattle, hogs, sheep, and horses, and occasionally is met with in



PLATE II.

Profile of the lower jaws of black mountain sheep, showing enlargement of the bone, fistulous openings, and loss of the molar teeth.

man. Among wild animals in captivity we have seen the disease in *mule deer*, *Florida deer*, *prong-horned antelope*, and in a *grizzly bear*. Experimentally, the disease has been produced in calves, dogs, goats, and guinea-pigs. The disease now recognized as actinomycosis has long been known to stockmen and veterinarians as "lumpy jaw," "wooden tongue," cancer of the tongue, etc., but it was not until 1876 that its true pathology was demonstrated by Bollinger. When he had identified and accurately described the pathogenic organism, new observations of the disease were rapidly made, not only in animals but in man.

Studies of the last few years appear to have established the fact that there are a number of closely allied organisms belonging to the group of actinomyces "ray fungus," and that the clinical phenomena ordinarily called actinomycosis may be due to any one of several closely allied parasites. All of the actinomyces are branching fungi, non-motile and spore-forming.

As a rule the disease appears sporadically. It may, however, attain an enzootic distribution. It is quite widely distributed in the temperate zones, but has not yet been recognized to any extent in the tropics.

The disease as seen in wild animals is especially virulent, runs a very acute course, and is invariably fatal. In this respect it differs from the affection as seen in the domestic animals, where it generally assumes the chronic form, and where the treatment with iodide of potassium is followed by marked improvement.

The "ray fungus" may, under certain circumstances, exhibit a general distribution. We have observed several cases of generalized actinomycosis—prong-horned antelope and bear—with metastases in the cervical lymph nodes, stomach, diaphragm and liver.

Cause.—The cause of actinomycosis is the propagation in the tissues of the actinomyces, or "ray fungus." This fungus is supposed to grow especially on cereals, particularly barley, the beards of which favor its entrance into wounds of the skin and mucous membranes of the mouth; but since the disease is of frequent occurrence on our western ranges, where the cereals do not exist, it would seem that it must be traced to other forms of gramineæ, or to diverse vegetation and soil.

The period of dentition and the attendant laceration of the gums affords good opportunity for the entrance of the fungus; hence, youth is a strongly predisposing condition. The winter season is the main period of invasion, the dry, fibrous fodder tending to scratch or wound the mucous membranes of the gums, cheeks, and tongue, and thus open a portal of entry for the para-

site. The disease has been successfully transferred by inoculation, as proved by experiments on calves, dogs, and rabbits by Johne, Crookshank and others.

Diagnosis.—Actinomycosis is an unusually easy disease to recognize, particularly on account of the characteristic lesions, and to the presence of quantities of yellowish or grayish granules representing clusters of actinomyces "ray fungus" which are present in the pus and liquid from the suppurating lesions. The organism grows in the form of little rounded masses resembling grains of iodoform, or as a result of calcareous deposit, grains of sand.

Upon superficial examination, especially when the disease is generalized, and the liver and lungs are involved, actinomycosis may be confounded with tuberculosis. In these cases microscopic examination makes certain the diagnosis.

Demonstration of the Parasite.—The organism appears in the pus from sub-acute or chronic suppurative lesions as grayish or yellowish granules, usually less than 1 mm. in diameter. These granules are friable, and when gently crushed beneath a cover-glass and examined under the microscope, they are seen to have been broken up into hyaline rounded masses, at the margins of which are fine radial striations or filaments of bulbous or club-shaped cells, all closely set together.

It is owing to this characteristic arrangement of the filaments that the name "ray fungus" is applied. The club-shaped bodies are variable in size, and are composed of a hyaline substance. Not all of the granules have these "clubs." In the granules obtained from the lesions of wild animals—antelope—they are much less frequently observed than in those obtained from the lesions in cattle.

Contrasted with the frequency of actinomycosis in the head, that of other organs is comparatively rare.

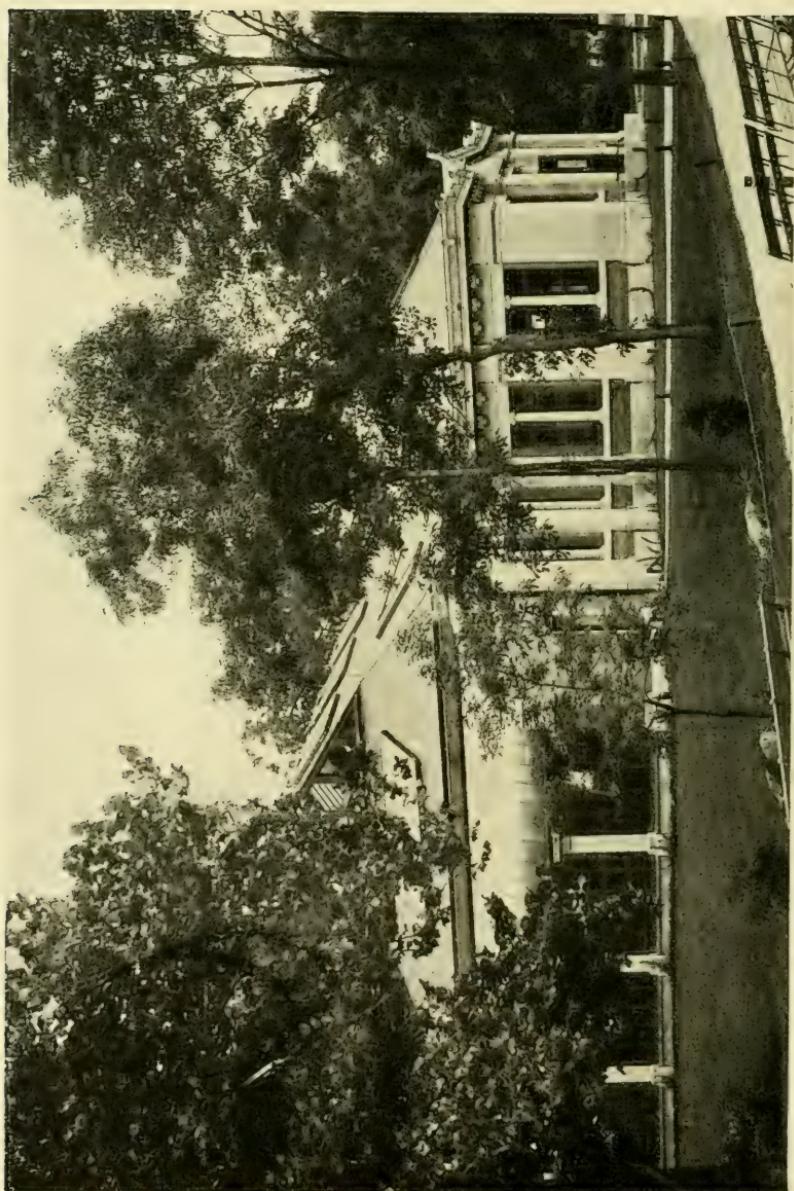
Actinomycosis of the jaw bones frequently attacks young animals, and its usual seat is in the region of the molar teeth, (Plate II) although it occasionally affects the incisors. The earliest change consists of a swelling of the bone, generally in the middle region of the row of molars. This swelling, which is at first firm and painful to the touch, gradually increases in size, invades the deeper regions of the skin, and is followed by the formation of abscesses which soon show points of fluctuation. These abscesses opening on the surface, discharge a whitish, creamy, odorless pus. The cavity of the abscess shows no tendency toward healing, and the opening through which the pus has escaped is transformed into a fistula. (Plate I.) Later on, the

pus discharge acquires an offensive odor, and the fistulous openings are surrounded by exuberant granulations, forming a fungoid mass. The adjacent tissues become hardened, and the jaw becomes greatly deformed. The tooth sockets undergo extensive ulceration, with the result that the molars become loose, and in many cases fall out. For reasons difficult to explain, actinomycosis attacks the bones of the lower jaw much more frequently than those of the upper jaw.

The actinomycotic lesions in the internal organs are generally rounded masses of different sizes, enclosed in a fibrous capsule of variable thickness, hard and resistant at the surface, and somewhat softened toward the center.

They are generally slightly elevated above the surface of the invaded tissue, grayish white in appearance, and surrounded by an area of redness.

Direct infection from actinomycotic animals to man has been doubted and even denied, yet in view of the many cases of successful inoculation it can not be considered as impossible. The general consensus of opinion is, that there is no danger of persons contracting this disease from eating the flesh of affected animals, provided the visibly diseased portions are removed.



THE ALLIGATOR POOL, REPTILE HOUSE.

GROWTH OF THE ALLIGATOR.

By RAYMOND L. DITMARS,
CURATOR OF REPTILES.

FOR an indefinite time, many authors of natural history essays have insisted that tortoises and crocodilians require an amazingly long time to attain full growth and maturity. These assertions have, without doubt, been prompted by observations made under conditions which positively retarded the natural growth of the reptiles. Unfortunately, theory appears to have elicited much elaboration in some writings. Particularly plausible assertions have been so frequently exploited as to be generally quoted nowadays in the best text books.

There is some solid foundation, however, for the pronounced theoretical side of the question, for of all reptiles, tortoises and crocodilians grow at a tardy rate as compared with representatives of the other orders. While the average lizard or snake attains maturity in one or two years, (exclusive of the hibernating season, if there be any), a tortoise or crocodilian may require five years or more, according to conditions, before reaching the stage that might be designated as a young adult. From that point it continues to increase steadily in size until it reaches maximum adult dimensions. The latter period, embracing a slower growth, may cover from five to ten years—possibly more; and the reptile continues to survive to a surprising age as compared with lizards and snakes.

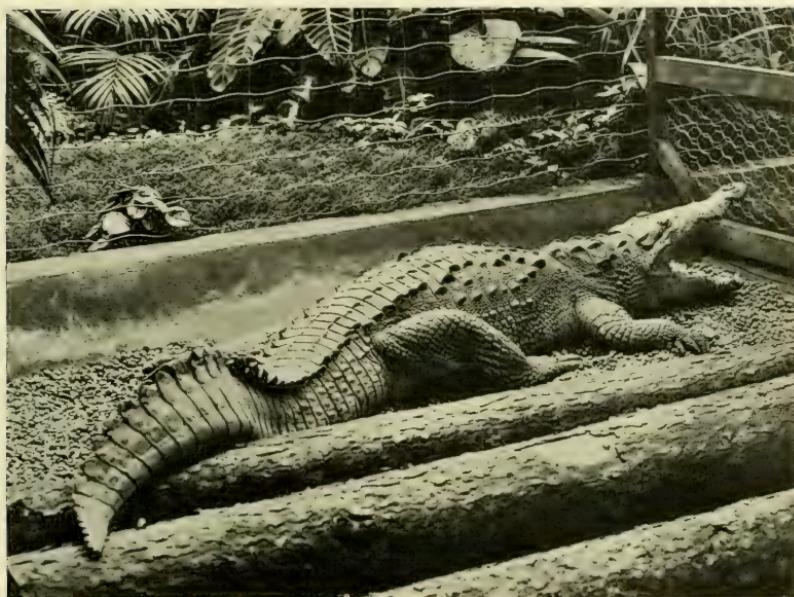
The present article has been prepared with two objects in view. The first is to correct the erroneous and theoretical impressions concerning the growth of crocodilians, using as a subject of our observations the American Alligator, (*Alligator mississippiensis*). Our second object is to furnish information that may possibly be of value to experimenters in alligator culture. There have been numerous rumors of alligator farming in the interests of the leather trade, but it seems those attempts have always been discouraged by the idea that the slow growth of the reptiles would render success quite impossible. As an illustration of how efforts to start alligator farms have been discouraged, we may quote



ALLIGATORS IN THEIR SUMMER POOL.

from an authority of the United States Fisheries Bureau, who says, in one of the government publications: "Alligators grow very slowly. At fifteen years of age they are only two feet long. A twelve-footer may be reasonably supposed to be seventy-five years of age."

Our observations in the Reptile House have enabled us to look well into the development and habits of the Alligator. This article is the result of seven years' accumulation of notes, during which time, among several series of examples, the writer has been able to gauge the rate of growth of the Alligator from the time of hatching up to the twelve-foot reptile—and a specimen of the latter size is a giant, nowadays. In a period of six years, the writer has succeeded in hatching alligator eggs, and rearing the young to a length of over five feet. Inasmuch as alligators of various sizes were received at the Reptile House seven years ago, at the opening of the building, we are able to approximately carry our records of the rate of growth from the young specimens hatched in the Park, through other series that have attained much larger growth during the time specified. As will be explained later, wild crocodilians seem to grow much faster than those in captivity, notwithstanding all possible facilities and food abun-



FLORIDA CROCODILE.

dance in the latter state. It would therefore appear that the rate of growth figured in a following list is actually below the normal, rather than above it. The table in question, however, was compiled from actual specimens and the tape line, all theoretical deductions being eliminated.

Our observations in the Reptile House were made under what we consider the best possible conditions. Our alligator quarters are commodious, giving the reptiles ample room for swimming, while they are provided with banks floored with sand upon which the animals may emerge from the water. During the cold months of the year the water of the tanks is kept heated, by means of a submerged pipe, to a temperature varying between 90 and 95 degrees Fahrenheit, while the temperature of the Reptile House ranges from 75 to 85 degrees F. Owing to a generous supply of tropical plants, the atmosphere of the building is very moist. We find that if alligators are kept in water of a lower temperature than that mentioned during the cold months they feed indifferently and irregularly, even though the temperature of the air is satisfactory. They prefer to pass the greater part of their time in the water, consequently this medium, to promote normal development must have a high temperature. The average captive "pet"

alligator that appears to indefinitely remain the same size, or to grow at a rate that would require a stupendous period to bring it to maturity, is an individual whose growth has been arrested by the effects of cold water, and an insufficient depth of that medium for proper exercise.

In addition to the tepid water of the Reptile House tanks, the high temperature of the building and moist atmosphere, the feeding of our crocodilians is a matter regulated with thorough system. It is highly essential that all crocodilians receive plenty of bone nourishment. Beef and fish alone are insufficient to promote rapid growth, or cause the animals to attain a large size. Our freshly hatched crocodilians are first given a diet of earthworms and minnows. Upon this they are kept for about two months, when dead mice are occasionally given them. As soon as they show an increase in size, the quantity of food is correspondingly increased. Earthworms are then excluded from the menu, while small rodents are given frequently, in alternation with frogs, fish, and scraps of beef. Young rats and sparrows are soon added to the list.

It will be realized that this food produces good bone development. Our medium-sized alligators receive small hares, pigeons, and large fish, all of which are entire. This food supply, we are convinced, closely approaches the diet of the wild alligator. The amount of food consumed by our specimens is not nearly so great as might be imagined. Usually they are fed twice a week, and at most three times a week. The average wild alligator should fare fully as well as this. If there is a scarcity of larger food it may always resort to a fish diet, for the waters of the most of the southern bayous usually teem with finny creatures.

At this point it is well to bring forward the answer to a query that may at once present itself to the reader: How does the growth of captive alligators compare with that of alligators in a wild state? We have already explained that our captive examples have proven their ability to attain maturity in a comparatively brief period, in comparison with the great number of years so generally alleged to be necessary in completing the process. We are moreover quite convinced, when considering our observations of wild alligators and their haunts, that the rate of growth noted in captivity by no means represents a forcing process, and that wild crocodilians actually grow faster than the rate we shall presently describe in detail. To be more emphatic, the writer would state his belief that alligators occurring even in the northern portion of this species habitat, where there is a quite prolonged

hibernating period, show a more rapid growth than that given in the table relating to our captive specimens. As evidence on this point, we may cite certain experiments that have been conducted in the Zoological Park.

Two lots of alligators, each containing about a dozen specimens, have been placed under the different conditions. One lot was kept outside, in a pond where the reptiles enjoyed comparative freedom, the other lot remained indoors, in one of the capacious tanks of the Reptile House. The outside specimens soon became wild, and very difficult to approach. As a result, they received food with less regularity and in smaller quantity than the indoor specimens; but at the end of the warm season, they were invariably found to be considerably larger than the latter.

There is a powerful and mysterious tonic in the outdoor air, the summer rains, and the muddy waters of a natural pool. The writer has noted the same result with snakes and lizards. He has set free young specimens of the latter kind in localities where they could be readily found again, and has kept members of the same broods indoors, endeavoring to "force" them by feeding them as frequently as they could properly assimilate their food. Yet we found the results to be the same as with crocodilians. The wild reptiles, when recaptured, were probably a third larger than those so carefully reared in confinement.

The coastal, swampy regions of the southeastern portion of the United States—the home of the alligator—are particularly conducive to the rapid growth of their reptile denizens. The favorite abode of the alligator is in the "low-grounds" rather than in large bodies of water. These ordinarily embrace combinations of jungle-like thickets, small savannas, and stagnant "water-holes." After heavy rains much of these areas are covered with water.

The writer's studies of the alligator at home were conducted in the immediate vicinity of the Savannah River, about forty miles above the city of Savannah. His work was confined to the river low-grounds, a vast tract teeming with reptiles. Alligators were found in isolated pools and small lakes, the larger examples generally in the larger bodies of water. Over a great part of this country it was difficult to distinguish firm ground from the swamp, as masses of water hyacinths and rushes flourished in luxurious profusion.

Over *terra-firma* itself the going was exceedingly difficult, compelling us to tear our way through thorny bushes, or masses of cane, eight to ten feet high. In August the heat was intense, the temperature frequently reaching 105 degrees F. in the shade, and



ROUGH-EYED CAIMAN.

it was rendered all the more unendurable to human beings by its excessive humidity. In the "gator holes" the water was tepid, and teeming with fish, among the latter being catfish of huge proportions. At times we passed shallow pools recently evaporated, and giving off an overpowering stench from masses of decomposing fish.

No alligators were seen in the Savannah River itself. They lived mostly in the surrounding swampy country, where they were fairly secure from molestation. As night fell upon these swamps, bringing a much lower temperature, the heated ground and tepid water of the pools gave off a steamy vapor which spread and stratified over the tree-tops, or floated in long, ghostly streamers into the shallow and undulating valleys of the hammock land. Owing to this apparently ever-present, nocturnal miasma, there was never anything but a pale and sickly moonlight over the low-grounds, although as we often made our way into the higher pine lands a few miles away, the unwholesome atmospheric conditions gave way to nights wonderfully clear. In those moisture-laden and heated swamps, the rapid development of large reptiles may be surmised.



HEAD OF FLORIDA CROCODILE.

Many alligators never attain a length of much over seven or eight feet. These are stunted individuals that have had the misfortune to take up their abode in localities wherein food had become scarce, or presented little variety. Sometimes we find localities where there exist whole colonies made up of stunted members. It is possible to retard the growth of captive specimens by feeding them raw beef only, or a diet composed entirely of small fish, and excluding whole, warm-blooded prey, with its attendant bone nourishment. If the process is continued for several years' time with a specimen about half grown, and then a miscellaneous and wholesome diet is substituted, the reptile will grow but little afterward and perhaps not at all, although it may become sexually mature and vigorous, and breed regularly.

Like all crocodilians, the alligator constructs a regular nest by heaping up a great mound of twigs, dead grass and rushes, together with fallen masses of the familiar hanging moss. The eggs, to a considerable number, are deposited well to the bottom of this mound, where the heat generated by the decomposing vegetation produces their development. The period of incubation appears to be lengthy, taking at least eight weeks. There is apparent variation in the egg-laying period. In Hampton County, South Carolina, the writer collected alligator eggs during the middle of August. The eggs collected at that time hatched during the following October. Through the courtesy of Dr. Albert M. Reese, of Syracuse University, however, the writer has



AMAZON CAIMAN.

been furnished with advance sheets of a paper* by him which shows that in Florida the alligator deposits its eggs much earlier in the year. Dr. Reese made detailed investigations of the nesting habits with a view to obtaining embryological material. The following is an extract from this article:

"One of the first things to be determined, of course, in the collection of embryological material is the time at which the eggs are laid. Judging from the statements of native hunters the laying season of the alligator might be thought to be at any time from January to September. As a matter of fact, the month of June is the time when most, if not all, of the eggs are laid. S. F. Clarke gives June 9th and June 17th as the limits of the laying season in Florida, but I found at least one nest in which eggs were laid as late as June 26th; no eggs were found before the first date given by Clarke. It seemed quite certain that the laying, during the season in question, had been delayed by an extreme drought that had dried up the smaller swamps and reduced the alligator holes to mere puddles.

*This paper is to be published officially at Washington.



CAROLINA ALLIGATOR.

"Nests were found in considerable numbers as early as June 8th, but no eggs were laid in any of them until the end of the dry period, which occurred nearly two weeks later. Almost immediately after the occurrence of the rains that filled up the swamps, eggs were deposited in all of the nests at about the same time. From the fact that all of these completed nests had stood for so long a time without eggs, and from the fact that all of the eggs from these nests contained embryos in a well advanced state of development, it seemed evident that the egg-laying had been delayed by the unusually dry weather. Eggs taken direct from the oviducts of the alligator that was killed at this time also contained embryos that had already passed through the earlier stages of development. Thus it was that the earlier stages of development were not obtained during this summer."

On August 12, 1900, the writer discovered an alligator's nest close to a causeway (an ancient rice ditch) in Hampton County, South Carolina. It consisted of a mound of decomposing vegetable matter about five feet in diameter and three feet high, half hidden among some bushes at the border of a pool. At one side of the nest, inward toward its center fully two feet, protruded two

thick basal stems of a large bush, these fully an inch and a half in diameter, but about them the material composing the mound was as carefully matted down as on the clear portions.

The eggs were discovered about two and one-half feet down in the center of the mound, in a single, irregular mass. They looked strangely white and immaculate as compared with our hands and clothing after breaking our way through the swamp. There were thirty-seven eggs, averaging two and one-half inches long, and an inch in diameter. Their shells were hard and brittle, considerably thicker than the shell of a hen's egg, and when struck together produced a metallic sound. The entire nest and its contents were packed on our horses, brought to the nearest railway station, and shipped to the Zoological Park. During all our work there was no hint as to the whereabouts of the parent alligator, though from the appearance of the much matted grass at the edge of the pool it would seem she frequently visited the vicinity of the nest. The pool itself was barely eight feet in diameter, and was well sounded, but the result convinced us that the female alligator was not hiding at the bottom. Near by was a series of bayous connecting with the Savannah River low-grounds. It was from the eggs in this nest that we hatched the specimens which prompted the writer to prepare the present article.

The eggs began hatching on the 14th of October. But five alligators emerged, the remainder of the eggs having evidently been spoiled in the severe shaking received in transit. From the time of their arrival in New York to the period of hatching,—the five hatching within a week's time,—the eggs were buried in the medium composing the original nest, which was kept well moistened. The process of incubation was carried on in one of the Reptile House cages, at a temperature averaging 80 degrees Fahrenheit.

Upon hatching, the little alligators were very stout of body, with a chunky head, and short snout, the head being decidedly convex at the top. They averaged eight inches in length, and showed a weight of one and three-quarters of an ounce each. As they were very well nourished by the egg yolk at the time of hatching, they refused food for some days. They were decidedly active, swimming or crawling about a shallow tank of warm water. When disturbed they "barked" vigorously, and made efforts to snap at the observer's fingers.

At the present time, these alligators are over five feet long. The following table shows their increase in weight:

October, 1900—Hatched.....	Weight 1 $\frac{3}{4}$ ounces.
October, 1901	" 9 $\frac{1}{4}$ ounces.
August, 1902.....	" 3 pounds.
March, 1903.....	" 14 "
October, 1906.....	" 50 "

By combining his notes on three series of alligators, the writer is enabled to prepare the following table, showing the rate of growth of the Alligator as he has observed it:

GROWTH OF THE AMERICAN ALLIGATOR.

At time of hatching	8 inches. Weight, 1 $\frac{3}{4}$ ounces.
At one year	1 foot 6 inches.
At two years	2 feet 2 inches.
At three years	3 feet 1 inch.
At four years	4 feet — inches.
At five years	4 feet 10 inches.
At six years	5 feet 4 inches. Weight, 50 pounds.
At seven years	6 feet 2 inches. (Maturity.)
At eight years	6 feet 11 inches.
At nine years	8 feet 2 inches.
At ten years	9 feet 3 inches.
At eleven years	10 feet 11 inches.
At twelve years	11 feet 3 inches.
At thirteen years	11 feet 5 inches.
At fourteen years	11 feet 8 inches.
At fifteen years	12 feet. Estimated weight, 650 pounds.

It appears that after an alligator attains the patriarchal size of eleven feet, its growth is much slower. However, with an example living under favorable conditions, there is a steady increase, the limit of growth appearing to be about fourteen feet. "Old Mose," a fine specimen, was twelve feet long when received at the Reptile House in 1899. In July, 1903, he had increased in length to twelve feet five inches. When measured in 1906, he showed a length of twelve feet seven inches.

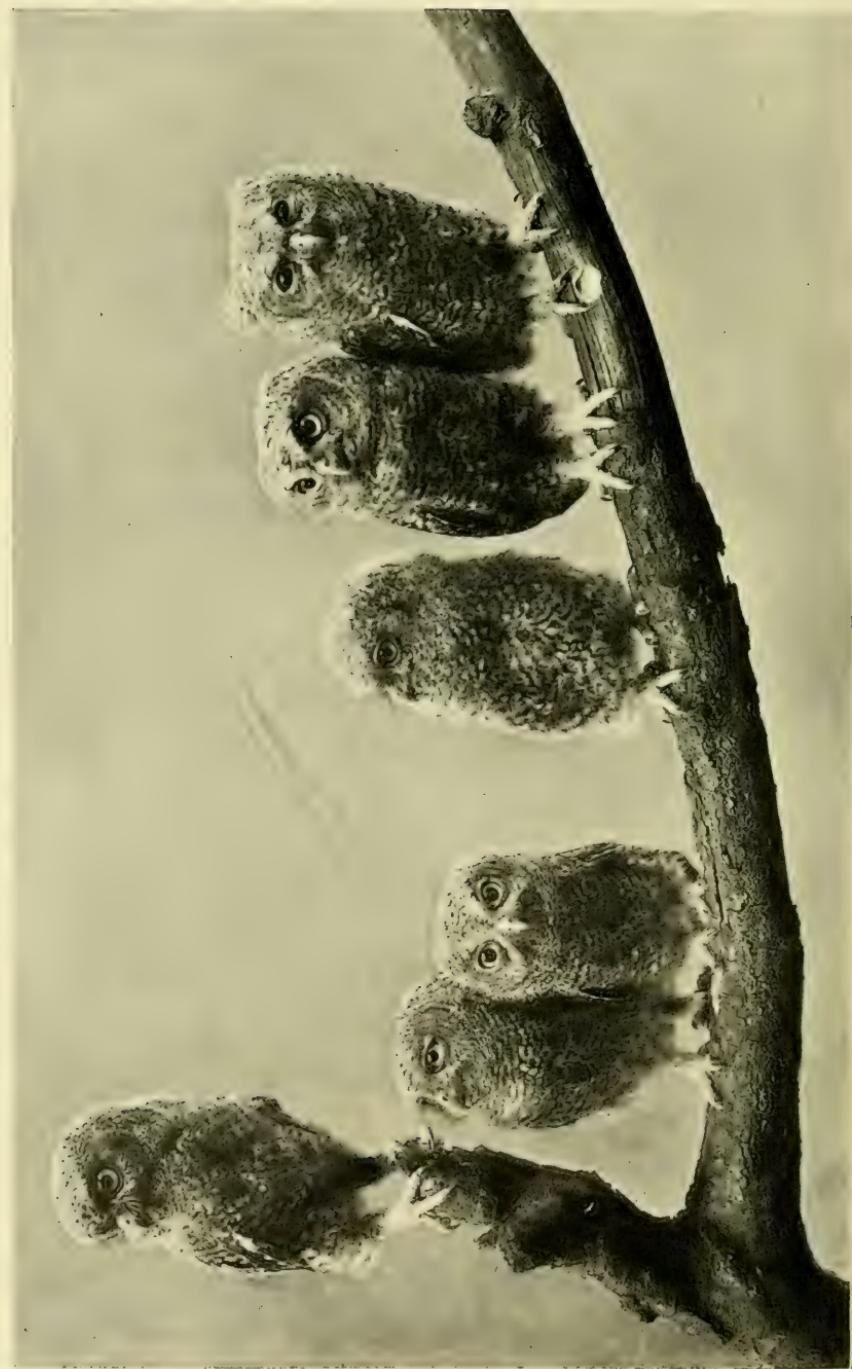
Two six-foot alligators have been in the Reptile House for over seven years. They have made absolutely no increase in size. Four years ago, one of them deposited a number of eggs.

A curious example has been under the writer's observation for over fifteen years. This specimen was, years ago, kept in a small tank in the writer's study. The accommodations were not suit-

able for its development, and though it fed well, for a period of five years it did not seem to increase in size as much as one inch. Previous to that period it had been kept for three years by a friend of the writer, who explained that it was about sixteen inches long at the time he received it, and that was about its size when it was deposited in the Reptile House, seven years ago.

For about a year it showed no increase in size, despite its favorable quarters,—a large tank of tepid water. At the expiration of its first year in the Park it was attacked by a young crocodile and badly lacerated. Its abdomen was torn open nearly the entire length, through which aperature the intestines protruded; another big tear on the side disclosed the heart and lungs. As this specimen had been in the writer's possession for so long a time he endeavored, with but little hope of success, to save its life. The intestines were carefully replaced, and the abdominal laceration sewed up. When the tear on the side had been similarly treated, the creature was placed in a shallow tank of tepid water from which it could not escape. The treatment was as nearly antiseptic as conditions would permit.

The lacerations rapidly healed, with attendant vigorous sloughing. Within ten days the reptile was feeding in normal fashion. More remarkable than the reptile's reconstructive energy in healing its great wounds, was the effect upon its subsequent development. At once it began to grow, and at this date it is nearly six feet long, and weighs over fifty pounds.



YOUNG SCREECH OWLS.

OWLS OF THE NEARCTIC REGION.

By C. WILLIAM BEEBE,
CURATOR OF BIRDS.

PART I.—General Account.

Introduction.	Adaptations of Plumage and Body.
Owls and Mankind.	Adaptations of Sense Organs.
Parallels and Relationships.	Adaptations of Feet.

PART II.—Special Account.

PART I.—GENERAL ACCOUNT.

INTRODUCTION.

“Est illis *Strigibus* nomen; sed nominis hujus
Causa quod horrendâ stridere nocte solent.”

Ovid, *Fasti*, vi, 139.

IF WE may judge of the rapidity with which mankind is taking possession of the earth, or, to speak from the point of view of the wild creatures, is usurping every habitable portion, it seems safe to say that evolution on any extensive scale is at an end among the larger forms of wild life. To read aright the story of the evolution of past ages, we must decipher the palimpsest which the creatures themselves offer,—their fossil remains, development, structure, appearance, distribution and habits. When all these are considered both separately and together, we gain the imperfect glimpse into the past, which is all that we can hope. Hence the value of even a fragmentary résumé of the known ecology of an individual or group of organisms.

As is the case with so many groups of birds, we know almost nothing of the ancestry of owls from palaeontological evidence. In deposits of the Eocene Age in the Lower Tertiary in Wyoming, a species of *Bubo* has been described by Marsh.* Earlier evidence of the existence of owls upon the earth, is as yet lacking.

**Bubo leptosteus* Marsh, Am. Jour. Sci., II, 1871, 126.

The Order *Strigiformes*, or Owls, as we know these birds to-day, forms a group very homogeneous, both in structure and appearance, and there are few people who can not name an owl on sight. They number over two hundred species, or if we include geographical races and sub-species, the total is not far from three hundred and twenty-five different forms. They vary in length from five inches to over two feet, and in character from the tiny, insect-eaters to the fierce eagle and horned owls. Their diet embraces almost all forms of terrestrial life, from insects, worms, and snails to fish, frogs, lizards, birds, bats, moles, mice, and even rabbits, large game birds and hawks.

In one of the most recent classifications, owls are divided into two very unequal Families:

I. *Strigidae*, with a single genus, containing the Barn Owl, and its twenty or twenty-five geographical species and races.

II. *Bubonidae*, with thirty genera, including all the remaining species of owls.

Owls range over the whole globe, extending far into the polar regions and even to the most isolated oceanic islands.

OWLS AND MANKIND.

The word owl has its counterpart in many languages; in Anglo-Saxon, *Ule*; in Swedish, *Uggla*; in German, *Eule*; and all of these hark back to the Latin *Ulula*, which was obviously an attempt to imitate the note of some one of these birds.

The mystery of their life by night, their weird unearthly hoots and screams and their sometimes almost human expression must have made owls objects of terror to our primeval forefathers in the far distant past. Ever on the lookout for evil omens, these birds must have satisfied the most lively imaginations in this respect. In many parts of the world, gruesome superstitions connected with the owl are still prevalent, as is hinted in some of the local German names, "corpse-hen," "death-owl" and "sorrowing mother." On the pampas of Argentina in South America, the former wildness of the burrowing owl was due to the superstitious fears of the native tribes, who called it "Sister of the Evil Spirit." They killed it on every opportunity, and would never camp, or stop, or rest where an evil owl had been seen. With the advent of Europeans, this persecution ceased, and the birds soon became tame and fearless. With the owl has always been connected the idea of femininity. Among widely separated savage tribes it is the woman's bird, the death of which is certain to be followed by

the death of a woman. The bat stands in the same relation to man.

When owls came to be better known they gained in character, and from their solemn demeanor and judicial frowning mien were deemed of great wisdom. Thus, among the Greeks, we find the owl sacred to Minerva, the Goddess of wisdom and the liberal arts.

To-day in Rome and Athens we often meet vendors of tiny owls, each fastened by one leg to a perch. The modern mind, filled only with hard, practical ideas, has no desire for these owls as poetic emblems of a past deity, and wastes not a moment's thought on the cruelty of it all. The little feathered beings are sold to be used as lures for still smaller birds. The owl is taken to the woods, fastened to a stake and lime sticks are then set about it, to entangle all the birds, from the size of a wren to a sparrow, which soon gather about their little enemy. Myriads of these song birds are devoured by the Latin peoples, who seem to prefer the half-mouthful of a song bird's breast, to the trouble of hatching and rearing poultry.

Only in the last few years when our grain crops reach from ocean to ocean, and the devastations of hordes of mice have touched one of the deepest chords of man's nature—his purse—is the owl getting due credit for his value and economic importance. If every owl on our continent was suddenly swept out of existence, it is doubtful if, after a few years, a single crop of grain could be raised successfully. It would take the mice and other rodents and many injurious insects but little time to confine all their ravages to the hours of darkness. Hawks would in such an event, become almost useless to man, and though weasels and minks might increase prodigiously, yet without the deadly swoop of the owl, the mice would soon overrun the land. Thus the relation of owls to mankind may be resolved into four different phases, and man's estimate of the bird has varied from fear to admiration; from disregard to appreciation.

Certain owls possess an attribute which will stand out in increasing importance, especially during the coming years, when their wild haunts will be curtailed more and more by the inroads of man's unnatural environment: the ability readily to adapt themselves to life in his very orchards and streets, as shown by the screech owl.

As a whole, owls do well in captivity, only a few species being intractable. Although they never really lose their innate wildness, yet by rearing a nestling by hand, it can be so far tamed that it

will recognize its owner, and allow him to take almost any familiarity with it. If occasionally given its freedom it will return to its human home. In Zoological Gardens, owls live and thrive for long periods of time, and sometimes nest and rear their young. It is not sufficient, however, to feed captive owls on a diet of raw meat and liver. To remain in perfect health, they occasionally require dead mice, sparrows, or pigeons, the fur, feathers, and bones serving to keep their digestive organs in good condition. If the regurgitative function is not exercised, the birds will not long survive.

As regards snowy owls, special arrangements are necessary. They will not moult well or live long if compelled to endure the heat of our southern summers, but if confined in a large flying-cage in a cool, dark cellar, every feather will be moulted, and bones serving to keep their digestive organs in good condition as perfect condition as if they had spent the preceding months on their native tundras of the Arctic Zone.

PARALLELS AND RELATIONSHIPS.

As we pass in review the larger mammals and birds we perceive two important groups of predatory creatures which, by stress of the struggle for food, have become adapted to a nocturnal life. Among mammals the *Felidae* or cats, and among birds the owls, both live by the chase and both are fitted for a more or less nocturnal existence. This similarity of life has brought about certain resemblances between the two unrelated groups. Cats have a stealthy, noiseless gait—owls fly silently; the eyes of cats are large and usually yellow—the same is true of owls; talons are developed to a high degree in both groups, and both cats and owls voice their emotions in deep, sonorous tones or in high-pitched weird screams.

Another curious but wholly superficial likeness, is the resemblance of the feather horns or 'ears' of many species of owls, to the alert ears of the cats and other Carnivores. These elongated feathers have, however, no connection with the real ears of the birds.

If we compare owls with the diurnal birds of prey—hawks and eagles—we find many and much closer resemblances. But these two groups are by no means as closely related, structurally, as ornithologists have heretofore thought. Many of the resemblances are merely parallelisms due to the identity of methods of hunting their prey, and are only beak and talon deep.

Though some of the smaller species of owls feed largely upon insects, there is another nocturnal group of birds which is wholly insectivorous. These are the nighthawks and whip-poor-wills (*Caprimulgidae*), and in the noiseless flight, large eyes, and dark, mottled plumage we find corresponding resemblances between the two groups. Examination of the internal structure shows that a real affinity exists, the connection being especially clear through the closely-related, fruit-eating, oil-bird (*Steatornis*), which is the sole representative of its Family *Steatornithidae*.

There still remains much to be learned from the structure of owls, but it is probable that if their line of descent could be retraced, we would find it coalescing sooner with that of the oil-bird and the nighthawks, than with any other living groups of birds.

ADAPTATIONS OF PLUMAGE AND BODY.

Owls are eminently fitted for their life—a nocturnal predatory one, and in all parts of their body we find delicate adaptations to this end. Unlike the nocturnal apteryx the sense of smell is but slightly developed. In owls, the senses of sight and hearing are the only means used to reveal the whereabouts of the prey.

Taking the plumage as a whole, we find that each feather is more or less soft and fluffy especially at the tips of the barbs, resulting in a downy condition of the entire outline. The absence of barbicels accounts for this, and on many of the body feathers we find that even barbules themselves are less numerous than on the corresponding feathers of other birds. Even the primaries or flight-feathers and the tail-feathers, the stiffest and strongest on the body, are surprisingly soft to the touch, and at first thought this softness would seem to be a great disadvantage to the bird in flight. Closer examination of the wing feathers of a barred or screech owl shows that, intrinsically, the vanes are as impervious to the air as those of a pigeon or hawk. There is no radical loss of barbules or barbicels, and hence the feathers are perfectly adapted for flight. An interesting condition exists however. The barbules along the distal side of each barb are greatly elongated, being often six or eight times as long as the barbules along the opposite side. Near the base of the barbules, the barbicels are as well-developed and numerous as in any bird of strong flight, but the elongated distal portions are soft and fluffy, and all are bent slightly upward so that they lie on the upper face of the vane. Hence the surface of the feather is covered with a

dense pile or nap of hair-like barbule-tips, and this furry coat, like the muffled oars of a boat, deadens all sound and renders the flight of an owl almost noiseless, at least to our ears.

About the eyes of an owl, two more or less circular feather disks radiate outward, each composed of stiff loose feathers, whose degenerate barbs and barbules are often in the form of broad spatulate scales. These disks prevent the soft head plumage from blowing into the eyes of the bird and also perhaps aid in directing the scant light-rays of twilight, inward to the seat of vision. This latter suggestion receives confirmation from the fact, that in those species of diurnal habits, the disks are imperfectly developed.

Owls have large strong beaks and the upper mandible is always prominently hooked, serving, as in the hawks, to tear the prey into pieces when it is too large to be swallowed whole. Connected with this habit of swallowing the prey entire whenever possible, owls, in common with many other birds, have the ability of being able to disgorge inedible portions of the food. After a midnight repast of mice, several oval pellets of fur and bones will be regurgitated, the latter cleansed of every bit of flesh, and the skulls of the rodents in as good condition as if prepared by some skilful osteologist.

ADAPTATIONS OF SENSE ORGANS.

From the outer contour of the feathers no hint is given of the real size of the head and neck of an owl, and when we feel beneath the neck plumage, it is always a surprise to find how slender this string of vertebræ and its scanty covering of flesh really is.

The skull is large in comparison with the body, but the greater part of the cranium is taken up by the eye-sockets. The remarkable development of the sense of sight may be appreciated from the fact that the cubic contents of *each* eye is slightly greater than the capacity of the entire brain cavity, at least in the common screech owl. This does not mean that the brain of an owl is unusually small, but only emphasizes the great size of the eyes.

The pupil is round and the iris is capable of remarkable voluntary contraction and accommodative expansion—the enlarged pupil thus formed, admitting all the light rays which are available in the dim twilight which characterizes even “darkest midnight.” There are few more beautiful sights than that seen through the ophthalmoscope, looking into the eye of a great horned owl, and it is well worthy of brief description. When the pencil of light

strikes the retina, the iris contracts, only to enlarge a moment later, and the whole optical fundus, with the delicately pigmented choroidal coat, veined with its myriad of blood vessels, becomes plainly visible. Below the level of the pupil and to the nasal side may be seen the curious fan-like pecten, throbbing rhythmically, its black tissue crumpled into a half dozen folds. We know nothing positively concerning its function, but judging from its elastic nature, and the frequent enlargement and contraction as the flow of blood fills it or flows back, considerable weight is lent to the theory that it functions in accommodation—in pressing forward toward the lens and perhaps aiding in changing the angle of refraction of the vitreous humor, thus altering the shape and consequently the focus of the eye.

In the snowy owl at least, there seems to be a certain amount of regular pulsation—about twenty-four to the minute. A few seconds after the ophthalmoscopic beam of light is first flashed into the eye, a sudden tremor or twitching may be observed throughout the entire structure of the pecten—as of a spasmotic effort to readjust the eye to the suddenly altered condition of illumination. If this be its most important function there is no reason why the pecten may not also aid in supplying the retina and vitreous humor with nutriment. Judging by analogy with other organs of the body, such a specialized structure as this may well subserve one or more secondary as well as a primary function.

It is interesting to notice what a pronounced difference exists in the pigmentation of the choroid of a light and a dark plumaged owl. In the snowy owl the choroidal vessels are so conspicuous that the scanty pigmentation of the background is subordinated. In the great horned owl the pigmentation is much more abundant and darker, while the dusky horned owl shows the ramifying lines of scarlet choroidal vessels sharply silhouetted against the dark background of pigment.

The view which we get of the pecten in an ophthalmoscopic examination of the eye of a living owl, is directly anterior and shows no trace of the basal attachment except at the ends. At the upper end is plainly visible the edge of the disk of the optic nerve—a white plate-like structure clearly differentiated from the surrounding pigment and choroidal vessels. Upon the white surface of the nerve-disk, a myriad of tiny dots represents the *lamina cribrosa*; otherwise it is immaculate. Radiating out from the optic disk, like slender teased threads, and especially conspicuous in the snowy owl, are many opaque nerve fibres. These nerve fibres are visible for only a short distance, becoming transparent

owing to the loss of the neurilemma, or fatty outer sheath. The fovea must be very indistinct, for in a three hours' examination of six or eight owls no trace of it could be made out.

Contrary to the rule in the majority of birds, the upper, not the lower, eyelid functions chiefly in the closing of the eye, resembling mankind in this respect. The presence of prominent hair-like eye-lashes is another feature which aids in giving to some owls such a ludicrously human expression. The third eye-lid or nictitating membrane, is well developed, and is frequently drawn across the eye in the day-time, serving to shut out the blinding glare of the sunshine.

Yellow predominates as the color of the iris, all of the North American species of owls having this color, except the barn and barred owls, in which the eye is brownish-black, rendering the dark pupil-hole indistinguishable except at close range.

Owls in searching for their food in the dusk, fly silently over the fields, watching and listening for the slightest movement of the mice beneath them, and this concentration in one direction is most interestingly correlated with the position of the eyes. These are directed forward to a greater degree than in any other group of birds although the facial disks make the convergence appear even greater than it actually is. For example, in barn owls the eyes seem to have almost parallel or convergent vision, as in the higher apes and in man, whereas the eyes of this species have but slightly less divergence than in the great horned owls. In the latter the yellow irides render the detection of divergence from parallel vision more easy to the casual observer.

Rough measurements with a goniometer show a divergence of the optical axes in owls (in six living species which I have examined) of from 23 to 36 degrees. This places owls between the wolves and dogs, (*Canidae*) and the horses, (*Equidae*) of the mammalia, and gives them about the same divergence as the bears, (*Ursidae*). Unlike all of these animals, however, the eyeball in owls admits of little or no motion, rotation or otherwise, and hence we have an explanation of the constant movement of the head in these birds, when looking intently about them.

The circle of bony plates in the sclerotic coat of the eye is so remarkably developed—each plate being so large and the whole fitting so closely together, that the owl is forced to turn its whole head in the exact direction in which it wishes to look. This immobility of the eyeball is in part compensated for by the unusual amount of play between the fourteen bones of the neck, far ex-

ceeding the mobility of this region in mammals—the great majority of which possess but seven separate cervical vertebrae.

Necessity for wider vision in the diurnal birds of prey is shown by the 69 degrees divergence of the optical axes in the kestrel, and from 55 degrees to 65 degrees in the turkey vulture, the rolling of the eyes in this species extending through a horizontal arc of about 10 degrees.

It has often been asserted that owls are near-sighted, but this is untrue. Careful tests made with the ophthalmoscope show the eyes of recently caught birds to be perfectly normal, there being not a trace of either myopic or hyperotropic tendency. Although as we have seen, owls have become especially adapted for a nocturnal life, a number have changed their habits secondarily, and are as diurnal as any hawk. This change is of such comparatively recent date, however, that no radical structural changes are apparent. The facial disks are incomplete or almost lacking in some of these diurnal forms.*

The ear opening is of large size in most owls and a fleshy flap-like outer ear serves to direct the sound more accurately. An interesting condition of asymmetry is not unfrequently present, the opening of the outer ear being larger on one side of the head than on the other, and this unlikeness may extend even to the bones of the skull itself.

ADAPTATIONS OF THE FEET.

The structure of the feet and more particularly the toes of owls is very peculiar. When perching, the arrangement of the toes is zygodactyl, that is, two in front and two behind, but when an owl pounces upon its prey, the four toes point to the four quarters of a circle. Again when the bird alights upon the ground, the arrangement is still different, being more like that of a typically avian foot—three toes in front and one behind. This facile adjustment to different conditions makes the foot of great efficiency in all its functions. The osprey or fish hawk shares the digital elasticity of the owls. Not only in present mobility but in past evolution, the owl's foot has proved extremely plastic, and we find considerable differences between the feet of various species.

*Measurements of the optic axes in the skulls and mounted specimens of the diurnal hawk owls, (*Surnia*), together with the apparently more-lateral position of the facial disks, indicate a wider divergence, perhaps of as much as 43° , but this evidence cannot be confirmed until living specimens have been examined.

As illustrating adaptative radiation among these birds we may consider three types of feet. The foot of the barred owl is typical of the owls in general. It is feathered down the entire length of the tarsus or lower leg and even to the distal joint of the toes. The talons are long, sharp and curved and the soles of the feet are covered with rough dermal spicules which must be of great assistance in keeping a firm hold upon living prey.

The foot of the snowy owl shows a beautiful adjustment to life in the treeless regions of the far north, closely paralleling the foot of the ptarmigan. The entire foot to the very base of the claws is completely hidden in a dense growth of loose-vaned feathers, and even the soles of the feet are thus covered, the feathers here being stiffer and more bristle-like. When, for months at a time, the rocks and tundras are covered deeply with snow, the owl is thus protected from the cold, frozen surfaces on which it must perch and roost. The dead, non-conducting pad of feathers on each sole, leaves exposed nothing but the horny tips of the claws.

On our western prairies the little burrowing owls have broken away from all traditional owl customs, and have taken to a diurnal life and a subterranean home. Under these conditions, feet like those of other owls would be almost useless, and so we find a radical change in these members. The tarsus is much elongated as may be realized by a comparison between a great horned and a burrowing owl. While the former may have as much as thirty-five inches greater extent of wing, yet there is but one-half inch difference in the length of the tarsal joint of the leg.

PART II.—SPECIAL ACCOUNT.

The group of owls is, as a whole, so homogenous and the radiations within the Order so uniformly distributed that the generalizations of Part I, while true of the owls of the world, may, without exception, be applied to the owls of the Nearctic Region. This Region comprises the North American continent south to, and including, the high, central tablelands of Mexico. Its boundaries are determined by the limits of distribution of many important groups of plants, insects, birds, mammals and other forms of life. The remainder of the Western Hemisphere comprises what is termed the Neotropical Region.

In this Nearctic Region we find twelve well-marked groups or

genera of owls. Divided among these are twenty species and twenty-two sub-species, or geographical races, making in all forty-two different forms. These genera are as follows, with the number of forms in parentheses:

A. SUB-COSMOPOLITAN.

<i>Strix</i> —Barn Owls (1).	<i>Otus</i> —Screech Owls (13).
<i>Asio</i> —Long- and Short-eared Owls (2).	<i>Bubo</i> —Great Horned Owls (6).
<i>Syrnium</i> —Barred Owls (5).	<i>Glaucidium</i> —Pygmy Owls (4).

B. CIRCUMPOLAR.

<i>Scotiaapterx</i> —Great Gray Owls (2).	<i>Nyctea</i> —Snowy Owls (1).
<i>Cryptoglaux</i> —Saw-Whet Owls (3).	<i>Surnia</i> —Hawk Owls (2).

C. CONFINED TO THE NEW WORLD.

<i>Speotyto</i> —Burrowing Owls (2).	<i>Micropallas</i> —Elf Owls (1).
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In tracing the distribution of these dozen groups we find that they fall naturally into the three classes A, B, and C.

Owls have become so well adapted to their peculiar mode of life, and are so well protected from strenuous competition with other forms, that they have changed but little throughout, perhaps millions of years. In the geological periods of the Oligocene and Miocene, a temperate climate existed as far north as Alaska and Greenland, and this, with the land bridge which joined North America to Asia, explains the large proportion of cosmopolitan genera of owls, Class A. If we may judge by the distribution of insects and mammals, the trend of diffusion across this northern continental isthmus was chiefly from Asia into North America and rarely in the reverse direction. In a strict geographic sense the continental mass of North America is still connected with Asia, as the continental shelf unites the two, and a rise of the sea bottom of only two hundred feet would result in a dry land bridge between the Old and the New World. We can but theorize as to the early distribution of these owls, it being impossible without palaeontological evidence, to indicate the center of origin of genera which are cosmopolitan.

The Circumpolar species, Class B, also doubtless inhabited North America during these early periods. Later, in the Pleistocene, all were forced southward by the onward march of the

glaciers. During the ensuing age, as the ice disappeared northward, the four groups, Class B, accompanied or closely followed it, and to-day they are at home in the Arctic regions. One or two species in some of the other genera have also become adapted to a boreal life.

Although the two genera, Class C, are peculiar to this hemisphere, yet they are only slightly differentiated,—the burrowing owls (*Speotyto*), from the *Athene* group of the Old World, and the tiny elf owls (*Micropallas*), from the pygmy owls—the cosmopolitan *Glaucidium*.

As intrusive Strigine elements from the Southeast and Southwest, the Florida and western burrowing owls are of exceptional interest. No owls seem, even accidentally, to have entered this Region by way of Greenland, as birds occasionally do; although the snowy owl has been caught alive seven hundred miles out at sea, and both the American hawk owl and the screech owl are recorded from England. The only Old World forms which are known to have entered the Nearctic Region during historical times, are the lapp owl and the hawk owl, both being accidental visitors to Alaska.

Having thus briefly reviewed the North American owls as a whole, we shall consider each group more in detail.

In the New York Zoological Park there have been on exhibition nine out of the twelve genera of Nearctic Owls, no living specimens of the great gray, American hawk or elf owls having as yet been obtained.

GROUP I.—BARN OWLS, *Strix*.

The single genus of the Barn Owls is set apart from all others by differences in structure and appearance sufficient to be designated as a separate family.

The American Barn Owl, *Strix pratincola* Bonap., is the sole representative of this genus in North America. Since its isolation from the European Barn Owl, it has increased considerably in size and is lighter in color.

Of all the owls these are the most peculiar looking, as the common name of "monkey-faced owl" suggests. In color they are very beautiful, with gray and golden-buff upper parts, speckled finely with black and white. Beneath they are white or buff, sprinkled with round dots. The face is white and the heart-shaped facial disk is yellowish-brown. "Golden Owl" is an excellent name for this bird.



BARN OWL.

The American Barn Owl ranges over almost the whole of the United States and Mexico, but does not nest north of Long Island, Nebraska and California. It is one of the most nocturnal of the owls, and is seldom seen by day. If by chance one is caught in the daylight, it seems almost too dazed to fly, and with eye-lids shut to narrowest slits, it waits patiently for the relief of twilight.

Its utterances are varied. The most startling is a wild, high scream—cr-r-r-ee!, but in its nest it utters a snoring sound with its beak closed, and hisses when disturbed. I have known this owl, when flying about at twilight, to click its beak repeatedly, perhaps as a signal to its mate, as it was not feeding upon insects at the time.

It is difficult to define the nesting site of a barn owl. It may



SHORT-EARED OWL.

be in a hole in a river bank, in a church belfry, or a barn or hollow tree may be used. Little or no nesting material is provided, the five to nine ovate, white eggs often lying on the bare earth or wood. At the time of hatching the young are covered with yellowish down, and, like the young of all owls they are most curious looking creatures. The wing and tail feathers and the facial disks are the first to appear, and even when five weeks old the body is still clothed in the nestling down.

Economically this owl is everywhere of the greatest value to man. In California it preys on gophers and ground squirrels; in the South on cotton rats, and in the North, mice and rats form its chief food. Dr. Fisher, in an examination of twenty-nine stomachs, found traces of poultry in only one. Three contained the remains of small birds; seven were empty; four contained insects; seventeen had mice and seventeen more contained other small mammals; conclusive evidence that these birds deserve all the protection that man can give them.

This bird's delicate plumage of white and gold has, however,



LONG-EARED OWL.

found favor with the milliner and in a day in one of our large cities, we may count a hundred bedraggled Barn Owls on women's hats—all staring out of glassy yellow eyes, as *unlike* the dark brown eyes of the living birds, as the feathered masses are like caricatures of the beauty of the birds in their native haunts!

GROUP II.—LONG-EARED and SHORT-EARED OWLS, *Asio*.

These two birds are closely associated structurally and their genus is quite sharply defined.

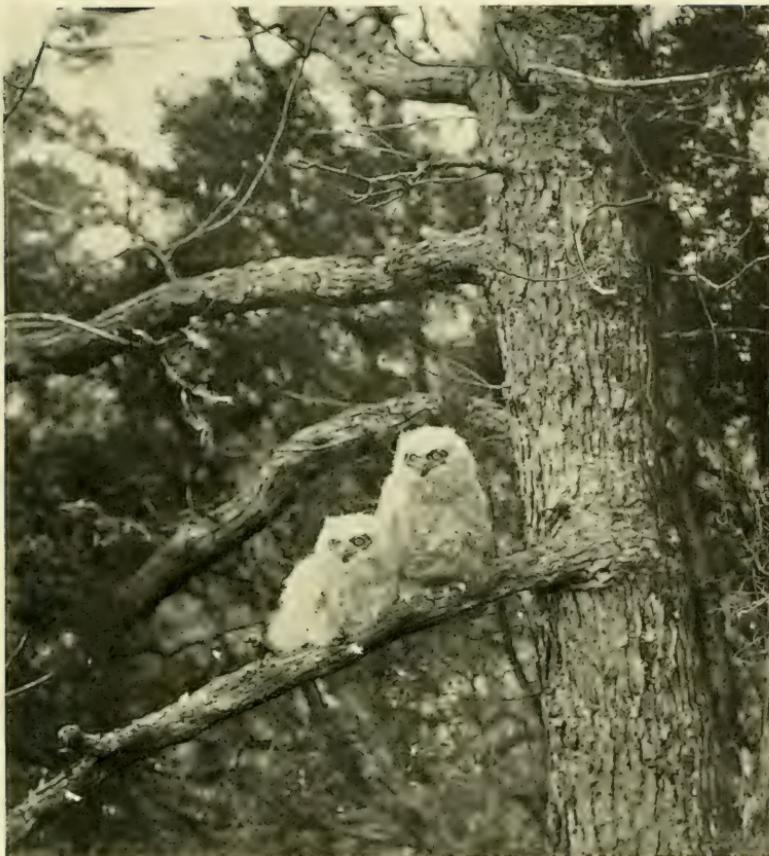


EGGS AND YOUNG OF LONG-EARED OWL.
From a photograph by T. H. JACKSON.

The American Long-Eared Owl, *Asio wilsonianus* (Less.), is, like the barn owl, found throughout temperate North America and Mexico, and also like that species, it is eminently nocturnal. The chief difference from the bird of the Old World is the breaking up of the longitudinal stripes into mottling or indistinct transverse bars. Although such a distinction as this is only superficial, yet the fact that the American owls are completely isolated geographically, from the Eurasian birds, warrants their specific designation.

In size it is midway between the great horned owls and the screech owls, and its long feather horns rise from the middle, not the sides, of the head.

Although not an uncommon bird, yet we know but little of its habits and less of its notes. Sometimes when hunting it utters a low, pleasing whistle, but when disturbed on its nest, it gives voice to a loud wailing cry and a grating mew, while in common



YOUNG GREAT HORNED OWLS.
From a photograph by T. H. JACKSON.

with all owls it snaps its beak in defiance. To an old deserted crow or squirrel nest, high in a pine or hemlock tree, the Long-Eared Owl carries a little grass for lining, and here lays three to six eggs. From beneath, the nest looks like a hundred other deserted nests in the neighboring woods. Rarely this owl will build for itself.

This is another bird valuable to man, since in one hundred and seven stomachs examined, no less than eighty-four contained mice, while sixteen showed birds; five, shrews; and one, insects, the remainder being empty.

For some reason both this and the following species are ex-



YOUNG BARN OWL.
From a photograph by T. H. JACKSON

tremely difficult to tame and seldom live long in captivity unless reared from the nest by hand.

The Short-Eared Owl, *Asio accipitrinus* (Pall.), is, for several reasons, of especial interest. It is one of the most widely distributed of all birds. The keenest systematists can not distinguish between specimens from Europe, Asia, Africa, North and South America and the Hawaiian Islands. It is absent only from west Africa, Australia, and the adjacent Pacific Islands.

Although so closely related to the Long-Eared Owl, this is a bird of very different habits. Its favorite haunts are open, grassy marshes and its nest is placed invariably upon the ground. It is so far diurnal that in cloudy weather and occasionally in bright sunshine, it may be seen hunting its prey. It differs from many owls in that it has strong instincts of migration, nesting often on the Arctic tundras of the far north and coming southward in winter. At such times large flocks may be observed in our salt marshlands.

This habit of congregation, even at the breeding season, has at times been of the greatest value to man, as when in Scotland during a plague of voles or field mice, these owls appeared suddenly in surprising numbers and as many as four hundred of their



BARRED OWL.

nests were found within a comparatively small tract of country. Their economic value may be estimated from the contents of one hundred and one stomachs, eighty-four of which contained mice and shrews; seven, insects; and eleven, small birds.

They are said to have a shrill, barking call, like the yelp of a small dog. A low pile of sticks and grass hidden on the ground and lined with feathers serves to hold the half dozen eggs.

GROUP III.—BARRED OWLS, *Syrnium*.

The Barred or Hoot Owl, *Syrnium varium* (Barton), is not uncommon in the wilder parts of our northeastern states throughout the year, and its large size, lack of feather horns, and deep impressive voice render it easy of identification. As soon as dusk has

settled down upon the woods, the strange voices come to us—*Whōō, whōō-whōō, whōō-whōō!* and the owl leaves its hollow tree and sets out upon its nightly hunt. When one is suddenly awakened at midnight by one of these birds close overhead, staring, and hooting at the camp fire, one can sympathize with the superstitious fears of the ancients!

Barred Owls are not shy and I have known them to fly up within a few yards of a man, governed apparently by curiosity, while by imitating their cry it is an easy matter to bring them, even from some distance. The hooting is unusually loud and frequent at the season of courtship from February to April. Two to four eggs are laid in the hollow of a tree or in an old crow nest.

These birds are easily tamed and make interesting and amusing pets, and if liberated in a barn or corn crib during the night, will clear the premises of all rats and mice. Over half their food, in a wild state, consists of mice, while they also feed on small birds, moles, frogs, and insects. It is only very rarely that they attack poultry, the evidence being that on the whole they are of great benefit to mankind. Although as a rule nocturnal, I have seen these birds hunting in daylight in the dark spruce forests of Nova Scotia.

In Florida and the Gulf States, the humid climate has darkened the plumage, and perhaps the warmer temperature has had something to do with the reduction of the feathering on the toes, and these birds have been given the rank of a sub-species. The birds of southern Texas are also slightly different. In the West, however, the Barred, or as it is there called, the Spotted Owl, differs so considerably in plumage, besides being less in size, that it is considered as specifically distinct, *Syrnium occidentale* Xantus. So rare is it, and so fond of the wilder portions of the mountains that little is known of its habits or of those of the darker form which inhabits the coast of Washington and British Columbia.

GROUP IV.—GREAT GRAY OWLS, *Scotiaptex*.

Considerably larger, but showing its rather close relationship in its general resemblance to the barred owl, the Great Gray Owl, *Scotiaptex nebulosa* (Forster), of the far north, is to most of us known only from books and skins. Although it is a bird of the deep forest, and therefore never goes beyond the limit of tree growth, yet even the severest winters force it but a short distance southward and seldom beyond the northern border of the United



ELF OWL AND GREAT GRAY OWL.

States. Thus the range of the snowy owl is greater in extent, both to the north and the south.

The Great Gray is one of the largest owls in the world, measuring twenty-seven inches in total length.

In its breeding haunts about Great Bear Lake and throughout Alaska, the sun never sinks below the horizon in summer, so that this bird is of necessity diurnal, during at least part of the year. A nest of twigs, lined with moss and feathers, is built in a tall

spruce tree, and two to four eggs are laid. We know but little of its habits and its food, but it seems to sustain the reputation of the Barred Owl, of a fondness for rodents. Of nine stomachs examined, all contained mice, while in one was the remains of a snow bunting.

The Lapp owl of the Old World has been noted as accidentally occurring in Alaska.

GROUP V.—SAW-WHET OWLS, *Cryptoglaux*.

Three forms belonging to this genus occur in the Nearctic Region. The handsome little Richardson Owl, *Cryptoglaux tengmalmi richardsoni* (Bonap.), has much the same distribution as the Great Gray Owl, breeding in northern Canada and coming south in winter as far as the northern United States. It is a sub-species of the Tengmalm Owl of northern Europe and Asia, and differs from that bird chiefly in the predominance of the darker tints of the plumage. A hint of the dangers to which this little owl is exposed is shown in the fate of a parent owl which had a nest with four eggs in a hollow spruce stub; the unfortunate bird being killed and eaten by a pair of ravens whose nest was in a neighboring tree.

Quite similar in general tone of plumage, but lighter in color and smaller in size, is the familiar Saw-Whet Owl, *Cryptoglaux acadica* (Gmel.). Its rasping, but not unpleasant notes have given to it its common name. During March and early April, when the thoughts of these little owls are turning to nesting, the notes are most often heard—calls of defiance or invitation—we know not which. A woodpecker or a squirrel hole is finally chosen, and three or four small white eggs laid therein.

It is nocturnal and sits so still in the daytime, huddled up close to the trunk of some dense spruce or cedar, that it is seldom observed. If carefully looked for in winter, however, it can usually be found, and is so sleepy or dazzled by the light, that one can pick the bird from its perch without difficulty. Four-fifths of its food consists of small field mice.

Along the humid coast of British Columbia, the Saw-Whets are much darker, and have been accounted worthy of sub-specific distinction. Otherwise, the Saw-Whet Owls from Newfoundland and British Columbia, south to Pennsylvania and New Mexico are all alike.



SAW-WHET OWL.



SCREECH OWL.

GROUP VI.—SCREECH OWLS, *Otus*.

The Screech Owl, *Otus asio* (Linn.), is the commonest owl about our houses, and the one which, in daylight, is most often the object of persecution by mobs of small birds. These seem instinctively to recognize their hereditary nocturnal enemy, and to appreciate its comparative helplessness in the blinding light of day.

Its name is undeserved, for the ordinary call of these birds, far from being a screech, is a tremulous, quavering series of notes, not at all unmusical, especially to those who associate it with pleasant memories.

Screech Owls do not migrate, and even in winter do not wander far from their favorite hollow tree. There is hardly any orchard or group of old gnarled trees which does not shelter one of these fluffy owls deep within some hollow trunk.

A curious phenomenon of color is found in a number of species of owls, but is especially marked in the Screech Owls. This is called dichromatism—two distinct color phases being found, which, so far as we know, are independent of age, sex or season. If we take four or five young birds from a nest and rear them by

hand, they will assume adult plumage either of a general bright rufous color, or else a brownish gray, being streaked with black in both phases. This description, together with the small size—about nine inches in length—and feather ears on the sides of the head, will serve for identification.

There are few birds more trustful of man than the Screech Owl, coming often into the very streets of villages, and nesting there if they can find a suitable cavity, while upon the neighboring farms they are omnipresent. Everywhere it finds work ready to its talons and beak, work which no cunning of man could supplement, in ridding gardens and fields of mice and noxious insects.

In the stomachs of two hundred and fifty owls from all parts of the country, the remains of mice and shrews were found in a hundred, while insects had formed the diet of a hundred more. Thirty-eight only had fed on small birds, and this item is of the greatest importance in this species, since, being the only owl which frequents our villages and even cities, it may prove of great importance in the future in keeping down the numbers of the pestiferous English sparrows. A gentleman from Ohio writes as follows concerning this latter bird: "Last summer they were so thick around my house as almost to set me wild, when a little screech owl got to visiting us every night, and at each visit he carried off a sparrow. My house is thickly covered with vines, and the little owl would make a dart into the vines and catch his sparrow every time. By fall they were well thinned out." A Screech Owl should never be killed, but left to live his life of constant usefulness to mankind.

The sedentary life of this species of owl, together with its plasticity of structure, doubtless explains the quick and radical reaction which it shows to various environments. In the United States alone there are no fewer than thirteen forms of the Screech Owl, all differing so much *inter se*, that they have been given specific or sub-specific rank.

As we know nothing of the ancestry of these birds, it is impossible to tell which are the most modified, and which approach most closely to the prototype. The Screech Owl as we know it in the east, remains unchanged as far south as Georgia, and west to Dakota and Kansas. In Florida and along the Gulf coast, the owls are smaller and darker, but west of the plains from Canada to Mexico we find as many as eleven different forms. This may mean that the Rocky Mountain region was the original center of distribution of this species, or it may reflect only the extremes



GREAT HORNED OWL.

of environment, with which, in this much diversified region, these non-migratory birds have come into contact.

The plasticity of the owls of this genus is remarkable, considering the narrow structural limits within which the differences range. About eighty forms have been described from all parts of the world. The differences are in the darker or paler plumage, and in the greater or lesser size. The large Kennicott Screech Owl, which inhabits the coast region from Oregon north to Sitka, is dark, sooty brown, streaked with black, and is almost eleven inches in length. From this we have gradations, continuous or not, according to whether the forms are more or less isolated, until we reach the pale, desert-hued Xantus Screech Owl some eight inches over all, which is found only in Lower California, and because of its isolation has been made a species. The minimum in size, however, is shown by the Dwarf Screech Owl of Idaho, a pale form hardly seven inches from head to tail. In addi-

tion to the thirteen forms mentioned above, there are more than half a dozen kinds of Screech Owls known to inhabit Mexico, none of which cross the southwest border of the United States.

The habits of all are very similar to those of our eastern bird. When wishing to conceal itself, a Screech Owl draws its feathers close to its body, stands bolt upright, with eyes almost shut, and in this posture its remarkable resemblance to a dead branch stub is doubtless of great value to it. The illusion is heightened by the conspicuous feather ears which stick up like the splintered ends of a broken off branch.

GROUP VII.—GREAT HORNED OWLS, *Bubo*.

These are the largest and fiercest of the owls of the United States, and are important, both as a conspicuous feature of our Avifauna and in their economic relations to man. They are found in almost all parts of the North American continent, and show adaptive radiation in a most interesting way. Six different forms are recognized, but these intergrade and the ranges overlap to such an extent that no hard and fast lines can be drawn.

Considering the Great Horned Owls as a whole, the eastern form *Bubo virginianus* (Gmel.), which extends from Newfoundland and Ontario southward, is clothed with various shades of ochraceous-buff and black. In the central west we find a form much lighter than our eastern owl; but then, passing northward in the interior to the Hudson Bay territory—the land of snow and snow-colored creatures—*Bubo* becomes whiter and whiter, until, in the extreme type of the Arctic Horned Owl, we have a bird with a plumage of a white ground-color, with a few restricted dark markings above, and almost wholly white below!

As we approach the humid regions of the Pacific slope, we enter the range of the typical Dusky Horned Owl, well named *saturatus*, for the dampness of the atmosphere has permeated his plumage, giving it a dark sooty brown tone, wholly without yellow or buff.

Finally in the dry, arid waste of Lower California, lives the extreme southern type, the small Dwarf Horned Owl.

Our Horned Owl of the east, perched quietly in a tree, seems the personification of gentleness and good nature. The sharp beak and talon are buried in the fluffy feathers and the half-shut eyes are softened. But as night approaches and the pangs of hunger are felt, a transformation takes place in the bird. After sundry stretches and yawns, his eyes open wide, shining with a fierce

yellow light. Quick turns of his head show how keen is his vision, perceiving the slightest movement of anything within sight. The sharp talons open and shut on the branch, the bill is given one or two vicious snaps, and, noiseless as a shadow, the dreaded hunter swoops from his perch.

The most common cry of this owl is a deep, gruff *Hoo-hoo* *whoo!* given, however, with far less expression and modulation than the utterances of the barred owl. A rarer sound is a sudden, loud, blood-curdling shriek, which well befits the character of this feathered tiger. Wherever found it is easily master of the night—a noiseless, flying shadow of death, which must ever haunt the timid creatures crouching on the branches or among the stubble.

Crows have sworn eternal war upon the Great Horned Owl, and when they discover one in the daytime they will shout at it for hours, and persecute it in any way which they dare. Quartering the fields and woods at night, the strong owl swoops unerringly upon rabbit, mouse, or bird. In the north it feeds upon the large Arctic hare and grouse. No bird of prey excels it in courage or fierceness, and it is the only bird I know, which, in captivity, will fearlessly attack a man entering its cage. It occasionally kills and devours even our largest hawks—the red-tailed and red-shouldered, while geese and young foxes have been known to fall victims to it. It suffers no other large and nocturnal owl to live unmolested on the hunting grounds it has chosen, and whenever Great Horned Owls appear for the first time in a locality, the barred owls rapidly decrease, and finally give way altogether and go elsewhere. Of all the owls this is the most frequent visitor to our hen-roosts, but far from universally condemning it on this account, the habits and food of these birds should be studied in each particular locality before it is indiscriminately slain. The mice, hares, and insects outnumber the poultry three to one in the stomachs of those birds which have been examined.

Two or three white eggs are laid in a last year's nest of some hawk or crow, and in the latitude of New York the eggs are sometimes deposited as early as the first of March, before the last snow flurry has past.

As the woods are cut down, the Great Horned Owl becomes rarer, everywhere retreating to the wilder, less settled regions. This will be the first species of owl to disappear when mankind has carried his areas of cultivation throughout the mountains and backwoods.



SNOWY OWL.

GROUP VIII.—SNOWY OWLS, *Nyctea*.

In all countries of the north—America, Europe, and Asia—this is a typical owl, *Nyctea nyctea* (Linn.), of the Arctic plains—the frozen tundras. It is white in color, more or less barred with brown, these dark markings being more abundant in the female. The old male birds are sometimes almost pure white in color. Of such a specimen shot in Alaska, Mr. Nelson writes, that its plumage was suffused with "a rich and extremely beautiful shade of

clear lemon-yellow, exactly as the rose blush clothes the entire plumage of some gulls in spring. The morning after the bird was killed the color was gone, the plumage being dead white."

Its natural home is on open, treeless plains, and when it wanders south in winter it is almost always to be found perched on a rock or on the snow in an open field. During some years Snowy Owls enter the United States in large numbers, and may be so abundant in one locality that it seems as if they were living in flocks. The Snowy Owl can see well in the daytime, without which faculty it would indeed be helpless during the months of sunlight throughout the Arctic summer. It has a strong, rapid flight, although noiseless, and according to Audubon, is able to capture ducks, pigeons, and grouse on the wing. It is fond of fish, and is said to swoop down upon them, osprey fashion, and seize them in the water. In the north, ptarmigan and hares form its principal food.

Its nest is rarely found. This consists merely of a few feathers placed in a slight hollow in the ground. An unusually large number of eggs is laid, three to eleven, and this is doubtless due to the many dangers from ravens and Arctic foxes, to which such a terrestrial nest must be exposed. It is only, however, while the parents are absent that there is any danger from marauders, as these owls are strong and courageous, and few creatures would care to face those sharp talons, which are controlled by tendons as strong as steel.

The Snowy Owl is a strangely silent bird, and Arctic explorers and those who have observed it in captivity have recorded nothing concerning its voice, except that when disturbed it hisses and snaps its beak after the usual owl fashion. That it has a voice and an unusually strange one, however, was made apparent to me on one occasion not long ago when one of these birds was brought into a dark room, preparatory to an examination with the ophthalmoscope. It suddenly gave utterance to a series of loud, piercing screams, a shrill cachinnation so startling that the man who was holding the bird nearly dropped it. This single utterance is the only vocal sound I have ever heard from this species, although I have sometimes watched a cageful of seven, off and on, during the whole of a winter's night.

Although no trace of feathery ears is visible externally, yet close examination will show them developed slightly beyond the other feathers of the head. In general structure these owls stand midway between the great horned (*Bubo*), and the Screech Owls (*Otus*).

GROUP IX.—HAWK OWLS, *Surnia*.

The typical Hawk Owl of the Old World is only a casual straggler to Alaska, so hardly enters into our consideration, but those members of this species, which in past time took up their life upon our continent, have, through their isolation, changed in color from the excess of white spotting to the prevalence of brown markings, and are deemed worthy of a sub-species—the American Hawk Owl, *Surnia ulula caparoch* (Müll.).

It is interesting to note that this increase in dark markings in American birds when compared with their congeners in the Palæarctic Region, occurs also in the Richardson as compared with the Tengmalm owl, and was formerly thought to form a distinction between snowy owls of the New and the Old World.

Though typically owl-like in structure the diurnal habits of the Hawk Owl are strongly reflected in its appearance, which is so hawk-like that it is hard to believe that this resemblance is only a parallelism. Curiously enough, this likeness is even apparent in its sudden, shrill scream—unowl-like and recalling the cry of one of the smaller hawks.

The home of the Hawk Owl is in the fur countries of the north, breeding from Newfoundland to the limit of tree growth. Occasionally it comes as far south as Pennsylvania. It hunts throughout the day and at night retires to some arboreal roost for sleep, like any bird of the day. Its food consists chiefly of mice, but in the more northern parts of its range it feeds largely upon ptarmigan. These grouse exceed the owl in size and weight, so that it is unable to carry them off, but is compelled to devour them where they are caught and killed.

It is not particular as to a nesting place, choosing either a hollow stub, a woodpecker hole or else relining some deserted nest. Three to seven eggs are laid.

GROUP X.—BURROWING OWLS, *Speotyto*.

These are perhaps the most aberrant of all owls, and, together with *Micropallas* are found only in the New World. This genus is eminently tropical in its distribution, and its presence in the Nearctic Region is clearly an intrusion from the south, standing in sharp contrast to the other groups, which, from their distribution and congeneric relationship with Old World forms, seem to be more recent emigrants from the northwest. But even



HAWK OWL.

the Burrowing Owls have as their nearest relation, the genus *Athene* of Europe.

What is considered as the typical form of Burrowing Owl, *Speotyto cunicularia* (Mol.), is widely spread over South America, although its terrestrial habits confine it to the open plains and pampas of that continent. Passing northward through Central America and Mexico, and over the wide western plains of our own country, the Burrowing Owl becomes smaller, and the brown areas on wings and tail increase until they predominate over the white. This is the Western Burrowing Owl, *S. c. hypogaea* (Bonap.), which has so often figured in pseudo-scientific tales as the third element in the "happy family" of rattlesnakes and prairie-dogs. There is of course no vestige of truth in the story. The prairie-dog is doubtless dispossessed by both bird and reptile, if not indeed devoured during the process.

Turning back to South America and starting northward again via the West Indies, we find a second line of distribution of these owls, with distinct island forms on Margarita, Guadeloupe, Antigua, and Hayti. Finally, the most northern link in the chain, in the Bahamas and southern Florida, is the Florida Burrowing Owl, *S. c. floridana* Ridgw. This differs from the Western race



THE WESTERN BURROWING OWL.

in being gray instead of earthy brown or sand color, the greater humidity of its habitat and of that of its island progenitors accounting for its darker coloration.

Wherever the Burrowing Owl is found, it is wholly terrestrial in habit, and subterranean in its nesting. This unusual environment has affected its structure and appearance; the diurnal life having perhaps brought about the degeneration of the facial disk, which is markedly imperfect. The legs have greatly increased in length and the feathers on the toes and tarsus have either disappeared or degenerated into bristles.

The Western owl usually occupies the deserted hole of a prairie-dog; farther south, the burrows of the large iguana lizards are sometimes pre-empted, and in South America, armadillos and vizcachas are often the original architects of the owl's burrow.

But whenever dependent upon their own exertions for a home, these owls, whether of the Western or Florida race, show themselves to be expert sappers and miners. The birds from the latter region, indeed, must always dig their own burrows, as there are no native fossorial mammals or reptiles of large size to im-

pose upon. Nevertheless, the Florida owls do not live lives of unalloyed peacefulness, since there, as in the west, rattlesnakes are not adverse to appropriating a tempting burrow, and if a young owl is to be had for the taking, at the end, why so much the better! A most interesting fact is told about these owls; that when disturbed, they utter a sound, startlingly like the buzz of a rattler. This, if correct, must often serve a useful purpose in frightening away a marauding weasel or other predatory animal.

The food of these birds defies description. It may be said to consist of anything edible and small enough to be captured and killed by them—whether insect, lizard, bird, or mammal. Insects, however, form the chief item in their diet.

The burrows which these birds dig for themselves are usually about eight feet in length with little attempt at a nest at the end, where the five to ten eggs are laid.

I have observed both of the Nearctic races of Burrowing Owls in captivity, and have seen each make burrows with equal rapidity. I know of no account of the actual operation, so will add what I have noticed concerning the nesting of a pair of the Florida birds.

When a pile of earth and clay, some three feet deep, was placed in their cage, they began to work at once, and within a few days had burrowed out of sight. This work was carried on mostly at night, on account of the many people passing during the day, but several times on rainy days, when the bird house was quiet, by stealthily watching behind a door, the birds were seen at work. Their method of excavating was to alight at the entrance of the burrow and walk slowly into it, kicking a shower of dirt backward at each step. Long after the bird disappeared from view, the little spouts of sand would continue to be thrown out, as regular as clockwork. In three or four minutes the bird would come up to the entrance and repeat its trip to the end of the burrow. In this way the entire length of the passage was kept clear, and the earth loosened at the inner end was gradually heaped up outside.

Soon after the burrow was begun, the two Florida birds paired off, and the single Western Burrowing Owl which shared the cage, led an unhappy life until removed to another enclosure. If he happened to alight anywhere near the burrow, both of the owners would jump on him literally "with both feet," rolling him over and over.

When the offensive third owl was removed, the two partners settled down to burrowing in earnest, and excavated a large pile of earth. Now began a most amusing courtship. They would stand side by side in the entrance of the burrow, and chuckle and

bow to each other by the hour. Then they would race around and pop up and down the hole like jack-in-the-boxes. Of course their burrowing operations under ground could only be guessed at, but one of the owls, presumably the female, remained below most of the day, and when she appeared, presented such a worn and dirty appearance that it seemed probable she was sitting. Her partner took up his station on the pile of earth near the entrance and dutifully swore at any one who intruded, or promptly conveyed mice and sparrows into the mysterious cavern where, week after week, his mate was patiently incubating in the darkness.

If stared at intently, he would slowly back down, until in the darkness of the burrow, nothing was distinguishable but his two round, shining, yellow eyes. Again when not frightened, he would twist his head around sideways in a vertical direction, until he looked at the observer with head completely reversed. This was quite a common trick, but why he wanted an upside-down view of things, was more than I could ever explain. One day a board was placed across the entrance of the burrow, as an experiment, but the next morning the little owl was standing beside a new hole higher up, and venting all the wrath in his diminutive body on the innocent piece of wood.

Week after week passed and the faithful owl-wife grew more and more emaciated and bedraggled, until, fearing that she would die, it was decided to dig out her secret. So both owls were shut out of the burrow and a layer of earth removed, then a second and third, until the whole excavation was exposed to view, and it was found that the owls had used their limited amount of earth in the most ingenious possible way. The burrow, as a whole, resembled a descending spiral. It led obliquely downward from the entrance, then curved around to the left, and about five feet from the mouth, widened into a circular chamber, evidently in use as a dining-room, as the floor was covered with scraps of dried meat and feathers. The tunnel, which was almost circular in section, with hard-packed walls, extended about five feet further, describing a large, gradually descending circle in its course, until it crossed under the upper portion of the burrow, near the entrance. At the extreme end was the nest, merely a second circular chamber containing two white eggs, laid on the bare clay, with a few scattered pebbles around them. These pebbles were evidently the cause of all the trouble, for each egg had a little nick in the side, made, no doubt, by a pebble falling from the roof, and so rendering useless the four week's incubation of the parent owl; the embryos within the eggs being completely dry.



FERRUGINOUS PYGMY OWL.

GROUP XI.—PYGMY OWLS, *Glaucidium*.

This group of tiny owls is unknown to us in the east, although, as a genus, it is wide-spread, being represented in Europe and by a number of species in Asia, Africa, and South America. The Pygmy Owl, *Glaucidium gnoma* Wagl., inhabits the mountain regions of the Rockies, from British Columbia south into Mexico, while a darker sub-species lives in the humid coast region.

Besides a form inhabiting Lower California, there is a southern species, the Ferruginous Pygmy Owl, *G. phalaenoides* (Daud.), which reaches the southern border of the United States. This is a most beautiful little owl, clothed in a varied pattern of white and brilliant rufous.

Although not strictly diurnal, yet these owls have so far deserted the habits of their Order, that they fly about in the morning and late afternoon, pursuing the grasshoppers and small mice upon which they prey.

The call-notes are said to be soft and musical and four eggs are deposited in the deserted hole of a woodpecker.

GROUP XII.—THE ELF OWL, *Micropallas*.

Last and in this case least—at any rate in point of size, comes the Elf Owl, *Micropallas whitneyi* (Cooper). Micro-Pallas he is indeed, the smallest owl in the world, but from head to tail, throughout his diminutive stature of five and a half inches, he holds true to the traditions and structure of the birds sacred to his goddess namesake.

If we disregard his tail, we have about three and a half inches of owl. During the day he sleeps soundly in accepted owl-fashion; at evening he wakes, stretches his wings, and sallies forth in quest of prey. No great game is his, for even a big beetle will give the tiny owl much trouble, and yet he is capable of overpowering a small mouse or shrew. Sparrows, as a rule, show no fear of this diminutive bird of prey when they come across him in the daytime, but feathers have been found in his stomach, so that he can claim victory over at least a wren or a sparrow. These owls sometimes collect around the light of a camp-fire, probably attracted by the insects which gather and fly about the bright spot.

When discovered in the daytime, the Elf Owl resorts to a most interesting ruse to conceal his diminutive body. His wing is mottled gray and white like the gray stems and flecks of sunlight about him, and when he thinks he is in danger of being discovered he draws one wing across the front part of his body like a shield, holding it so high that he can just peer over it. If we walk around his perch, the knowing little chap will slowly revolve, always presenting his mottled wing to the front. When thus barricaded behind his own protectively colored feathers, it is impossible, at a little distance, to distinguish him from his surroundings.

Two to four eggs are laid in a deserted woodpecker hole in the stem of some giant cactus, and the young elfin owls are most quaint little creatures. The home of the Elf Owl is on the table-lands of Mexico, and northward to southern Texas and California. This owl, including a barely separable darker form from western Mexico, is the sole representative of its genus, which is therefore peculiar to this region. Its nearest relatives are perhaps members of the genus *Glaucidium*, which, however, are larger, with much longer tails and, as we have seen, are more diurnal in habits.

LIST OF BIRDS LIVING IN THE NEW YORK ZOOLOGICAL PARK,

December 31, 1906.*

Class AVES, Birds.

Sub-Class RATITAE. Flat-breasted Birds.

Order **RHEIFORMES**, Rhea-like Birds.

Family RHEIDAE, Rheas.

Common Rhea *Rhea americana* (Linn.).

Order **STRUTHIONIFORMES**, Ostrich-like Birds.

Family STRUTHIONIDAE, Ostriches.

North African Ostrich *Struthio camelus* Linn.

South African Ostrich *Struthio australis* Gurney.

Order **CASUARIIFORMES**, Cassowary-like Birds.

Family DROMAEIDAE, Emeus.

Emeu *Dromaeus novae-hollandiae* Lath.

Family CASUARIIDAE, Cassowaries.

Ceram Cassowary *Casuarius casuarius* (Linn.).

Sub-Class CARINATAE. Keel-breasted Birds.

Order **TINAMIFORMES**, Tinamou-like Birds.

Family TINAMIDAE, Tinamous.

Rufous Tinamou *Rhynchotus rufescens* (Temm.).

Crested Tinamou *Calopezus elegans* (D'Orb. & Geoffr.).

*In the great majority of cases, the Society holds that the publication of lengthy lists of names is uninteresting to the public, and therefore undesirable. The present, however, is regarded as an exceptional case, partly on account of the universal interest in living birds, and also because of our need of a printed check-list of our bird collection.—Ed.

Order **GALLIFORMES**, Fowl-like Birds.Sub-Order **Megapodii**.

Family MEGAPODIIDAE, Brush Turkeys.

- Brush Turkey *Catheturus lathami* (Lath.).

Sub-Order **Craces**.

Family CRACIDAE, Curassows and Guans.

Banded Curassow *Crax fasciolata* Spix.

Globose Curassow *Crax globicera* Linn.

Panama Curassow *Crax panamensis* Grant.

Razor-billed Curassow *Mitua mitu* (Linn.).

Lesser Razor-billed

Curassow *Mitua tomentosa* (Spix.).

Crested Guan *Penelope cristata* (Linn.).

Bolivian Guan *Penelope boliviiana* Bonap.

White-breasted Guan *Ortalis albiventris* (Wagl.).

Chattering Chachalaca *Ortalis garrula* (Humb.).

Northern Chachalaca *Ortalis vetula maccalli* Baird.

Sub-Order **Phasiani**.

Family TETRAONIDAE, Ptarmigan and Grouse.

Capercaillie *Tetrao urogallus* Linn.

Family PHASIANIDAE, Partridges, Pheasants, and Peacocks.

Chukar Red-legged

Partridge *Caccabis chukar* Gray.

Painted Francolin *Francolinus pictus* (J. & S.).

Gray Francolin *Francolinus pondicerianus* (Gmel.).

Abyssinian Francolin *Pternistes infuscatus* Cab.

European Partridge *Perdix perdix* (Linn.).

European Quail *Coturnix coturnix* (Linn.).

Chinese Painted Quail *Excalfactoria chinensis* (Linn.).

Temminck Horned

Tragopan *Tragopan temmincki* (J. E. Gray).

Cabot Tragopan *Tragopan caboti* (Gould).

Impeyan Moonal Pheasant. *Lophophorus impeyanus* Lath.
 Siamese Fire-backed
 Pheasant *Diardigallus diardi* Bonap.
 Manchurian Eared
 Pheasant *Crossoptilum manchuricum* Swinh.
 Black-crested Nepal
 Pheasant *Gennaeus leucomelanus* (Lath.).
 Melanotus Pheasant *Gennaeus melanotus* (Blyth).
 Anderson Pheasant *Gennaeus andersoni* (Elliot).
 Lineated Pheasant *Gennaeus lineatus* (Vig.).
 Silver Pheasant *Gennaeus nycthemerus* (Linn.).
 Swinhoe Pheasant *Gennaeus swinhœi* Gould.
 English Pheasant *Phasianus colchicus* Linn.
 Ring-necked Pheasant *Phasianus torquatus* Gmel.
 English Ring-necked
 Pheasant *Phasianus colchicus*+*torquatus*.
 Satschen Ring-necked
 Pheasant *Phasianus satscheunensis* Przev.
 Versicolor Pheasant *Phasianus versicolor* Vieill.
 Reeves Pheasant *Syrmaticus reevesi* Gray.
 Elliot Pheasant *Calophasia ellioti* (Swinh.).
 Golden Pheasant *Chrysolophus pictus* (Linn.).
 Amherst Pheasant *Chrysolophus amherstiae* Leadb.
 Red Jungle Fowl *Gallus gallus* (Linn.).
 Polish Fowl *Gallus domesticus*.
 Peacock Pheasant *Polyplectrum germaini* Elliot.
 Indian Peacock *Pavo cristatus* Linn.
 White Indian Peacock *Pavo cristatus* Linn.
 Black-winged Peacock *Pavo nigripennis* Sel.
 Jayan Peacock *Pavo muticus* Linn.

Family NUMIDIPAE. Guinea Fowl.

Abyssinian Guinea Fowl . . *Numida ptilorhyncha* Licht.
 Wild Guinea Fowl. *Numida meleagris* Linn.
 Vulturine Guinea Fowl . . *Acryllium vulturium* (Hardw.).

Family MELEAGRIDAE. Turkeys.

Wild Turkey *Meleagris gallopavo silvestris*
(Vieill.).

Family ODONTOPHORIDAE, Quail.

- Scaled Quail *Callipepla squamata* (Vig.).
 Plumed Quail *Oreortyx pictus plumiferus* (Gould).
 California Quail *Lophortyx californicus* (Shaw).
 Bob-white *Colinus virginianus* (Linn.).
 Jamaica Bob-white *Colinus virginianus* var.
 Florida Bob-white *Colinus floridanus* Coues.
 Cuban Bob-white *Colinus cubanensis* Gould.
 Montezuma Quail *Cyrtonyx montezumae* (Vig.).

Order COLUMBIFORMES, Pigeons and Doves.

Sub-Order **Columbae.**

Family COLUMBIDAE, the Rock Dove and others.

- | | | |
|--------------------------------|------------------------------|------------|
| Pouter Pigeon | <i>Columba livia</i> | Bonn. var. |
| Fan-tailed Pigeon | <i>Columba livia</i> | Bonn. var. |
| Jacobin Pigeon | <i>Columba livia</i> | Bonn. var. |
| Curacao Dove | <i>Columba gymnophthalma</i> | Temm. |
| Spotted Pigeon | <i>Columba arquatrix</i> | Temm. |
| White-crowned Pigeon | <i>Columba leucocephala</i> | Linn. |
| Band-tailed Pigeon | <i>Columba fasciata</i> | Say. |

Family PERISTERIDAE, Turtle and Ground Doves.

- Red-underwing Dove *Leptoptila rufaxilla* (Rich.).
 White-breasted Dove *Leptoptila jamaicensis* (Linn.).
 Key West Quail Dove *Geotrygon chrysia* Bonap.
 Wonga-wonga Pigeon *Leucosarcia picata* (Lath.).
 Bleeding-heart Pigeon *Phlogonas luzonica* (Scop.).
 Blue-headed Quail Dove... *Starnoenas cyanocephala* (Linn.).

*Family GOURIDAE, Crowned Pigeons.

- Great Crowned Pigeon.... *Goura coronata* (Linn.).
 Victoria Crowned Pigeon... *Goura victoria* (Fraser).

Order **RALLIFORMES**, Rails, Gallinules, and Coots.

Family RALLIDAE, Rails, Gallinules, and Coots.

- Weka Rail *Ocydromus australis* (Sparrm.).
 Florida Gallinule *Gallinula galeata* Bonap.
 Purple Gallinule *Ionornis martinica* (Linn.).
 Sultana Gallinule *Porphyrio porphyrio* (Linn.).
 Gray-headed Gallinule *Porphyrio poliocephalus* (Lath.).
 Black-backed Gallinule ... *Porphyrio melanonotus* Temm.
 Coot *Fulica americana* Gmel.

Order **PODICIPEDIDIFORMES**, Grebes.

Family PODICIPEDIDAE, Grebes.

- Horned Grebe *Dytes auritus* (Linn.).

Order **LARIFORMES**, Terns, Skimmers, and Gulls.

Family LARIDAE, Terns, Skimmers, and Gulls.

- Common Tern *Sterna hirundo* Linn.
 Sooty Tern *Sterna fuliginosa* Gmel.
 Black Skimmer *Rhynchos nigra* Linn.
 Laughing Gull *Larus atricilla* Linn.
 Brown-headed Gull *Larus ridibundus* Linn.
 Great Black-backed Gull... *Larus marinus* Linn.
 Herring Gull *Larus argentatus* Brunn.
 American Herring Gull.... *Larus argentatus smithsonianus*
 Cous.
 Western Gull *Larus occidentalis* Aud.
 Ring-billed Gull *Larus delawarensis* Ord.
 Ivory Gull *Pagophila alba* (Gunn.).

Order **CHARADRIIFORMES**, Plovers, Sandpipers, Thicknees, and Bustards.

Sub-Order **Charadrii.**

Family CHARADRIIDAE, Plovers and Sandpipers.

- European Lapwing *Vanellus vanellus* (Linn.).
- European Curlew *Numenius arquata* (Linn.).
- Redshanks *Totanus calidris* (Linn.).
- Spotted Sandpiper *Actitis macularia* (Linn.).
- Ruff *Pavoncella pugnax* (Linn.).
- Knot *Tringa canutus* (Linn.).

Sub-Order **Oedicnemii.**

Family OEDICNEMIDAE, Thicknees.

- Double-striped Thicknee... *Oedicnemus bistratus* (Wagl.).

Order **GRUIFORMES**, Cranes, Seriemas, etc.

Sub-Order **Grues.**

Family GRUIDAE, Cranes.

- Sandhill Crane *Grus mexicana* (Müll.).
- Little Brown Crane *Grus canadensis* (Linn.).
- Whooping Crane *Grus americana* (Linn.).
- Asiatic White Crane *Sarcogeranus leucogeranus* (Pall.).
- Sarus Crane *Antigone antigone* (Linn.).
- Paradise Crane *Tetrapteryx paradisea* (Licht.).
- Demoiselle Crane *Anthropoides virgo* (Linn.).
- Crowned Crane *Balearica pavonina* (Linn.).

Sub-Order **Dicholophii.**

Family CARIAMIDAE, Seriemas.

- Seriema *Cariama cristata* Linn.

Order **ARDEIFORMES**, Ibises, Storks, and Herons.

Sub-Order **Plataleae.**

Family IBIDIDAE, Ibises.

- White-faced Glossy Ibis... *Plegadis guarauna* (Linn.).
- White Ibis *Guara alba* (Linn.).
- Scarlet Ibis *Guara rubra* (Linn.).

Family PLATALEIDAE, Spoonbills.

Roseate Spoonbill *Ajaja ajaja* (Linn.).

Sub-Order CICONIAE.

Family CICONIIDAE, Storks and Adjutants.

- Wood Ibis *Tantalus loculator* (Linn.).
- White Stork *Ciconia ciconia* (Linn.).
- Black Stork *Ciconia nigra* (Linn.).
- Black-necked Stork *Xenorhynchus asiaticus* (Lath.).
- Indian Adjutant *Leptoptilus dubius* (Gmel.).
- Javan Adjutant *Leptoptilus javanicus* (Horsf.).
- Marabou Stork *Leptoptilus crumeniferus* (Less.).

Sub-Order ARDEAE.

Family ARDEIDAE, Herons and Bitterns.

- Great Blue Heron *Ardea herodias* Linn.
- Ward Heron *Ardea herodias wardi* Ridgw.
- Great White Heron *Ardea occidentalis* Ord.
- American Egret *Herodias egretta* (Gmel.).
- Little Blue Heron *Florida caerulea* (Linn.).
- Snowy Egret *Egretta candidissima* (Gmel.).
- Black-crowned Night
Heron *Nycticorax nycticorax naevius*
(Bodd.).
- European Night Heron *Nycticorax nycticorax* (Linn.).
- Green Heron *Butorides virescens* (Linn.).
- Louisiana Heron *Hydranassa tricolor ruficollis*
(Gosse).
- Tiger Bittern *Heterocnus cabanisi* (Heine).

Order PALAMEDEIFORMES, Screamers.

Sub-Order Palamedeae.

Family PALAMEDIDAE, Screamers.

Crested Screamer *Chauna cristata* (Swains.).

Order PHOENICOPTERIFORMES, Flamingos.

Family PHOENICOPTERIDAE, Flamingos.

- American Flamingo *Phoenicopterus ruber* Linn.
European Flamingo *Phoenicopterus roseus* Pall.

Order **ANSERIFORMES**, Swans, Geese, and Ducks.

Family ANATIDAE, Swans, Geese, and Ducks.

- | | |
|-------------------------------|---|
| Bewick Swan | <i>Cygnus bewicki</i> Yarr. |
| Whistling Swan | <i>Cygnus columbianus</i> (Ord.). |
| Trumpeter Swan | <i>Cygnus buccinator</i> Richards. |
| Mute Swan | <i>Cygnus olor</i> Gmel. |
| Black-necked Swan | <i>Cygnus melanocoryphus</i> (Mol.). |
| Black Swan | <i>Chenopsis atrata</i> (Lath.). |
| Semipalmated Goose | <i>Anseranus semipalmata</i> (Lath.). |
| Spur-winged Goose | <i>Plectropterus gambensis</i> (Linn.). |
| Muscovy Duck | <i>Cairina moschata</i> (Linn.). |
| Wood Duck | <i>Aix sponsa</i> (Linn.). |
| Mandarin Duck | <i>Aix galericulata</i> (Linn.) |
| Snow Goose | <i>Chen hyperborea</i> (Pall.). |
| Greater Snow Goose | <i>Chen hyperborea nivalis</i> (Forst.). |
| Wild Gray Goose | <i>Anser anser</i> (Linn.). |
| White-fronted Goose | <i>Anser albifrons</i> (Gmel.). |
| Bean Goose | <i>Anser fabilis</i> Lath. |
| Pink-footed Goose | <i>Anser brachyrhynchus</i> (Baill.). |
| Bar-head Goose | <i>Eulabia indica</i> (Lath.). |
| Chinese Goose | <i>Cygnopsis cygnoides</i> (Linn.). |
| Canada Goose | <i>Branta canadensis</i> Linn. |
| Hutchin Goose | <i>Branta canadensis hutchinsii</i> (Richards). |
| Brant Goose | <i>Branta bernicla</i> (Linn.). |
| Fulvous Tree-duck | <i>Dendrocygna fulva'</i> (Gmel.). |
| Black-bellied Tree-duck | <i>Dendrocygna autumnalis</i> (Linn.). |
| Australian Tree-duck | <i>Dendrocygna arcuata</i> (Horsf.). |
| Java Tree-duck | <i>Dendrocygna javanica</i> (Horsf.). |
| Bahama Tree-duck | <i>Dendrocygna arborea</i> (Linn.). |
| Egyptian Goose | <i>Alopochen aegyptiacus</i> (Linn.). |
| Ruddy Sheldrake | <i>Casarca casarca</i> (Linn.). |
| Mallard Duck | <i>Anas boschas</i> Linn. |

- Black Duck *Anas obscuras* Gmel.
 Red-legged Black Duck .. *Anas obscuras rubripes* Brewst.
 Australian Gray Duck..... *Anas superciliosa* Gmel.
 Gadwall Duck *Chaulelasmus strepera* Linn.
 European Widgeon *Mareca penelope* (Linn.).
 Baldpate *Mareca americana* (Gmel.).
 American Green-winged
 Teal *Nettion carolinensis* (Gmel.).
 Garganey Teal *Querquedula querquedula* (Linn.).
 Blue-winged Teal *Querquedula discors* (Linn.).
 Pintail Duck *Dafila acuta* (Linn.).
 Rosy-billed Duck *Metopiana peposaca* (Vieill.).
 Pochard Duck *Aythya ferina* (Linn.).
 Red-head Duck *Aythya americana* (Eyt.).
 Canvas-back Duck *Aythya vallisneria* (Wils.).
 Tufted Seaup Duck..... *Aythya fuligula* (Linn.).

Order PELECANIFORMES, Cormorants, Pelicans, etc.

Family PHALACROCORACIDAE, Cormorants.

- Double-crested Cormorant. . *Phalacrocorax dilophus* (Swains.).
 Florida Cormorant *Phalacrocorax dilophus floridanus* (Ord.).

Family SULIDAE, Gannets.

- Gannet *Sula bassana* (Linn.).

Family FREGATIDAE, Frigate Birds.

- Frigate Bird *Fregata aquila* Linn.

Family PELECANIDAE, Pelicans.

- European White Pelican .. *Pelecanus onocrotalus* Gmel.
 Red-backed Pelican *Pelecanus rufescens* Gmel.
 Brown Pelican *Pelecanus occidentalis* Linn.
 American White Pelican... *Pelecanus erythrorhynchus* Gmel.
 Black-backed Pelican *Pelecanus conspicillatus* Temm.

Order **CATHARTIDIFORMES**, American Condors and
Vultures.

Family CATHARTIDAE.

- King Vulture *Gypagus papa* (Linn.).
- Condor *Sarcorhamphus gryphus* (Linn.).
- Black Vulture *Catharista urubu* (Vieill.).
- Turkey Vulture *Cathartes aura* (Linn.).
- California Condor *Gymnogyps californianus* (Shaw).

Order **ACCIPITRIFORMES**, Hawks, Eagles, and Old World
Vultures.

Sub-Order **Accipitres**.

Family VULTURIDAE, Old World Vultures.

- Griffon Vulture *Gyps fulvus* (Gmel.).

Family FALCONIDAE, Hawks and Eagles.

- Caracara *Polyborus cheriway* (Jacq.).
- Cooper Hawk *Accipiter cooperii* (Bonap.).
- Sennett White-tailed Hawk. *Buteo albicaudatus sennetti* Allen.
- European Buzzard *Buteo buteo* (Linn.).
- Red-tailed Hawk *Buteo borealis* (Gmel.).
- Red-shouldered Hawk *Buteo lineatus* (Gmel.).
- Golden Eagle *Aquila chrysaetos* (Linn.).
- Rough-legged Hawk *Archibuteo lagopus sancti-johannis* (Gmel.).
- Bateleur Eagle *Helotarsus ecaudatus* (Daud.).
- Vulturine Sea Eagle *Gypohierax angolensis* (Gmel.).
- European Red Kite *Milvus milvus* (Linn.).
- Bald Eagle *Haliaetus leucocephalus* (Linn.).
- American Duck Hawk *Falco peregrinus anatum* (Bonap.).
- White Gyrfalcon *Falco islandus* Brunn.
- Kestrel *Falco tinnunculus* Linn.
- Short-winged Sparrow Hawk *Falco brevipennis* Berl.
- Cuban Sparrow Hawk *Falco sparverioides* Vig.

Sub-Order **Pandiones.**

Family PANDIONIDAE, Ospreys or Fish Hawks.

- American Osprey *Pandion haliaetus carolinensis*
 (Gmel.).

Order **STRIGIFORMES.**

Family BUBONIDAE, Horned Owls and others.

- Giant Eagle Owl *Bubo bubo* (Linn.).
 Great Horned Owl *Bubo virginianus* (Gmel.).
 Western Horned Owl *Bubo virginianus pallescens* Stone.
 Dusky Horned Owl *Bubo virginianus saturatus* Ridgw.
 Cape Eagle Owl *Bubo capensis* Smith.
 Snowy Owl *Nyctea nyctea* (Linn.).
 Spectacle Owl *Pulsatrix perspicillata* (Lath.).
 Little Scops Owl *Scops scops* (Linn.).
 Screech Owl *Megascops asio* (Linn.).
 Tawny Owl *Syrnium aluco* (Linn.).
 Barred Owl *Syrnium varium* (Barton).
 Saw-whet Owl *Cryptoglaux acadica* (Gmel.).
 European Little Owl *Athene noctua* (Scop.).

Family STRIGIDAE, Barn Owls.

- American Barn Owl *Strix pratincola* Bonap.
 Cape Grass Owl *Strix capensis* Smith.

Order **PSITTACIFORMES**, Parrots, Macaws, Cockatoos,
 and Lories.

Family LORIIDAE, Lories.

- Scarlet Chattering Lory... *Lorius garrulus* (Linn.).

Family CACATUIDAE, Cockatoos.

- Gang-gang Cockatoo *Callocephalum galeatum* (Lath.).
 Sulphur-crested Cockatoo .. *Cacatua galerita* (Lath.).
 Leadbeater Cockatoo *Cacatua leadbeateri* (Vig.).
 Red-crested Cockatoo *Cacatua moluccensis* (Gmel.).
 Bare-eyed Cockatoo *Cacatua gymnopis* Scl.
 Roseate Cockatoo *Cacatua roseicapillus* Vieill.

Western Slender-billed

- Cockatoo *Licmetis pastinator* Gould.
Cockateel *Calopsittacus novae-hollandiae*
(Gmel.).

Family PSITTACIDAE, Macaws, Parrots, and Parrakeets.

- Blue-and-Yellow Macaw *Ara ararauna* (Linn.).
Red-and-Blue Macaw *Ara macao* (Linn.).
Austere Macaw *Ara severa* (Linn.).
Green-winged Macaw *Ara chloroptera* Gray.
Military Macaw *Ara militaris* (Linn.).
Great Green Macaw *Ara ambiguus* (Bechst.).
Illiger Macaw *Ara maracana* (Vieill.).
Blue-crowned Conure *Conurus haemorrhouss* (Spix.).
Yellow-headed Parrakeet *Conurus jendaya* (Gmel.).
Brown-throated Parrakeet *Conurus aeruginosus* (Linn.).
Yellow-faced Parrakeet *Conurus pertinax* (Linn.).
White-eared Parrakeet *Pyrrhura leucotis* (Kuhl.).
Pigmy Parrotlet *Psittacula spengeli* Hartl.
Canary-winged Parrakeet *Brotogeris chiriri* (Vieill.).
White-winged Parrakeet *Brotogeris virescens* (Gmel.).
Orange-winged Parrakeet *Brotogeris pyrrhopterus* (Lath.).
Tovi Parrakeet *Brotogeris jugularis* (Müll.).
Golden-naped Amazon *Amazona auripalliata* (Less.).
Yellow-shouldered Amazon *Amazona ochroptera* (Gmel.).
Yellow-fronted Amazon *Amazona ochrocephala* (Gmel.).
Mealy Amazon *Amazona farinosa* (Bodd.).
Blue-fronted Amazon *Amazona aestiva* (Linn.).
Yellow-headed Amazon *Amazona oratrix* Ridgw.
Dominican Amazon *Amazona ventralis* (Müll.).
White-fronted Amazon *Amazona leucocephala* (Linn.).
Bahama Amazon *Amazona bahamensis* (Bryant).
Red-faced Amazon *Amazona albifrons* (Sparrm.).
Blue-headed Parrot *Pionus menstruus* (Linn.).
Ring Parrakeet *Palaeornis eupatria* (Linn.).
Ring-necked Parrakeet *Palaeornis torquata* (Bodd.).
Blossom-headed Parrakeet *Palaeornis cyanocephala* (Linn.).
Banded Parrakeet *Palaeornis fasciata* (Müll.).
Gray-headed Love-birds *Agapornis cana* (Gmel.).

- Pale-headed Rosella *Platycercus pallidiceps* Vig.
 Rosella Parrakeet *Platycercus eximius* (Shaw).
 Undulated Grass Parrakeet. *Melopsittacus undulatus* (Shaw).
 Yellow Grass Parrakeet. *Melopsittacus undulatus* var.

Order **CORACIFORMES**, Kingfishers, Hornbills, etc.

Sub-Order **Halcyones**.

Family ALCEDINIDAE, Kingfishers.

Giant Laughing Kingfisher. *Dacelo gigas* (Bodd.).

Sub-Order **Bucerotes**.

Family BUCEROTIDAE, Hornbills.

Concave-easque Hornbill . . *Dichoceros bicornis* (Linn.).

Order **TROGONES**, Trogons.

Family TROGONIDAE, Trogons.

Cuban Trogon *Priotelus temnurus* (Temm.).

Order **COCCYGES**, Cuckoos.

Sub-Order **Cuculi**.

Family CUCULIDAE, Cuckoos.

Yellow-billed Cuckoo *Coccyzus americanus* (Linn.).

Roadrunner *Geococcyx californianus* (Less.).

Order **SCANSORES**, Barbets and Toucans.

Sub-Order **Capitones**.

Family CAPITONIDAE, Barbets.

Great Himalayan Barbet. . *Megalaema marshallorum* Swinh.

Sub-Order **Rhamphastides**.

Family RHAMPHESTIDAE, Toucans.

Toco Toucan *Rhamphastos toco* (Müll.).

Sulphur-breasted Toucan. . . *Rhamphastos carinatus* Swains.

Green-billed Toucan *Rhamphastos dicolorus* Linn.

Order **PICIFORMES**. Woodpeckers.

Sub-Order. **Pici.**

Family PICIDAE, Woodpeckers.

Order PASSERIFORMES. Perching Birds.

Division Mesomyodi.

Family TYRANNIDAE, Flycatchers.

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|------------|-----------------------------------|
| Phoebe | <i>Sayornis phoebe</i> (Lath.). |
| Kingbird | <i>Tyrannus tyrannus</i> (Linn.). |
| Wood Pewee | <i>Contopus virens</i> (Linn.). |

Division **Acromyodi.**

Family HIRUNDINIDAE, Swallows.

- European Swallow *Hirundo rustica* (Linn.).
Barn Swallow *Hirundo erythrogaster* Bodd.

Family PYCNONOTIDAE, Bulbuls.

- White-eared Bulbul *Otocompsa leucotis* (Gould).

Family TIMELIIDAE, Babblers.

- Himalayan Jay Thrush . . . *Garrulax leucolophus* (Hardw.).
 Melodious Thrush *Leucodioptron canorum* (Linn.).
 Red-bellied Hill Tit. *Liothrix luteus* (Scop.).

Family MIMIDAE, Mockingbirds.

- Mockingbird *Mimus polyglottos* (Linn.).
 Curacao Mockingbird *Mimus gilvus rostratus* Ridgw.
 Catbird *Galeoscoptes carolinensis* (Linn.).
 Brown Thrasher *Toxostoma rufum* (Linn.).
 Blue Mocking-thrush *Melanotis caerulescens* (Swains).

Family TURDIDAE, Thrushes.

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|---------------------------|--------------------------------------|------------|
| Mexican Solitaire | <i>Myiadestes obscurus</i> | (Lafr.). |
| Cuban Solitaire | <i>Myiadestes elizabethae</i> | (Lemb.). |
| Cuban Mocking-thrush | <i>Myiadestes elizabethae</i> | (Lemb.). |
| European Blackbird | <i>Merula merula</i> | (Linn.). |
| Robin | <i>Merula migratoria</i> | (Linn.). |
| Gray Robin | <i>Merula tristis</i> | (Swains.). |
| Ring Ouzel | <i>Turdus torquatus</i> | (Linn.). |
| Wood Thrush | <i>Hylocichla mustelina</i> | (Gmel.). |
| Wilson Thrush | <i>Hylocichla fuscescens</i> | (Steph.). |
| Bicknell Thrush | <i>Hylocichla aliciae bicknelli</i> | |
| | | (Ridgw.). |
| Olive-backed Thrush | <i>Hylocichla ustulata swainsoni</i> | |
| | | (Cab.). |
| Hermit Thrush | <i>Hylocichla guttata pallasii</i> | (Cab.). |
| Song Thrush | <i>Hylocichla musica</i> | (Linn.). |
| Rock Thrush | <i>Monticola saxatilis</i> | (Linn.). |
| Nightingale | <i>Aedon luscinia</i> | (Linn.). |
| English Robin | <i>Erithacus rubecula</i> | (Linn.). |
| Shama Thrush | <i>Cittocincla tricolor</i> | (Vieill.). |
| Wheatear | <i>Saxicola oenanthe</i> | (Linn.). |
| Black-capped Thrush-Robin | <i>Catharus mexicanus</i> | (Bonap.). |
| Bluebird | <i>Sialia sialis</i> | (Linn.). |

Family SYLVIDAE, Old World Warblers.

- Whitethroat *Sylvia sylvia* (Linn.).
 Lesser Whitethroat *Sylvia curruca* (Linn.).
 Blackcap Warbler *Sylvia atricapilla* (Linn.).
 Willow Warbler *Phylloscopus trochilus* (Linn.).
 Wood Warbler *Phylloscopus sibilator* (Sal.).

Family VIREONIDAE, Vireos.

- Warbling Vireo *Vireo gilvus* (Vieill.).

Family AMPELIDAE, Waxwing Chatterers.

- Cedar Waxwing *Ampelis cedrorum* (Vieill.).

Family LANIIDAE, Shrikes.

- Loggerhead Shrike *Lanius ludovicianus* (Linn.).
Red-backed Shrike *Enneocotonus collaris* (Linn.).

Family PARIDAE, Chickadees and Titmice.

- Black-capped Chickadee . . *Penthestes atricapilla* (Linn.).
 Marsh Titmouse *Poecile palustris* (Linn.).
 Great Titmouse *Parus major* Linn.
 Blue Titmouse *Cyanistes caeruleus* (Linn.).
 White-headed Long-tailed
 Titmouse *Aegithalus caudatus* (Linn.).
 Long-tailed Titmouse . . . *Aegithalus roseus* (Blyth).

Family MNIOTILTIDAE, American Warblers.

- Black-and-White Warbler . . *Mniotilla varia* (Linn.).
 Prairie Warbler *Dendroica discolor* (Vieill.).
 Myrtle Warbler *Dendroica coronata* (Linn.).
 Blackpoll Warbler *Dendroica striata* (Forst.).
 Redstart Warbler *Setophaga ruticilla* (Linn.).
 Ovenbird *Seiurus aurocapillus* (Linn.).
 Water-thrush *Seiurus noveboracensis* (Gmel.).

Family MOTACILLIDAE, Wagtails and Pipits.

- Pied Wagtail *Motacilla lugubris* (Temm.).
Yellow Wagtail *Motacilla campestris* (Pall.).

Family ALAUDIDAE, Larks.

Family FRINGILLIDAE, Sparrows, Grosbeaks, and Buntings.

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|------------------------|---|
| Cuban Bullfinch | <i>Melopyrrha nigra</i> (Linn.). |
| Melodious Grassquit | <i>Euetheia canora</i> (Gmel.). |
| Yellow-faced Grassquit | <i>Euetheia olivacea</i> (Linn.). |
| Bahama Grassquit | <i>Euetheia bicolor</i> (Linn.). |
| Pyrrhuloxia | <i>Pyrrhuloxia sinuata</i> Bonap. |
| Chaffinch | <i>Fringilla coelebs</i> Linn. |
| Brambling | <i>Fringilla montifringilla</i> (Linn.). |
| European Goldfinch | <i>Carduelis carduelis</i> (Linn.). |
| American Goldfinch | <i>Astragalinus tristis</i> (Linn.). |
| European Siskin | <i>Chrysomitris spinus</i> (Linn.). |
| Pine Siskin | <i>Spinus pinus</i> (Wils.). |
| Redpoll | <i>Acanthis linearia</i> (Linn.). |
| Linnet | <i>Cannabina cannabina</i> (Linn.). |
| Mountain Finch | <i>Passer montanus</i> (Linn.). |
| English Sparrow | <i>Passer domesticus</i> (Linn.). |
| Canary | <i>Serinus canaria</i> (Linn.). |
| Canary+European | |
| | Goldfinch. Hybrid. |
| Saffron Finch | <i>Sycalis flaveola</i> (Linn.). |
| Rosy Finch | <i>Carpodacus erythrinus</i> (Pall.). |
| Purple Finch | <i>Carpodacus purpureus</i> (Gmel.). |
| House Finch | <i>Carpodacus mexicanus frontalis</i>
(Say). |
| Mexican House Finch | <i>Carpodacus mexicanus</i> (Müll.). |
| Bullfinch | <i>Pyrrhula europaea</i> Vieill. |
| Reed Bunting | <i>Emberiza schoeniclus</i> Linn. |
| Yellow-hammer | <i>Emberiza citrinella</i> Linn. |
| Ortolan Bunting | <i>Emberiza hortulana</i> Linn. |
| White-throated Sparrow | <i>Zonotrichia albicollis</i> (Gmel.). |
| White-crowned Sparrow | <i>Zonotrichia leucophrys</i> (Forst.). |
| Indigo Bunting | <i>Cyanopiza cyanea</i> (Linn.). |
| Tree Sparrow | <i>Spizella monticola</i> (Gmel.). |
| Slate-colored Junco | <i>Junco hyemalis</i> (Linn.). |
| Chipping Sparrow | <i>Spizella socialis</i> (Wils.). |
| Field Sparrow | <i>Spizella pusilla</i> (Wils.). |
| Vesper Sparrow | <i>Pooecetes gramineus</i> (Gmel.). |
| Song Sparrow | <i>Melospiza cinerea melodia</i> (Wils.). |
| Swamp Sparrow | <i>Melospiza georgiana</i> (Lath.). |
| Fox Sparrow | <i>Passerella iliaca</i> (Merr.). |

- Pileated Finch *Coryphospingus pileatus* Neuw.
 Red-crested Cardinal *Paroaria cucullata* (Lath.).
 Red-headed Cardinal *Paroaria larvata* (Bodd.).
 Chestnut-capped
 Buarremon Sparrow .. *Buarremon brunneinuchus* (Lafres.).

Family COEREBIDAE, Sugar-birds and Honey-creepers.

- Yellow-winged Sugar-bird.. *Coereba cyanea* (Linn.).

Family TANAGRIDAE, Tanagers.

- Abbot Tanager *Tanagra abbas* Licht.
 Scarlet Tanager *Piranga erythromelas* Vieill.
 Brick-red Tanager *Piranga testacea* ScL.
 Red-crowned Tanager *Tachyphonus coronatus* (Vieill.).

Family PLOCEIDAE, Weaver-birds.

- Paradise Whydah *Vidua paradisea* (Linn.).
 Red-shouldered Whydah .. *Coliuspasser progne* (Bodd.).
 Crimson-crowned Weaver .. *Pyromelana flammiceps* Swains.
 Orange Weaver *Pyromelana franciscana* (Isert).
 Napoleon Weaver *Pyromelana afra* Gmel.
 Red-billed Masked Weaver. *Quelea quelea* Linn.
 Bronze Mannikin *Spermestes cucullatus* Swains.
 Magpie Mannikin *Amaurosthes fringilloides* Lafres.
 Cut-throat *Amadina fasciata* Gmel.
 Red-headed Finch *Amadina erythrocephala* (Linn.).
 Combassou *Hypochera aenea* Hartl.
 Zebra Finch *Taeniopygia castanotis* (Gould).
 Strawberry Finch *Sporaeginthus amandava* (Linn.).
 Orange-cheeked Finch *Sporaeginthus melpodus* Vieill.
 White Java Sparrow..... *Munia oryzivora* var.
 Java Sparrow *Munia oryzivora* Linn.
 Three-colored Mannikin .. *Munia malacca* Linn.
 White-headed Mannikin .. *Munia maja* Linn.
 Black-headed Mannikin .. *Munia atricapilla* Vieill.
 Spice Mannikin *Munia punctulata* Linn.
 Bengalee *Aidemosyne malabarica* + *Uroloncha striata* (?).
 Indian Silver-bill *Aidemosyne malabarica* Linn.

Gould Yellow-rumped

- Mannikin *Munia flavigyrnna* Gould.
 Red-tailed Finch *Bathilda ruficauda* (Gould).
 Long-tailed Grass Finch ... *Poephila acuticauda* Gould.
 Grass Finch *Poephila cineta* Gould.
 St. Helena Waxbill..... *Estrilda astrilda* Linn.
 Common Waxbill *Estrilda cinerea* Vieill.
 Scaly-fronted Weaver *Sporopipes squamifrons* (Smith).
 Madagascar Weaver *Foudia madagascariensis* Linn.
 Reichenback Masked
 Weaver *Hyphantornis taeniopterus* (Reich.).

Family ICTERIDAE. Cowbirds, Blackbirds, and American Orioles.

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|-----------------------------------|--------------------------------------|------------|
| Bobolink | <i>Dolichonyx oryzivorus</i> | (Linn.). |
| Cowbird | <i>Molothrus ater</i> | (Bodd.). |
| Dwarf Cowbird | <i>Molothrus ater obscurus</i> | (Gmel.) |
| Red-eyed Cowbird | <i>Callothrush robustus</i> | (Cab.). |
| Red-winged Blackbird | <i>Agelaius phoeniceus</i> | (Linn.). |
| Vera Cruz Red-winged
Blackbird | <i>Agelaius phoeniceus richmondi</i> | Nelson. |
| Rufous-shouldered
Blackbird | <i>Agelaius humeralis</i> | (Vig.). |
| Yellow-headed Blackbird | <i>Xanthocephalus xanthocephalus</i> | (Bonap.). |
| Orange-headed Blackbird | <i>Amblyrhynchus holosericeus</i> | (Scop.). |
| Meadowlark | <i>Sturnella magna</i> | (Linn.). |
| Baltimore Oriole | <i>Icterus galbula</i> | (Linn.). |
| Orchard Oriole | <i>Icterus spurius</i> | (Linn.). |
| Cuban Oriole | <i>Icterus hypomelas</i> | (Bonap.). |
| Wagler Oriole | <i>Icterus wagleri</i> | Scl. |
| Hooded Oriole | <i>Icterus cucullatus</i> | (Swains.). |
| Yellow-tailed Oriole | <i>Icterus mesomelas</i> | (Wagl.). |
| Troupial | <i>Icterus icterus</i> | (Linn.). |
| Purple Grackle | <i>Quiscalus quiscula</i> | (Linn.). |
| Bronzed Grackle | <i>Quiscalus quiscula aeneus</i> | (Ridgw.). |
| Great-tailed Grackle | <i>Megaquiscalus major macrourus</i> | Swains. |

Family EULABETIDAE, Glossy Starlings.

Purple-crowned Glossy

- Starling *Calornis metallica* (Temm.).
Green Glossy Starling *Calornis chalybea* (Horsf.).

Family STURNIDAE, Starlings and Mynas.

- English Starling *Sturnus vulgaris* Linn.
Malabar Myna *Poliopsar malabaricus* (Gmel.)
Black-headed Myna *Temenuchus pagodarum* (Gmel.).
Common Myna *Acridotheres tristis* (Linn.).
Larger Hill Myna *Mainatus intermedius* (Hay).
Rose-colored Pastor *Pastor roseus* (Linn.).

Family CORVIDAE, Ravens, Crows, and Magpies.

- Rook *Corvus frugilegus* Linn.
European Raven *Corvus corax* Linn.
American Raven *Corvus corax sinuatus* (Wagl.)
Jackdaw *Corvus monedula* Linn.
American Crow *Corvus brachyrhynchos* (Brehm).
Fish Crow *Corvus ossifragus* Wils.
European Magpie *Pica pica* Linn.
European Jay *Garrulus glandarius* (Linn.).
Blue Jay *Cyanocitta cristata* (Linn.).
Alpine Chough *Pyrrhocorax alpinus* Vieill.

BY-LAWS
OF THE
NEW YORK ZOOLOGICAL SOCIETY
AMENDED TO JANUARY 15, 1907

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 as 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 \$10,000, or any Founder who shall donate \$5,000, 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.

Index

- ACCOUNT, income, 32, 44
Ackerman, Chief Clerk G. K., 39
Acknowledgments, 38, 79
Actinomycosis, 137
Actinomycosis, diagnosis of, 140
Administration building, 35
Alligator, American, 143
growth of, 143, 153
mississippiensis, 143
Ambloplites rupestris, 108
Ameiurus nebulosus, 110
marmoratus, 110
An anglers' paradise, 111
Animals, health of, 54
Aquarium, 37
fish culture, 89
history, 87
maintenance of, 33
report of director, 83
school work, 85
temperatures at, 88
Arctictis binturong, 129
Asio accipitrinus, 174
wilsonianus, 172
Attendance, Aquarium, 31, 84, 85
Zoological Park, 31, 53
- BAIRD Court, 34
walls and stairways, 71
work on, 64
Barney, Charles T., 42
Bass, black, book of, 111
breeding habits of, 111
habits and culture of, 110
large-mouthed, 107
small-mouthed, 107
small-mouthed, propagation, 111
Bear dens, water supply at, 66
Beaver pond pipe line, 64
Beebe, Curator C. W., 57, 157
Beerbower, Geo. M., 78
- Berry, Comr. Jos. I., 39
Biological laboratory, 35
Birds, summary of, 59
Bishop, Henry, 87
Boat House, 34, 74
Bourne, Frederick G., 33
Bronx River, preservation of, 37
Buildings, new, 34
public comfort, 71
Buffalo Range, the large, 67
- CAGE paralysis, 128
Cardeza, T. D. M., 33
Caprimulgidae, 161
Carp and its culture, 111
Catfish, common, 110
Civil engineering, 78
Clark, Master Billy, 87
Collections, animal, 35
size of, 54
summary of, 61
Congo Free State, 61
Corrals, buffalo, 62
Costain, E. H., 72
Crappie, 109
Cryptoglaux acadica, 178
tengmalmi richardsoni, 178
Currys' Sons, William, 87
Cysts, tape-worm, 128
Cytosporá, 36
- DEATHS, table of, 131
- Department, administration, 73
bird, 57
engineering, 78
forestry, 36
mammal, 56
medical, 36
park, 56
photography and publications, 79
reptile, 59

Dimock, A. W., 33, 86
 Director, report of, 53
 Diseases, unusual, 130
 Distemper, 129
 Ditmars, Curator R. L., 55, 59
 Duel, Dr. A. B., 33
 EGER, Theodore G., 86
 Estimate, board of, 55
 Executive committee, 41
 report of, 31
 Enteritis, gastro, 127
 FEED barn, 71, 77
 Fences and gates, 63
 Finley, W. L., 58
 Fish Commission, New York, 86
 Fish culture for farmers, 112
 manual of, 110
 modern, in fresh and salt water,
 110
 notes on, 111
 on the farm, 111
 utilizing water by, 111
 hatching and fish catching, 111
 poisoning, 130
 Fisheries, bureau, U. S., 86
 Forest fires, 69
 Forestry, 68
 Fund, animal, 32, 45
 Aquarium, 50
 Aquarium improvement, 33, 49
 general, 32, 43
 ground improvement, 32, 47
 maintenance, 32, 46
 GAME protection, 36
 Gastro-enteritis, 127
 Gate receipts, 77
 Gifts, important, 33
 list of, 113
 Glass court, 71
 Glaucidium, gnoma, 191
 phalaenoides, 191
 Guide book, 75
 Gottsleben, Emil, 87
 Greenleaf, James L., 36
 Ground Improvements, Contract
 work, 69

HARRIMAN, E. H., 33
 Heads and horns, national collection
 of, 36, 41
 Hennessy, Asst. Eng. W. P., 39
 Herrman, Hon. Moses, 38
 Holmes, E. A., 58
 Hoot-owl, 175
 Hornaday, Director William T., 37,
 53, 80
 House, elephant, 55
 small-deer, 34, 62, 69
 ICE manufacturing plant, 78
 Improvements, 62
 Injuries, 130
 Insect pests, 68
 Intestinal parasites, 128
 JACOB, Capt. Paul, 87
 James, Mrs. Arthur Curtiss, 33
 LAING, H. O., 55
 Lepomis pallidus, 109
 MAINTENANCE, 72
 Mammals, department of, 55
 summary of, 57
 Marone americana, 109
 interrupta, 109
 Mayer, Dr. A. G., 87
 McLaughlin, James, 58
 McClellan, Hon. Geo. B., 38
 McMillin, Emerson, 33
 Merkel, Chief Constructor H. W.,
 36, 62, 72
 Metz, Hon. Herman A., 38
 Micropallas whitneyi, 192
 Micropterus dolomieu, 107
 salmoides, 107
 Miscellaneous items, 67
 Mitchell, Chief Clerk H. R., 73
 William, 73
 Mombasa, 55
 Morris, A. Newbold, 38
 Museum, American, 55
 NYCTEA nyctea, 184
 OTUS asio, 179
 Ovis stonei, 137

- Owls, 157
 barn, 167, 168
 barred, 167, 175
 burrowing, 167, 186
 dwarf horned, 182
 elf, 167, 192
 great gray, 167, 176
 great horned, 167, 182
 hawk, 167, 186
 long-eared, 167, 171
 pygmy, 167, 191
 Richardson, 178
 saw-whet, 167, 178
 screech, 167, 179
 short-eared, 167, 171
 snowy, 167, 184
- PARALYSIS, cage, 128
- Parasites, intestinal, 128
 unusual, 129
- Pavilion, entrance, at West Farms, 71
- Pelham Avenue entrance, 71
- Perca flavescens*, 108
- Perch, white, 109
 yellow, 108
- Photography and publications, 79
- Planting, 68
- Pneumonia, 127
 verminous broncho, 128
- Pomoxis annularis*, 109
sparoides, 109
- Pond culture, 90, 111
- Ponds and lakes, natural, 94
 pond culture methods, 112
- Publications, 33
- QUARANTINE, 129
- RED-EYE, 108
- Redfield, Miss Bessie, 87
 Master Edward, 87
- Reptiles, summary of, 61
- Reese, Dr. Albert M., 149
- Riding animals, 77
- Roccus chrysops*, 109
- Restaurant, Rocking Stone, 75
- SANBORN, Elwin R., 79
- Schenck, Chief Engineer Martin, 39
- Schuylerville, Philip, 38, 87
- Schiff, Jacob, 33
- Scotiaptex nebulosa*, 176
- Seborrhoeic folliculitis, 132
- Service road, completion of, 62
- Sheep, black mountain, 137
- Shelton, F. H., 87
- Shields, G. O., 36
- Shooting in the Park, 69
- Skin disease, peculiar, 132
- Soda water, 75
- Souvenir book, 77
 postal cards, 75
- Speke gulf, 55
- Speotyto cunicularia*, 187
floridana, 188
hypogaea, 187
- Staphylococcus pyogenes*, 132
- Steatornis*, 161
- Steatornithidae*, 161
- Strigidae*, 158
- Strigiformes*, 158
- Strix pratincola*, 168
- Syrnium occidentale*, 176
 varium, 175
- Surnia ulula caparoch*, 186
- TAPE-WORM cysts, 128
- Thorne, Samuel, 33, 56
- Tjader, Richard, 35, 55
- Townsend, Director C. H., 89
- Treasurer's statements, 43
- Trout, domesticated, 111
- Tuberculosis, 129
- UNUSUAL diseases, 130
 parasites, 129
- VICTORIA Nyanza, 55
- VERNER, Samuel P., 61
- Veterinarian, report of, 127
- WEST FARMS block, 67
 entrance, 63
- Western boundary fence, 64
- Wichita forest reserve, 36

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