

Article V.—A NEW CLASSIFICATION OF MAMMALS

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INTRODUCTION

The following classification is an attempt to present a workable synthesis of recent taxonomic studies on mammals living and fossil. It is obvious that no one student or group of students can hope to make an arrangement of any large group of animals that can claim to be definitive or that will be acceptable to the specialist in all its details. Nor is it possible simply to combine the work of specialists on each group, for these are of such different dates and written from such divergent viewpoints that they cannot be unified except with much editing. In spite of these and other manifest difficulties, there is a real need for a general classification not wholly satisfied by those available, and no apology is necessary for trying to fill this need in some measure.

The aim of this classification is primarily practical. It has grown out of the attempt to arrange a large collection for cataloguing, storage, exhibition, and teaching. It follows that the classification is conservative so far as consistent with available opinion and recent advances in knowledge. The multiplication of groups has been avoided so far as possible, as well as their undue elevation in rank, as inconsistent with the aims of a general working and teaching classification. The ideal, perhaps unattainable, has been to avoid both splitting to the point of cumbersome confusion and lumping to the point of failure to represent the true state of present knowledge.

The classification has been critically examined by the following authorities: Henry Fairfield Osborn, Walter Granger, Barnum Brown, W. K. Gregory, Childs Frick, W. D. Matthew, and R. T. Hatt. Cordial thanks are due to all of these for their helpful criticism. T. S. Palmer has also given appreciated aid in tracing the origin of certain names used.

A numerical comparison of the present classification with the progressive work of Gill in 1872 is instructive regarding the trend of mammalian taxonomy. The exact figures are dependent on personal opinion, but their relationships would be approximately retained in any modern classification.

This classification includes 242 families; Gill's, 138. In this classification there are 129 extinct and 113 living families; in Gill's, 33 are extinct and 105 living.

Of Gill's extinct families, 22 are here retained (not invariably under the same name); one (Dromatheriidæ) is removed from the Class Mammalia, and ten are united with others of Gill's families. The latter were separated by Gill chiefly because their true relationships were indeterminate from the materials then available. For instance, he did not recognize the relationships between *Sivatherium*, *Helladotherium*, and *Giraffa*.

Of Gill's living families, 88 are retained in some form, and 17 are united with various of these. All of these seventeen are retained in some recent classifications, but in the present instance it has seemed out of balance with the great bulk of the whole class to separate such manifestly allied groups as the Phacochoeridæ and Suidæ, for instance.

In the present classification there are thus 107 extinct families and 25 recent families not recognized by Gill. The reasons for this increase are different in the two cases: the increase in number of extinct families is mostly due to new discoveries, that in recent families almost entirely to change of opinion and only indirectly to discovery.

Of the 107 new extinct families, only 38 include species known before Gill's work was sent to press. Even in these cases knowledge at that time was for the most part based on such fragmentary materials that their distinctive characters could not be appreciated. These changes are thus largely due to the discovery of better specimens of known species or of their allies. The remaining 69 extinct families are based on forms not known at all when Gill wrote.

Of the 25 living families not separated by Gill under any name, 22 include species known previous to 1872. Their separation is due to change of opinion, partly induced by restudy of the material already available in Gill's day, but perhaps more largely but less directly by the revaluation of the whole class in view of the more abundant fossil materials since discovered. A single one of these (Cænolestidæ) must perhaps be excepted, for it was neglected after its first discovery ("*Hyracodon*" Tomes, 1860) and recognized as distinct only when rediscovered (*Cænolestes* Thomas, 1895), although in the meantime Ameghino had established the same family (under the invalid name Epanorthidæ, 1889) on the basis of fossil forms. There are, however, only three families of living mammals in this classification which were really discovered subsequent to 1872: Dinomyidæ, Myzopodidæ, and Notoryctidæ, all monotypic.

It is clear that, so far as the number of families known is concerned, the progress of the last sixty years is due almost entirely to palæontologi-

cal discovery. Despite the addition of numerous new species and the splitting up of old groups, the discovery of new living mammals has added almost nothing to the broader taxonomy of the Class.

The same is true in but little less degree of the more important questions of relationships and arrangement. Changes between the classifications of sixty years ago and those of to-day owe much to research on the comparative anatomy of recent animals, but even more to the discovery of their extinct ancestors. Neither method is conclusive without the other, but the principal change since 1872 seems to be that palæontology has become the more important factor in dealing with questions related to classification. In the very nature of the problem this tendency will increase rather than decrease. Great as is the detailed work yet to be done, recent mammalogy can have little or nothing further to offer in the way of outstanding new discoveries, and promises more in the fields of ecology and biology than in taxonomy. The rate of palæontological discovery, whether of new groups or, what is even more important, of better materials of known groups, has not yet begun to diminish, and the problems of phylogeny and taxonomy become more and more the peculiar field of the palæomammalogist.

SYNOPTIC CLASSIFICATION

CLASS MAMMALIA

Subclass PROTOTHERIA

Order MONOTREMATA

¹†Subclass ALLOTHERIA

†Order MULTITUBERCULATA

†Suborder TRITYLODONTOIDEA

†Suborder PLAGIAULACOIDEA

Mammalia incertæ sedis

†Order TRICONODONTA

Subclass THERIA

†Infraclass PANTOTHERIA

†Order PANTOTHERIA

†Order SYMMETRODONTA

Infraclass METATHERIA

Order MARSUPIALIA

Superfamily Didelphioidea

†Superfamily Borhyænoidea

¹ †=Extinct, on this and the following pages.

Superfamily Dasyuroidea
 Superfamily Perameloidea
 Superfamily Cænolestoidea
 Superfamily Phalangeroidea

Infraclass EUTHERIA**Order INSECTIVORA**

†Superfamily Deltatheridioidea
 Superfamily Tenrecoidea
 Superfamily Chrysochloroidea
 Superfamily Erinaceoidea
 Superfamily Soricoidea
 Superfamily Tupαιοidea
 †Superfamily Pantolestoidea

†**Order TILLODONTIA****Order DERMOPTERA****Order CHIROPTERA**

Suborder MEGACHIROPTERA

Suborder MICROCHIROPTERA

Superfamily Emballonuroidea
 Superfamily Rhinolophoidea
 Superfamily Phyllostomatoidea
 Superfamily Vespertilionoidea

Order PRIMATES

Suborder LEMUROIDEA

Suborder TARSIOIDEA

Suborder ANTHROPOIDEA

Superfamily Ceboidea
 Superfamily Cercopithecoidea
 Superfamily Hominoidea

†**Order TÆNIODONTA****Order EDENTATA**

†Suborder PALÆANODONTA

Suborder XENARTHRA

Infraorder PILOSA

†Superfamily Megalonychoidea
 Superfamily Myrmecophagoidea
 Superfamily Bradypodoidea

Infraorder LORICATA

Superfamily Dasypodoidea
 †Superfamily Glyptodontoidea

- Suborder PHOLIDOTA
- Order RODENTIA
 - Suborder DUPLICIDENTATA
 - Suborder SIMPLICIDENTATA
 - Infraorder SCIUROMORPHA
 - Superfamily Aplodontoidea
 - Superfamily Sciuroidea
 - Superfamily Geomyoidea
 - Superfamily Castoroidea
 - Superfamily Anomaluroidea
 - Infraorder MYOMORPHA
 - Superfamily Myoidea
 - Superfamily Myoxoidea
 - Superfamily Dipodoidea
 - Infraorder HYSTRICOMORPHA
 - Superfamily Bathyergoidea
 - Superfamily Hystricoidea
- Order CARNIVORA
 - †Suborder CREODONTA
 - †Superfamily Arctocyonoidea
 - †Superfamily Mesonychoidea
 - †Superfamily Oxyænoidea
 - †Superfamily Miacoidea
 - Suborder FISSIPEDIA
 - Superfamily Canoidea
 - Superfamily Feloidea
 - Suborder PINNIPEDIA
- Order CETACEA
 - †Suborder ARCHÆOCETI
 - Suborder ODONTOCETI
 - Suborder MYSTICETI
- †Order CONDYLARTHRA
- Order TUBULIDENTATA
- †Order AMBLYPODA
- †Order DINOCERATA
- †Order NOTOUNGULATA
 - †Suborder ENTELONYCHIA
 - †Suborder ASTRAPOTHERIA
 - †Suborder TOXODONTA
 - †Suborder TYPOTHERIA

- †Order PYROTHERIA
- †Order LITOPTERNA
- Order PROBOSCIDEA
 - †Superfamily Mœritherioidea
 - †Superfamily Dinotherioidea
 - †Superfamily Mastodontoidea
 - Superfamily Elephantoidea
- †Order BARYTHERIA
- Order HYRACOIDEA
- Order SIRENIA
 - Suborder TRICHECHIFORMES
 - †Suborder DESMOSTYLIFORMES
- †Order EMBRITHOPODA
- Order PERISSODACTYLA
 - Superfamily Equoidea
 - †Superfamily Brontotherioidea
 - Superfamily Tapiroidea
 - Superfamily Rhinoceroidea
- Order ARTIODACTYLA
 - Suborder BUNODONTA
 - †Superfamily Dichobunoidea
 - Superfamily Suoidea
 - †Suborder ANCODONTA
 - †Superfamily Anthracotherioidea
 - †Superfamily Cænotherioidea
 - †Superfamily Agriochœroidea
 - Suborder TYLOPODA
 - Superfamily Cameloidea
 - Suborder PECORA
 - Superfamily Traguloidea
 - Superfamily Cervoidea
 - Superfamily Giraffoidea
 - Superfamily Bovoidea

DETAILED CLASSIFICATION

The following classification includes all taxonomic groups down to the families. The units employed are: Class, Subclass, Infraclass, Order, Suborder, Infraorder, Superfamily, and Family. Cohorts and Superorders have not been employed, because this cannot be done consistently within a whole Infraclass with true expression of relationships according

to the present state of knowledge. Popular names are omitted, because they are usually either mere anglicized versions of the scientific names or are not accurately applicable to the whole of a taxonomic group.

In addition to the classification itself, every name (except those of superfamilies, which merely grow out of the families) is followed by its author and date of publication so far as ascertained. The authority given is not invariably that for the first use in exactly the present form. This can be learned from the various available catalogues and indices (especially Palmer), which the present paper is not intended to supplant. The first conception of the group as such, and under approximately its present name, is the important point, and not the exact way in which various authors may be pleased to spell its name, so that nonessential changes of a letter or two have generally been ignored.

Well-known synonyms have been placed in brackets after the names here used. The general geologic and geographic distribution of each family is given by the following abbreviations:

L., lower	Pleist., Pleistocene
M., middle	R., Recent
U., upper	N. A., North America
Paleoc., Paleocene	S. A., South America
Eoc., Eocene	Eu., Europe
Olig., Oligocene	As., Asia
Mioc., Miocene	Af., Africa
Plio., Pliocene	Aus., Australia and adjacent islands.

Some references and notes follow the classification.

CLASS MAMMALIA Linnæus, 1758

A. Subclass PROTOTHERIA Gill, 1872

I. Order MONOTREMATA Bonaparte, 1838 [= Ornithodelphia Blainville, 1834].

Fam. Tachyglossidæ Gill, 1872 [= Echidnidæ Burnett, 1830, invalid name].
Pleist.-R.; Aus.

Fam. Ornithorhynchidæ Gray, 1869.
Pleist.-R.; Aus.

†B. Subclass ALLOTHERIA Marsh, 1880

†I. Order MULTITUBERCULATA Cope, 1884.

†1. Suborder TRITYLODONTOIDEA Simpson, 1928.

†Fam. Tritylodontidæ Cope, 1884. U.
Triassic; Eu., Af. M. Jurassic; Eu.

†2. Suborder *PLAGIAULACOIDEA* Simpson, 1928.

†Fam. *Plagiaulacidae* Gill, 1872. U. Jurassic; Eu., N. A. L. Cretaceous; Eu.

†Fam. *Ptilodontidae* Simpson, 1927. U. Cretaceous; N. A., As. Paleoc.; N. A., Eu. Eoc.; N. A.

†Fam. *Tæniolabididae* Granger and Simpson, 1929 [= *Polymastodontidae* Cope, 1884, invalid name]. Paleoc.; N. A., As.

Multituberculata? inc. sed.

†Fam. *Microcleptidae* Simpson, 1928 [= *Microlestidae* Marsh, 1887, invalid name]. U. Triassic or L. Jurassic; Eu.

Mammalia inc. sed.†Order *TRICONODONTA* Osborn, 1888.

†Fam. *Triconodontidae* Marsh, 1887. M. Jurassic; Eu. U. Jurassic; Eu., N. A.

C. Subclass *THERIA* Parker and Haswell, 1897 [= *Eutheria* Gill, 1872, but not *Eutheria* of Huxley and most other authors].†AA. Infraclass *PANTOTHERIA* Simpson, 1929.†I. Order *PANTOTHERIA* Marsh, 1880 [= *Trituberculata* Osborn, 1888].

†Fam. *Amphitheriidae* Owen, 1846. M. Jurassic; Eu.

†Fam. *Paurodontidae* Marsh, 1887. U. Jurassic; Eu., N. A., Af.

†Fam. *Dryolestidae* Marsh, 1879 [= *Amblotheriidae* Osborn, 1887]. U. Jurassic; Eu., N. A.

†Fam. *Docodontidae* Simpson, 1929 [= *Diplocynodontidae* Marsh, 1887, invalid name]. U. Jurassic; Eu., N. A.

†II. Order *SYMMETRODONTA* Simpson, 1925.

†Fam. *Spalacotheriidae* Marsh, 1887. U. Jurassic; Eu., N. A.

†Fam. Amphidontidæ Simpson, 1925. U.
Jurassic; N. A.

BB. Infraclass METATHERIA Huxley, 1880 [=Marsupialia,
sens. lat.]

I. Order MARSUPIALIA Illiger, 1811 [=Didelphia Blain-
ville, 1816].

Superfamily Didelphioidea

Fam. Didelphiidæ Gray, 1821. Cretace-
ous; N. A. Paleoc.; Eu.?, N. A.
Eoc.-Olig.?.; Eu., N. A., S. A.
Mioc.; Eu., N. A.?, S. A. Plioc.;
S. A. Pleist.-R.; N. A., S. A.

†Fam. Caroloameghiniidæ Ameghino,
1901. Eoc.; S. A.

†Superfamily Borhyænoidea [=Sparassodonta]

†Fam. Borhyænidæ Ameghino, 1894.
Eoc.-Plioc.; S. A.

Superfamily Dasyuroidea

Fam. Dasyuridæ Waterhouse, 1838.
Pleist.-R.; Aus.

Fam. Notoryctidæ Ogilby, 1891. R.; Aus.

Superfamily Perameloidea

Fam. Peramelidæ Gray, 1825. Pleist.-
R.; Aus.

Superfamily Cænolestoidea

Fam. Cænolestidæ Trouessart, 1898
[=Epanorthidæ Ameghino, 1889,
invalid name]. Eoc.-R.; S. A.

†Fam. Polydolopidæ Ameghino, 1897.
Eoc.; S. A.

Superfamily Phalangeroidea

Fam. Phalangeridæ Thomas, 1888
[=Phalangistidæ Gray, 1821, in-
valid name]. Plioc.-R.; Aus.

†Fam. Thylacoleonidæ Gill, 1872. Pleist.;
Aus.

Fam. Phascolomiidæ Goldfuss, 1820.
Pleist.-R.; Aus.

Fam. Macropodidæ Burnett, 1830.
Pleist.-R.; Aus.

- †Fam. Diprotodontidæ Gill, 1872. Pleist.:
Aus.
- CC. Infraclass EUTHERIA Huxley, 1880 [or Gill, 1872, but not
in the usage now generally adopted, = Monodelphia
Blainville, 1816, = Placentaria Fleming, 1822, =
Placentalia Owen, ca. 1837].
- I. Order INSECTIVORA Gray, 1827.
- †Superfamily Deltatheridioidea
- †Fam. Deltatheridiidæ Gregory and Simp-
son, 1926. U. Cretaceous; As. L.
Eoc.; N. A.?
- Superfamily Tenrecoidea [= Centetoidea Gill,
1872, invalid name. With Chrysochloroidea =
Zalambdodonta Gill, 1885].
- †Fam. Palæoryctidæ, new. Paleoc.;
N. A.
- †Fam. Apternodontidæ Matthew, 1910.
Olig.; N. A.
- Fam. Tenrecidæ Gray, 1821. [= Centeti-
dæ Bonaparte, 1838, invalid name].
Pleist.-R.; Madagascar.
- Fam. Potamogalidæ Allman, 1865. R.;
Af.
- Fam. Solenodontidæ Gill, 1872. Pleist.-
R.; West Indies.
- Superfamily Chrysochloroidea
- Fam. Chrysochloridæ Gray, 1825. R.; Af.
Chrysochloroidea? inc. sed.
- †Fam. Necrolestidæ Ameghino, 1894.
Mioc.; S. A.
- Superfamily Erinaceoidea
- †Fam. Zalambdalestidæ Gregory and
Simpson, 1926. U. Cretaceous; As.
- †Fam. Leptictidæ Gill, 1872. Paleoc.-
Olig.; N. A. Paleoc.?, Eoc.-Olig.; As.
- Fam. Erinaceidæ Fischer, 1817. Eoc.-R.;
Eu. Olig. and Plioc.; N. A. R;
N. Af. Olig., Pleist.-R.; As.
- †Fam. Dimyldæ Schlosser, 1887. Olig.-
Mioc.; Eu.

Superfamily Soricoidea

†Fam. Nyctitheriidae Simpson, 1928.

Paleoc.-Eoc.; N. A. Eoc.; Eu.

Fam. Soricidae Fischer, 1817. Olig. and

Pleist.-R.; N. A. Olig.-R.; Eu.

R.; As., Af.

Fam. Talpidae Fischer, 1817. Olig.-R.;

N. A. Eoc.-R.; Eu. R.; As.

†Fam. Nesophontidae Anthony, 1916.

Pleist.; West Indies.

Superfamily Tupaioidae [= Menotyphla Haeckel, 1866].

†Fam. Anagalidae Simpson (in press).

Olig.; As.

Fam. Tupaiidae Gray, 1825. R.; As.

Fam. Macroscelididae Bonaparte, 1838.

R.; Af.

†Superfamily Pantolestoidea

†Fam. Pantolestidae Cope, 1884. Paleoc.-

Eoc.; N. A. L. Eoc.; Eu.

Insectivora inc. sed.

†Fam. Apheliscidae Matthew, 1918. L.

Eoc.; N. A.

†Fam. Mixodectidae Cope, 1883. Paleoc.-

Eoc.; N. A.

†II. Order TILLODONTIA Marsh, 1875.

†Fam. Esthonychidae Cope, 1883. L.

Eoc.; Eu., N. A.

†Fam. Tillotheriidae Marsh, 1875 [= An-

chippodontidae Gill, 1872, validity
doubtful]. M.-U. Eoc.; N. A.

III. Order DERMOPTERA Illiger, 1811.

Fam. Galæopithecidae Gray, 1821. R.; As.

Dermoptera?? inc. sed.

†Fam. Plagiomenidae Matthew, 1918. U.

Paleoc., L. Eoc.; N. A.

IV. Order CHIROPTERA Blumenbach, 1779.

1. Suborder MEGACHIROPTERA Dobson, 1875.

Fam. Pteropodidae Gray, 1821. Olig.;

Eu. R.; Af., S. As., Aus.

2. Suborder MICROCHIROPTERA Dobson, 1875.

Superfamily Emballonuroidea

Fam. Rhinopomidæ Bonaparte, 1838.

R.; N. Af., S. As.

Fam. Emballonuridæ Gervais, 1855. L.

Olig.; Eu., S. A., S. N. A., Af., S. As., Aus.

Fam. Noctilionidæ Gray, 1821. R.; S. A.

Superfamily Rhinolophoidea

Fam. Nycteridæ Van der Hoeven, 1855.

R.; Af., S. As.

Fam. Megadermatidæ Allen, 1864. L.

Olig., M. Mioc.; Eu. R.; Af., S. As., Aus.

Fam. Rhinolophidæ Gray, 1825. Eoc-

Mioc.; Eu. R.; Eu., Af., As., Aus.

Fam. Hipposideridæ Lydekker, 1891.

Pleist.-R.; As. R.; Af., S. As., Aus.

Superfamily Phyllostomatoidea

Fam. Phyllostomatidæ Gray, 1825.

Pleist.-R.; S. A. U. Paleoc.; N. A.

Olig.; N. Af. R.; Tropical America.

Fam. Chilonycteridæ Miller and Rehn,

1901. R.; Tropical America.

Superfamily Vespertilionoidea

Fam. Natalidæ Gray, 1866. R.; Tropical America.

Fam. Furipteridæ Gray, 1866. R.; Tropical America.

Fam. Thyropteridæ Miller, 1907. R.; Tropical America.

Fam. Myzopodidæ Thomas, 1904. R.; Madagascar.

Fam. Vespertilionidæ Gray, 1821. L.

Olig.-R.; Eu. Pleist.-R.; N. A., S. A. Eoc.; N. A. R.; almost world-wide.

Fam. Mystacopidæ Miller, 1907 [=Mystacinæ Dobson, 1875, invalid name]. R.; New Zealand.

Fam. Molossidæ Gervais, 1855. Olig.-
L. Mioc., R.; Eu. R.; world-wide
in warmer regions.

Superfamily uncertain:

†Fam. Archæonycteridæ Revilliod, 1917.
Eoc.; Eu.

†Fam. Palæochiropterygidæ Revilliod,
1917. Eoc.; Eu.

V. Order PRIMATES Linnæus, 1758.

1. Suborder LEMUROIDEA Mivart, 1864.

†Fam. Adapidæ Trouessart, 1879 [In-
cluding Notharctidæ Trouessart,
1879]. Eoc.; Eu., N. A.

Fam. Lemuridæ Gray, 1821. Pleist.-R.;
Madagascar.

Fam. Indrisidæ Burnett, 1828. R.;
Madagascar.

†Fam. Plesiadapidæ Trouessart, 1897.
U. Paleoc.-Eoc.; N. A., Eu.

Fam. Daubentoniidæ Gray, 1863 [= Chei-
romyidæ Gray, 1821, invalid
name]. R.; Madagascar.

Fam. Lorisidæ Gray, 1821. R.; Af., S.
As.

2. Suborder TARSIOIDEA

†Fam. Anaptomorphidæ Cope, 1883. M.
Paleoc.- M. Eoc.; N. A. Eoc.; Eu.

Fam. Tarsiidæ Gray, 1825. R.; East
Indies.

†Fam. Microchoeridæ Lydekker, 1887.
U. Eoc.; Eu.

3. Suborder ANTHROPOIDEA Mivart, 1864.

Superfamily Ceboidea [= Platyrrhini Ehrenberg,
1820].

Fam. Cebidæ Bonaparte, 1831. Mioc.-
R.; S. A. R.; Cent. A.

Fam. Hapalidæ Gray, 1821 [= Callotrichi-
dæ Gray, 1821]. R.; S. A., Cent. A.

Superfamily Cercopithecoidea [With Hominoidea
= Catarrhini Ehrenberg, 1820].

Fam. Cercopithecidae Gray, 1821 [=Cynopithecidae Geoffroy, 1843; Semnopithecidae Owen, 1843; including Parapithecidae Schlosser]. Olig.-R.; Af. Plioc.-R.; As. Plioc.-Pleist.; Eu. R.; Af., As., Gibraltar.

Superfamily Hominoidea

Fam. Pongidae Elliot, 1913 [=Simiidae Fleming, 1822, invalid name]. Mioc.-Plioc.; Eu. Mioc.-R.; Af., As.

Fam. Hominidae Gray, 1825. Pleist.; Eu., As., ?Af., ?N. A. R.; world-wide.

†VI. Order TÆNIODONTA Cope, 1876 [=Ganodonta Wortman, 1896].

†Fam. Stylinodontidae Marsh, 1875 [=Calamodontidae Cope, 1876; including Conoryctidae Wortman, 1896]. Paleoc.-M. Eoc.; N. A.

VII. Order EDENTATA Vicq d'Azyr, 1792 [=Bruta Linnæus, 1758].

†1. Suborder PALÆANODONTA Matthew, 1918.

†Fam. Metacheiromyidae Wortman, 1903. U. Paleoc.-M. Eoc.; N. A.

?Palæanodonta inc. sed.

†Fam. Epoicotheriidae Simpson, 1927. Olig.; N. A.

2. Suborder XENARTHRA Gill, 1884.

Infraorder PILOSA Flower, 1883 [=Anicanodonta Ameghino, 1889].

†Superfamily Megalonychoidea [=Gravigrada Owen, 1842].

†Fam. Megatheriidae Gray, 1821. Mioc.-Pleist.; S. A. Pleist.; N. A.

†Fam. Megalonychidae Ameghino, 1889. Olig.-Pleist.; S. A. Plioc.-Pleist.; N. A. Pleist.; West Indies.

†Fam. Mylodontidae Gill, 1872. Mioc.-Pleist.; S. A. Pleist.; N. A.

Superfamily Myrmecophagoidea [= Vermilingua Illiger, 1811, as emended].

Fam. Myrmecophagidæ Gray, 1825.
Pleist.-R.; S. A.

Superfamily Bradypodoidea [= Tardigrada Geoffroy and Cuvier, 1795].

Fam. Bradypodidæ Gray, 1821. Pleist.-R.; S. A.

Infraorder LORICATA Owen, 1842 [= Hicanodonta Ameghino, 1889].

Superfamily Dasypodoidea [= Dasypoda Hoernes, 1886].

Fam. Dasypodidæ Gray, 1821. Eoc.-R.; S. A. Pleist.-R.; N. A.

†Fam. Peltephilidæ Ameghino, 1894.
Olig.-Mioc.; S. A.

†Superfamily Glyptodontoidea [= Glyptodonta Ameghino, 1902].

†Fam. Glyptodontidæ Burmeister, 1879.
Olig.-Pleist.; S. A. Plioc.-Pleist.; N. A.

3. Suborder PHOLIDOTA Weber, 1904 [= Squamata Huxley, 1872].

Fam. Manidæ Gray, 1821. Olig.?-Mioc.?; Eu.? Pleist.-R.; As. R.; Af.

VIII. Order RODENTIA Vicq d'Azyr, 1792 [= Glires Linnaeus, 1758].

1. Suborder DUPLICIDENTATA Illiger, 1811 [= Lagomorpha Brandt, 1859].

Fam. Ochotonidæ Thomas, 1897 [= Lagomyidæ Lilljeborg, 1866, invalid name]. Olig.-R.; Eu. Pleist.-R.; N. A. Mioc.; Af. R.; As.

Fam. Leporidæ Fischer, 1817. Olig.-R.; N. A., As. Plioc.-R.; Eu. R.; S. A., Af.

2. Suborder SIMPLICIDENTATA Lilljeborg, 1866.

Infraorder SCIUROMORPHA Brandt, 1855.

Superfamily Aplodontoidea

†Fam. Ischyromyidæ Alston, 1876. Eoc.-
Olig.; N. A. Eoc.; Eu. Olig.; As.

†Fam. Mylagaulidæ Cope, 1881. Mioc.-
L. Plioc.; N. A.

Fam. Aplodontidæ Thomas, 1897
[=Haplodontini Brandt, 1855, in-
correct form]. U. Olig.?, Mioc.-R.;
N. A.

Superfamily Sciuroidea

Fam. Sciuridæ Hemprich, 1820. U. Olig.-
R.; N. A., Eu. R.; As., Af.

Superfamily Geomyoidea

Fam. Heteromyidæ Gray, 1868. Olig.-R.;
N. A.

Fam. Geomyidæ Bonaparte, 1850. U.
Eoc.?, U. Olig.-R.; N. A.

Superfamily Castoroidea

Fam. Castoridæ Hemprich, 1820. Plioc.-
R.; Eu. Mioc.-R.; N. A., R.; As.

†Fam. Chalicomyidæ Miller and Gidley,
1918. U. Olig.-Plioc.; N. A. Mioc.-
Plioc.; Eu.

Superfamily Anomaluroidea

Fam. Anomaluridæ Gervais, 1849. R.;
Af.

†Fam. Pseudosciuridæ Winge, 1887. U.
Eoc.- Olig.; Eu. L. Olig.; Af.

†Fam. Theridomyidæ Alston, 1876.
Eoc.-L. Mioc.; Eu. L. Mioc.?.; Af.?

Fam. Pedetidæ Owen, 1847 [=Pedestina
Gray, 1825, incorrect form]. Mioc.,
R.; Af.

Infraorder MYOMORPHA Brandt, 1855.

Superfamily Myoidea

Fam. Spalacidæ Gray, 1821. Mioc.-R.;
Eu. R.; As., N. Af.

Fam. Muridæ Illiger, 1815 [Including
Nesomyidæ Forsyth Major, 1897,
and many other subfamilies or pro-
posed families]. Olig.-R.; Eu. U.

Eoc.-R.; N. A., As. Pleist.-R.;
S. A. R.; world-wide.

†Fam. Cricetopidæ Matthew and
Granger, 1923. Olig.; As.

Superfamily Myoxoidea

Fam. Myoxidæ Gray, 1821 [=Mus-
cardinidæ Palmer, 1899=Gliridæ
Thomas, 1897, invalid name]. U.
Eoc.?, Mioc.-R.; Eu. R.; As., Af.

Fam. Platacanthomyidæ Alston, 1876.
R.; As.

Superfamily Dipodoidea

Fam. Dipodidæ Bonaparte, 1838 [In-
cluding Sicistidæ Allen, 1901, and
Zapodidæ Coues, 1875]. Mioc.,
R.; Af. Pleist.-R.; Eu., N. A. R.;
As.

Infraorder HYSTRICOMORPHA Brandt, 1855.

Superfamily Bathyergoidea

Fam. Bathyergidæ Waterhouse, 1841. L.
Mioc.?, R.; Af. Olig.; As.

Superfamily Hystricoidea

Fam. Hystricidæ Fischer, 1817. Plioc.-
R.; As. Olig.-R.; Eu. R.; Af.

Fam. Erethizontidæ Bonaparte, 1845.
Pleist.-R.; N. A. Olig.-R.; S. A.

Fam. Dinomyidæ Troschel, 1874. R.;
S. A. Pleist.; Porto Rico.

Fam. Dasyproctidæ Bonaparte, 1838.
Pleist.-R.; S. A.

Fam. Caviidæ Gray, 1821. Pleist.; N. A.
Olig.-R.; S. A.

Fam. Chinchillidæ Bennett, 1833. Olig.-
R.; S. A.

Fam. Capromyidæ H. Smith, 1842.
Mioc.-R.; S. A. R.; West Indies.

Fam. Octodontidæ Waterhouse, 1839.
Mioc.-R.; S. A.

Fam. Ctenodactylidæ Gervais, 1853. R.;
Af.

- Fam. Petromyidæ Tullberg, 1900. R.; Af.
 Fam. Thrinomyidæ Pocock, 1922 [= Aulacodina Bonaparte, 1845]. R.; Af.
 †Fam. Heptaxodontidæ Anthony, 1917. Pleist.; Porto Rico.

Rodentia? inc. sed.

- †Fam. Eurymylidæ Matthew, Granger, and Simpson, 1929. U. Paleoc.; As.

IX. Order CARNIVORA Vicq d'Azyt, 1792 [= Feræ Linnæus, 1758].

†1. Suborder CREODONTA Cope, 1875.

- †Superfamily Arctocyonoidea [= Procreodi Matthew].

- †Fam. Arctocyonidæ Giebel, 1855 [Including Oxyclænidæ Scott, 1892]. Paleoc.-L. Eoc.; N. A., Eu. Paleoc.; As.?

- †Fam. Triisodontidæ Scott, 1892. Paleoc.; N. A.

- †Superfamily Mesonychoidea [= Acreodi Matthew].

- †Fam. Mesonychidæ Cope, 1875. Paleoc.-Eoc.; N. A., Eu. Eoc.-Olig.?.; As.

- †Superfamily Oxyænoidea [= Pseudocreodi Matthew].

- †Fam. Oxyænidæ Cope, 1877. Eoc.; N. A., Eu.

- †Fam. Hyænodontidæ Leidy, 1869. Eoc.-Olig.; N. A., Eu. Paleoc.?, Eoc.-L. Mioc.; As. Olig.-L. Mioc.; Af.

- †Superfamily Miacoidea [= Eucreodi Matthew].

- †Fam. Miacidæ Cope, 1880. Eoc.; N. A., Eu.

2. Suborder FISSIPEDIA Fischer von Waldheim, 1813.

- Superfamily Canoidea [= Arctoidea Flower].

- Fam. Canidæ Fischer, 1817. U. Eoc.-R.; N. A., Eu. Olig.-R.; As. Pleist.-R.; Af., S. A., Aus.

- Fam. Procyonidæ Gray, 1825. Mioc.-R.; N. A. Plioc.; Eu. Pleist.-R.; As. Plioc.-R.; S. A.

- Fam. Ursidæ Fischer, 1817. Plioc.-R.;
Eu., As., N. A. Pleist.-R.; S. A.
- Fam. Mustelidæ Fischer, 1817. Olig.-R.;
Eu., As., N. A. Plioc.-R.; Af.
Pleist.-R.; S. A.
- Superfamily Feloidea [=Aeluroidea Flower].
- Fam. Viverridæ Gray, 1821. Mioc.-R.;
Eu. Plioc.-R.; As. R.; Af.
- Fam. Hyænidæ Gray, 1821. Plioc.-
Pleist.; Eu., As. Pleist.-R.; Af.
- Fam. Felidæ Fischer, 1817. Olig.-R.;
Eu., N. A. Mioc.-R.; Af., As.
Pleist.-R.; S. A.
3. Suborder PINNIPEDIA Storr, 1780.
- Fam. Otariidæ Gray, 1825. Mioc.-R.;
N. A., S. A. Pleist.-R.; Aus. R.;
Antarctic, Pacific, South Atlantic.
- Fam. Odobænidæ Allen, 1880 [=Tri-
chechidæ Gray, 1821, invalid name,
not Trichechidæ Gill, 1872]. Plioc.-
R.; Eu. Pleist.-R.; N. A. R.;
Arctic.
- Fam. Phocidæ Gray, 1821. Mioc.-R.;
Eu., N. A. Plioc.; N. Af. R.;
all seas.
- X. Order CETACEA Blumenbach, 1779 [=Cete Linnæus, 1758].
- †1. Suborder ARCHÆOCETI Flower, 1883. [=Zeuglo-
dontia Gill, 1872].
- †Fam. Protocetidæ Stromer, 1908. Eoc.;
Af.
- †Fam. Dorudontidæ Miller, 1923. U.
Eoc.; N. A. U. Olig.; Eu., New
Zealand.
- †Fam. Basilosauridæ Cope, 1867 [=Zeu-
glodontidæ Giebel, 1855, invalid
name]. Eoc.; Af. U. Eoc.; N. A.,
Eu.
2. Suborder ODONTOCETI Flower, 1864.
- †Fam. Patriocetidæ Abel, 1914, U. Olig.;
Eu.

- †Fam. Agorophiidæ Abel, 1913. U. Eoc.; N. A.
- †Fam. Squalodontidæ Brandt, 1873, U. Olig.-U. Mioc.; Eu. Mioc.; N. A. Mioc.-L. Plioc.; S. A. L. Mioc.; Aus., New Zealand.
- †Fam. Acrodelphidæ Abel, 1905. Mioc.; Eu., N. A.
- †Fam. Eurinodelphidæ Abel, 1901. Mioc.; Eu., N. A., Japan.
- Fam. Iniidæ Gray, 1846. Mioc.-Plioc.; S. A. L. Plioc.; N. A. R.; S. A., As.
- Fam. Ziphiidæ Gray, 1850. Mioc.-Plioc.; Eu. L. Mioc.; S. A. U. Mioc.; N. A. R.; all seas.
- Fam. Delphinidæ Gray, 1821. L. Mioc.-R.; Eu., N. A., S. A. L. Mioc.; N. Af. U. Mioc.-R.; Japan. Pleist.-R.; New Zealand. R.; all seas.
- Fam. Platanistidæ Gray, 1846. M. Mioc., Pleist.; N. A. R.; As.
- Fam. Delphinapteridæ Gill, 1871. Pleist.; N. A. R.; Arctic.
- Fam. Physeteridæ Gray, 1821 [Including Kogiidæ Gill, 1871]. L. Mioc.-R.; Aus., Eu. L. Mioc.; S. A. M. Mioc.-R.; N. A., Japan. R.; chiefly tropical seas.
3. Suborder MYSTICETI Flower, 1864.
- †Fam. Cetotheriidæ Brandt, 1872. M. Olig.-L. Plioc.; Eu. L. Mioc.; S. A. Mioc.; N. A.
- Fam. Rhachianectidæ Weber, 1904. R.; North Pacific.
- Fam. Balænopteridæ Gray, 1864. U. Mioc.-R.; N. A. L. Plioc.-R.; Eu. R.; all seas.
- Fam. Balænidæ Gray, 1821. L. Mioc., L. Plioc.-R.; S. A. L. Plioc.-R.; Eu. R.; all seas.

- †XI. Order *CONDYLARTHRA* Cope, 1881.
 †Fam. *Phenacodontidæ* Cope, 1881.
 Paleoc.-L. Eoc.; N. A. L. Eoc.; Eu.
 †Fam. *Meniscotheriidæ* Cope, 1882 [In-
 cluding *Pleuraspidotheriidæ* Zittel,
 1892]. U. Paleoc.-L. Eoc.; N. A.
 U. Paleoc.; Eu.
 †Fam. *Hyopsodontidæ* Trouessart, 1879
 [Including *Mioclænidæ* Osborn and
 Earle, 1895]. Paleoc.-Eoc.; N. A.
 Eoc.; As.?
- XII. Order *TUBULIDENTATA* Huxley, 1872.
 Fam. *Orycteropodidæ* Gray, 1821.
 Olig.?-Mioc.?; Eu.? L. Plioc.;
 Greece, Persia. R.; Af.
- †XIII. Order *AMBLYPODA* Cope, 1875.
 †Fam. *Pantolambdidæ* Cope, 1883.
 Paleoc.; N. A.
 †Fam. *Periptychidæ* Cope, 1882. Paleoc.;
 N. A.
 †Fam. *Coryphodontidæ* Marsh, 1876. U.
 Paleoc.-L. Eoc.; N. A. L. Eoc.;
 Eu. U. Eoc.; As.
Amblypoda? inc. sed.
 †Fam. *Tricuspidontidæ* Teilhard, 1922.
 U. Paleoc.; Eu.
- †XIV. Order *DINOCERATA* Marsh, 1872.
 †Fam. *Uintatheriidæ* Flower, 1876 [= *Eo-*
basileidæ Cope, 1873; *Dinoceratidæ*
 Zittel, 1893; *Tinoceratidæ* Marsh,
 1872]. U. Paleoc.; N. A. U.
 Paleoc.; As.
- †XV. Order *NOTOUNGULATA* Roth, 1903.
 †1. Suborder *ENTELONYCHIA* Ameghino, 1893.
 †Fam. *Arctostylopidæ* Schlosser, 1923.
 U. Paleoc.; As. L. Eoc.; N. A.
 †Fam. *Notostylopidæ* Ameghino, 1897.
 Eoc.; S. A.
 †Fam. *Isotemnidae* Ameghino, 1897.
 Eoc.-Olig.; S. A.

- †Fam. Homalodontotheriidae Ameghino, 1889. Eoc.-Mioc.; S. A.
- †2. Suborder ASTRAPOTHERIA Lydekker, 1893.
 - †Fam. Trigonostylopidae Ameghino, 1901. Eoc.-Olig.; S. A.
 - †Fam. Astrapotheriidae Ameghino, 1887. Eoc.-Mioc.; S. A.
- †3. Suborder TOXODONTA Owen, 1858.
 - †Fam. Toxodontidae Gervais, 1847. Olig.-Pleist.; S. A.
 - †Fam. Notohippidae Ameghino, 1894. Olig.-Mioc.; S. A.
 - †Fam. Leontiniidae Ameghino, 1895. Olig.-Mioc.; S. A.
- †4. Suborder TYPOTHERIA Zittel, 1893.
 - †Fam. Notopithecidae Ameghino, 1897. Eoc.-Olig.?.; S. A.
 - †Fam. Archæopithecidae Ameghino, 1897. Eoc.; S. A.
 - †Fam. Archæohyracidae Ameghino, 1897. Olig.; S. A.
 - †Fam. Typotheriidae Lydekker, 1886. Olig.-Pleist.; S. A.
 - †Fam. Interatheriidae Ameghino, 1887. Olig.-Mioc.; S. A.
 - †Fam. Hegetotheriidae Ameghino, 1894. Olig.-Pleist.; S. A.
- †XVI. Order PYROTHERIA Ameghino, 1895.
 - †Fam. Pyrotheriidae Ameghino, 1889. Eoc.-Olig.; S. A.
- †XVII. Order LITOPTERNA Ameghino, 1889.
 - †Fam. Didolodontidae Scott, 1913. Eoc.-Olig.; S. A.
 - †Fam. Proterotheriidae Ameghino, 1887. Olig.-Plioc.; S. A.
 - †Fam. Macraucheniidae Gill, 1872. Olig.-Pleist.; S. A.
- XVIII. Order PROBOSCIDEA Illiger, 1811.
 - †Superfamily Mœritherioidea
 - †Fam. Mœritheriidae Andrews, 1906.

U. Eoc.-L. Olig.; N. Af. U. Olig.?
As.?

†Superfamily Dinotherioidea

†Fam. Dinotheriidae Bonaparte, 1845.
Mioc.-L. Plioc.; Eu. L. Mioc.; Af.
U. Olig.? or L. Mioc.-L. Plioc.; As.

†Superfamily Mastodontoidea

†Fam. "Bunomastodontidae" Osborn,
1918 [Invalid name, = Palæomastod-
ontidae Andrews, 1906 = Trilopho-
dontidae auct.]. L. Olig.-Mioc.; Af.
U. Olig.-Plioc.; As. Mioc.-Plioc.;
Eu. Mioc.-L. Pleist.; N. A. Plioc.-
Pleist.; S. A.

†Fam. Mastodontidae Gray, 1821 [=
Mammutinae Hay, 1930]. Mioc.-
Plioc.; Eu. Mioc.-Pleist.; N. A.

Superfamily Elephantoidea

Fam. Elephantidae Gray, 1821. Plioc.-R.
As. U. Plioc.-Pleist.; Eu. Pleist.;
N. A., Guiana. Pleist.-R.; Af.

†XIX. Order BARYTHERIA Andrews, 1904.

†Fam. Barytheriidae Andrews, 1904. U.
Eoc.; N. Af.

XX. Order HYRACOIDEA Huxley, 1872.

†Fam. Saghatheriidae Andrews, 1906.
Olig.; Af. L. Plioc.; Greece.

†Fam. Myohyracidae Andrews, 1914. L.
Mioc.; Af.

Fam. Procaviidae Thomas, 1892 [= Hyra-
cidae Gray, 1821, invalid name]. R.;
Af., Western As.

XXI. Order SIRENIA Illiger, 1811.

1. Suborder TRICHECHIFORMES Hay, 1923.

†Fam. Prorastomidae Cope, 1889. Eoc.;
N. Af., West Indies.

Fam. Dugongidae Gray, 1821 [= Hali-
coridae Gray, 1825, invalid name].
U. Eoc.; N. Af. U. Eoc.-Plioc.;
Eu. Olig.-Plioc.; N. A. Olig.;

Madagascar. R.; Indian Ocean,
West Pacific.

Fam. Trichechidæ Gill, 1872 [= Manati-
dæ Gray, 1821, invalid name. Not
Trichechidæ Gray, 1821]. Pleist.-
R.; Atlantic N. A. and S. A. R.;
Atlantic Af.

†2. Suborder DESMOSTYLIFORMES Hay, 1923.

†Fam. Desmostylidæ Osborn, 1905.
Mioc.; Pacific N. A., Japan.

†XXII. Order EMBRITHOPODA Andrews, 1905 [= Barypoda
Andrews, 1904].

†Fam. Arsinoitheriidæ Andrews, 1904.
Olig.; N. Af.

XXIII. Order PERISSODACTYLA Owen, 1848.

Superfamily Equoidea [= Hippoidea].

†Fam. Palæotheriidæ Bonaparte, 1850.
Eoc.-L. Olig.; Eu. Eoc.; As.

Fam. Equidæ Gray, 1821. Eoc.-Pleist.,
N. A., Eu. Plioc.-R.; As., Af.
Pleist.; S. A.

†Superfamily Brontotherioidea [= Titanotherioi-
dea and Chalicotherioidea or Ancy-
lopoda].

†Fam. Brontotheriidæ Marsh, 1873
[= Titanotheriidæ Flower, 1876].
Eoc.-L. Olig.; N. A., Eu. Eoc.-
Olig.; As.

†Fam. Chalicotheriidæ Gill, 1872. Eoc.-
Mioc.; N. A. Olig.-L. Plioc.; Eu.
Eoc. ?, Olig.-Pleist.; As. Plioc.;
Af.?

Superfamily Tapiroidea

†Fam. Lophiodontidæ Gill, 1872. Eoc.;
Eu., N. A., As.

†Fam. Helaletidæ Osborn, 1892. Eoc.;
Eu., N. A., As.

Fam. Tapiridæ Gray, 1821. Eoc.-Pleist.;
N. A. Olig.-Plioc.; Eu. Pleist.-
R.; S. A., As.

Superfamily Rhinoceroidea

†Fam. Hyracodontidae Cope, 1879. Eoc.-Olig.; N. A., As.

†Fam. Hyrachyidae Osborn, 1892. Eoc.; N. A.

†Fam. Amynodontidae Scott and Osborn, 1883. Eoc.-Olig.; N. A., As. Olig., Eu.

Fam. Rhinocerotidae Gray, 1821. Olig.-R.; As. Mioc.-R.; Af. Eoc.-Pleist.; Eu. Olig.-Plioc.; N. A.

XXIV. Order ARTIODACTYLA Owen, 1848.

1. Suborder BUNODONTA Kowalevsky, 1873

†Superfamily Dichobunoidea

†Fam. Dichobunidae Turner, 1849. Eoc.; N. A., As.? Eoc.-L. Olig.; Eu.

†Fam. Entelodontidae Lydekker, 1883. Eoc.-L. Mioc.; N. A. Olig.; Eu., As.

Superfamily Suoidea

Fam. Tagassuidae Palmer, 1897 [= Dicotylidae Turner, 1850, invalid name]. Olig.-R.; N. A. Pleist.-R.; S. A.

Fam. Suidae Gray, 1821. L. Olig.-R.; Eu. Mioc.-R.; As. L. Mioc., Pleist.-R.; Af.

Fam. Hippopotamidae Gray, 1821. Plioc.-R.; Af. Plioc.-Pleist.; As. Pleist.; Eu.

†2. Suborder ANCODONTA Matthew, 1929.

†Superfamily Anthracotherioidea

†Fam. Anthracotheriidae Leidy, 1869. U. Eoc.-L. Mioc.; Eu., As. Olig.; N. A. Mioc.; Af.

†Fam. Anoplotheriidae Gray, 1821. Eoc.-Olig.; Eu. Eoc.; As.?

†Superfamily Cænotherioidea

†Fam. Cænotheriidae Cope, 1881. U. Eoc.-L. Mioc.; Eu.

†Superfamily Agriocheroidea

†Fam. *Agriochæridæ* Leidy, 1869. U.
Eoc.-Mioc.; N. A.

Fam. *Oreodontidæ* Leidy, 1869 [= *Mery-
coidodontidæ* Hay, 1902]. U. Eoc.-
L. Plioc.; N. A.

3. Suborder *TYLOPODA* Illiger, 1811.

Superfamily *Cameloidea*

†Fam. *Xiphodontidæ* Flower, 1884. U.
Eoc.-Olig.; Eu.

Fam. *Camelidæ* Gray, 1821. U. Eoc.-
Pleist.; N. A. Plioc.-R.; As.
Pleist.; Eu. Pleist.-R.; Af., S. A.

4. Suborder *PÉCORA* Linnæus, 1758.

Superfamily *Traguloidea*

†Fam. *Amphimerycidæ* Stehlin, 1906.
Eoc.-Olig.; Eu.

†Fam. *Hypertragulidæ* Cope, 1879. U.
Eoc.-Mioc.; N. A.

†Fam. *Protoceratidæ* Marsh, 1891.
Olig.-L. Mioc.; N. A.

Fam. *Tragulidæ* Milne-Edwards, 1864.
Olig.-L. Plioc.; Eu. Mioc.-R.; As.
R.; Af.

†Fam. *Gelocidæ* Schlosser, 1886. Olig.;
Eu.

Superfamily *Cervoidea*

Fam. *Cervidæ* Goldfuss, 1820. Olig.?,
Mioc.-R.; As. Mioc.-R.; N. A.,
Eu. Pleist.-R.; S. A.

Superfamily *Giraffoidea*

†Fam. *Palæomerycidæ* Lydekker, 1883.
Mioc.; N. A., Eu.

Fam. *Giraffidæ* Gray, 1821. Plioc.; Eu.
Mioc.-Plioc.; As. Plioc.-R.; Af.

Superfamily *Bovoidea*

Fam. *Antilocapridæ* Gray, 1866. M.
Mioc.-R.; N. A.

Fam. *Bovidæ* Gray, 1821. Plioc.-R.;
N. A. Mioc.-R.; Eu., As., Af.

Artiodactyla inc. sed.

†Fam. Leptochoeridæ Marsh, 1884.
Olig.; N. A.

NOTES

The following are the principal recent general works consulted, each containing a classification of all or of a considerable part of the Class Mammalia. Most of them also contain numerous references and important discussions of special groups, but will not be cited again.

- ABEL, O. 1914. *Die vorzeitlichen Säugetiere*. Jena.
- GREGORY, W. K. 1910. The orders of mammals. *Bull. Amer. Mus. Nat. Hist.*, XXVII.
- HAY, O. P. 1930. Second bibliography and catalogue of the fossil Vertebrata of North America. *Carnegie Instn. Washington, Pub. No. 390, Vol. II.*
- MILLER, G. S. 1912. *Catalogue of the mammals of western Europe*. British Museum (Natural History), London.
1924. *List of North American Recent mammals*. U. S. Nat. Mus., Bull. 128.
- OSBORN, H. F. 1910. *The age of mammals*. New York.
- PALMER, T. S. 1904. *Index genera mammalium*. U. S. Dept. Agriculture, Div. Biol. Surv., *North American Fauna*, No. 23.
- SCHLOSSER, M. 1923. *Mammalia*. In, *Zittel, Grundzüge der Paläontologie*, II Abt., 4te Aufl. Munich and Berlin.
- SCOTT, W. B. 1910. *A history of land mammals in the Western Hemisphere*. New York.
- WEBER, M., AND ABEL, O. 1928. *Die Säugetiere*. 2te Aufl. Bd. II, *Systematischer Teil*. Jena.
- WINGE, H. 1923-24. *Pattedyr-Slaegter*. Copenhagen.

MESOZOIC MAMMALS AND MAJOR DIVISIONS

The major arrangement of the Class and the arrangement of the Mesozoic mammals are based on all the literature studied and on original research, mostly summed up in the following:

- SIMPSON, G. G. 1928. *A catalogue of the Mesozoic Mammalia in the Geological Department of the British Museum*. British Museum (Nat. Hist.), London.
1929. *American Mesozoic Mammalia*. *Mem. Peabody Mus. Yale Univ.*, III, Pt. I.

MARSUPIALIA

The classification of the marsupials is a modification of the classic arrangement as developed by Owen, Waterhouse, Thomas, Bensley, and others, and is based on a review of all of the literature on fossil marsupials and much of that on recent forms, as well as of numerous

specimens. This is mostly summed up in the following, which includes a very extensive bibliography of fossil types:

SIMPSON, G. G. 1930. Post-Mesozoic Marsupialia. Fossilium Catalogus, I: Animalia, Pars 47.

The principal change in content is the inclusion of the Polydolopidæ, defended in the following paper:

SIMPSON, G. G. 1928. Affinities of the Polydolopidæ. Amer. Mus. Novitates, No. 323.

The classic divisions Polyprotodontia and Diprotodontia, or the non-synonymous alternatives Diadactyla and Syndactyla, are suppressed chiefly because it is impossible to give the perameloids and cænolestoids proper places in such an arrangement. The chief fault of the present system is that the first three superfamilies are more intimately related than are the last three. Definitive classification awaits the discovery of Tertiary marsupial faunas in Australia.

INSECTIVORA

The classification of the insectivores is based on original research on a number of fossil forms, and on numerous monographs, of which the following have particularly influenced certain points:

BROOM, R. 1916. On the structure of the skull in *Chrysochloris*. Proc. Zool. Soc. London, 1916, 449-459.

CARLSSON, A. 1909. Die Macroscelididæ und ihre Beziehungen zu den übrigen Insectivoren. Zool. Jahrb., Abt. Syst. etc., XXVIII, Heft 4, 349-400.

1922. Über die Tupaiidæ und ihre Beziehungen zu den Insectivora und den Prosimiæ. Acta Zool., III, 227-270.

CLARK, W. E. LE GROS. 1926. On the anatomy of *Ptilocercus lowii*. Proc. Zool. Soc. London, 1926, 1179-1309.

DOBSON, G. E. 1883-90. A monograph of the Insectivora. London.

GILL, T. 1875. Synopsis of insectivorous mammals. Bull. Geol. Geog. Surv., Washington.

LECHE, W. 1902, 1907. Zur Entwicklungsgeschichte des Zahnsystems der Säugertiere. Zoologica, XV, Heft 37, and XX, Heft 49.

MATTHEW, W. D. 1909. The Insectivora and Carnivora of the Bridger Basin. Mem. Amer. Mus. Nat. Hist., IX.

PARKER, W. K. 1885. On the structure and development of the skull in the Insectivora. Phil. Trans. Roy. Soc. London, 1885.

SIMPSON, G. G. 1928. Affinities of the Mongolian Cretaceous insectivores. Amer. Mus. Novitates, No. 330.

(In press). A new insectivore from the Oligocene of Mongolia.

The work of Carlsson seems to show that the family Macroscelididæ is not far removed from the Erinaceidæ. The name Menotyphla (and its complement Lipotyphla) is, therefore, suppressed, as it was based

rather on the Macroscelididæ than on the Tupaiidæ. The relationships of the Tupaiidæ with these groups is apparently closer than granted by Carlsson, however, a matter on which light is shed by the very important new family Anagalidæ, a discussion of which, by Simpson, is in press.

Broom's work is convincing to the extent of removing the Chrysochloridæ from the Tenrecoidea, but does not seem to guarantee the greater distinction claimed.

The terms *Zalambdodonta* and *Dilambdodonta* are also abandoned except for descriptive purposes. They are conveniently descriptive of certain types of teeth, but can hardly now be claimed to designate natural and comparable phylogenetic units.

CHIROPTERA

The families of bats are essentially those recognized by Miller, and their allocation into superfamilies, for the more convenient handling of so bulky a group, approximately follows the classic divisions established by Dobson, Winge, and others. Revilliod's two extinct families are of rather doubtful significance. In spite of his work, the fossil evidence within this group is very scanty and the classification correspondingly incomplete and uncertain.

DOBSON, G. E. 1878. Catalogue of the Chiroptera in the British Museum. London.

MILLER, G. S. 1907. The families and genera of bats. U. S. Nat. Mus., Bull. 57.

REVILLIOD, P. 1917-22. Contributions à l'étude des chiropères des terrains tertiaires. Mém. Soc. Pal. Suisse, XLIII-XLV.

WINGE, H. 1892. Jordfundne og nulevende Flagermus (Chiroptera). E Museo Lundii, Copenhagen.

PRIMATES

The classification of the primates follows in general the most recent views of Gregory, with the possible exception of the following points, from some of which he may differ:

The Hominidæ and Pongidæ are united as a superfamily distinct from that of the Old World monkeys, following what seems a reasonable interpretation of the anatomical and palæontological facts actually known, however contrary to more theoretical or more emotional interpretations.

The Plesiadapidæ are placed in this order, following Stehlin. Matthew strongly opposes this, placing them in the Menotyphla (Tupaioidæ), but he has not published the detailed evidence, and examination of many specimens has not revealed any good evidence for this arrange-

ment in my own opinion. Stehlin is not followed, however, in placing them in a special chiromyiform section.

The Anaptomorphidæ and Tarsiidæ are retained as separate, not from any strong conviction, but in the absence of any good skeletal evidence for uniting them.

GREGORY, W. K. 1922. The origin and evolution of the human dentition. Baltimore.
1928. The upright posture of man, etc. Proc. Amer. Phil. Soc., LXVII,
339-376.

1929. Our face from fish to man. New York.

Numerous other papers by Gregory are for the most part cited in those listed above, which also contain reference to the very rich literature of the Primates.

MATTHEW, W. D. 1915. A revision of the Lower Eocene Wasatch and Wind River Faunas. IV—Entelonychia, Primates, Insectivora (part).
Bull. Amer. Mus. Nat. Hist., XXXIV, 429-483.

STEHLIN, H. G. 1912, 1916. Säugetiere des schweizerischen Eozäns. [Primates.]
Abh. schweiz. pal. Ges., XXXVIII, XLI.

EDENTATA

The groups here united under the Edentata might equally well be made orders of a Superorder Edentata, but this arrangement is equally correct and makes the arrangement of the Class as a whole simpler.

The position of the Metacheiromyidæ and of the Epoicotheriidæ has been discussed by Matthew and by myself:

MATTHEW, W. D. 1918. A revision of the Lower Eocene Wasatch and Wind River faunas. Pt. V. Insectivora (continued), Glires, Edentata.
Bull. Amer. Mus. Nat. Hist., XXXVIII, 565-657.

SIMPSON, G. G. 1927. A North American Oligocene edentate. Ann. Carnegie Mus.,
XVII, 283-298.

(In press). *Metacheiromys* and the relationships of the Edentata. Bull.
Amer. Mus. Nat. Hist., LIX.

The classification of the Xanarthra is essentially the same as that now in widest use; see especially the following and papers therein cited:

FLOWER, W. H. 1882. On the mutual affinities of the Edentata. Proc. Zool. Soc.
London, 1882, 358-367.

SCHULTHESS, B. 1920. Beiträge zur Kenntniss d. Xanarthra, etc. Abh. schweiz.
pal. Ges., XLIV, 1-119.

SCOTT, W. B. 1903-1904. Mammalia of the Santa Cruz Beds. I, Edentata. Repts.
Princeton Exped. Patagonia, V, 1-364.

WINGE, H. 1915. Jordfundne og nulevende Gumlere (Edentata) fra Lagoa Santa,
etc. E Museo Lundii, III, pt. 2.

The position of the Pholidota is uncertain, pending discovery of undoubted Tertiary remains. Those from Europe referred to this group are highly dubious.

The group probably belongs with the edentates, but not surely. See Matthew, 1918; Simpson (in press, "*Metacheiromys* and the relationships of the Edentata," Bull. A. M. N. H., LIX), referred to above, and the following:

WEBER, M. 1894. Beitrag zur Anatomie und Entwicklung des Genus *Manis*. Zool. Ergebn. e. Reise in niederl. Ostindien, II. Leiden.

The removal of the *Orycteropodidæ* is mentioned on page 290.

RODENTIA

The classification of rodents is one of the most vexatious of taxonomic problems. The present attempt is based largely on the recent synthesis by Weber ("Die Säugetiere," cited above), which in turn departs relatively little from the customary scheme worked out by Brandt, Waterhouse, Alston, Tullberg, Major, Thomas, Winge, and others (cited in Weber).

The principal changes from Weber are the insertion of various fossil families, the suppression of certain recent families (such as the inclusive use of *Sciuridæ* or *Muridæ*), tentative separation of certain others, and minor changes in arrangement and terminology.

Although following conservative lines, his classification is highly unsatisfactory. The principal desideratum is a thorough review of the group in the light of the abundant extinct forms, and a consequent clearer apprehension of the real evolutionary bases for classification. In spite of various excellent studies (a few of which are cited below), this has not yet been consistently done, and the available classifications are based on conflicting taxonomic criteria and diametrically opposed and largely unestablished views of evolutionary trends.

The most recent classification is that of Miller and Gidley, who take a consistent and inclusive viewpoint, but who do not give adequate evidence for their results, many of which are at wide variance with the better documented conclusions of other students. The result seems more a key than a natural classification, and it involves so many debatable conclusions as to structure and evolution that it has not been followed here.

MATTHEW, W. D. 1910. On the osteology and relationships of *Paramys* and the affinities of the *Ischyromyidæ*. Bull. Amer. Mus. Nat. Hist., XXVIII, 43-71.

MILLER, G. S., AND GIDLEY, J. W. 1918. Synopsis of the supergeneric groups of rodents. Journ. Washington Acad. Sci., VIII, 431-448.

- SCHAUB, S. 1925. Die hamsterartigen Nagetiere des Tertiärs und ihre lebenden Verwandten. Abh. schweiz. pal. Ges., XLV.
- SCHLOSSER, M. 1884. Die Nager des europäischen Tertiärs. Paläontographica, XXXI.
- SCOTT, W. B. 1903-05. Glires of the Santa Cruz Beds. Repts. Princeton Exped. Patagonion, V.

CARNIVORA

The arrangement of the creodonts is that of Matthew (e.g., 1909, under Insectivora, above, and personal communication), except for the use of superfamilies rather than sections. The classification of the other carnivores is the generally accepted conservative scheme resulting from the work of Turner, Flower, Mivart, and others, and requires no comment.

CETACEA

The classification of the Cetacea follows Kellogg, except for the insertion of a few additional families following Abel and Weber (cited by Kellogg). The most dubious point is the inclusion of the Patriocetidae in the Odontoceti. This family is often placed in the Archæoceti and has been supposed to be related to the Mysticeti as well.

- KELLOGG, R. 1928. The history of whales. Their adaptation to life in the water. Quart. Rev. Biol., III, 29-76, 174-208.

CONDYLARTHRA

The union of Meniscotheriidae and Pleuraspidotheriidae and their place in the Condylarthra follow Teilhard and my own observations. The union of Hyopsodontidae and Mioclænidae and their place here follow Matthew (personal communication). The condylarths and other Paleocene mammals are reviewed in Matthew's revision of Puerco and Torrejon faunas soon to be published.

TUBULIDENTATA

The recent thorough review by Sonntag and others substantiates various earlier investigators in removing *Orycteropus* entirely from the vicinity of the Edentata. It seems to be a derivative of a proto-ungulate stock.

- SONNTAG, C. F., WOOLLARD, H. H., AND CLARK, W. E. LE GROS, 1925-26. A monograph of *Orycteropus afer*. Proc. Zool. Soc. London, 1925, 331-437, 1185-1235; 1926, 445-485.

AMBLYPODA AND DINOCERATA

The arrangement of these diverse families is tentative at best. On the basis of the teeth, a division into (1) Periptychidae, (2) Pantolambidae and Coryphodontidae, and (3) Uintatheriidae would be possible. The feet would rather suggest a division into (1) Periptychidae and Panto-

lambdidæ, and (2) Coryphodontidæ and Uintatheriidæ. These groups demand further research. They seem to be diverse lines from the most ancient ungulate stock, and their aggregation into higher than family units cannot yet be definitive. In addition to Matthew's Paleocene memoir, in progress, see the following and papers therein cited:

- OSBORN, H. F. 1898. Evolution of the Amblypoda. Part I. Taligrada and Pantodonta, Bull. Amer. Mus. Nat. Hist., X, 169-218.
- SIMPSON, G. G. 1929. A new Paleocene uintathere and molar evolution in the Amblypoda. Amer. Mus. Novitates, No. 387.

NOTOUNGULATA, PYROTHERIA, AND LITOPTERNA

The classification of the South American ungulates follows Scott, except in placing the Astrapotheria in the Notoungulata and separating the Pyrotheria. Without supporting belief in proboscidean relationships (especially Loomis), the very distinctive skull and dentition of *Pyrotherium* do seem to warrant ordinal separation, while the astrapotheres seem rather more intimately connected with the varied notoungulate group. Many early forms, involving to some extent the arrangement of the whole South American ungulate complex, are very poorly known, and study of these now in prospect will doubtless make necessary further taxonomic changes.

- LOOMIS, F. B. 1914. The Deseado Formation of Patagonia. Amherst.
- SCOTT, W. B. 1909-28. Mammalia of the Santa Cruz Beds. Toxodonta, Entelonychia, Astrapotheria. Repts. Princeton Exped. Patagonia, VI.
1910. Litopterna of the Santa Cruz Beds. Repts. Princeton Exped. Patagonia, VII.
1913. A history of land mammals of the Western Hemisphere, New York.
- SINCLAIR, W. J. 1909-28. Mammalia of the Santa Cruz Beds. Typotheria. Repts. Princeton Exped. Patagonia, VI.

PROBOSCIDEA

The Proboscidea are classified as in Osborn's forthcoming very extensive monograph of the Order, and his numerous preliminary papers. The name Bunomastodontidæ does not appear to be based on a valid genus, as required by the International Rules, but it would be inappropriate to make any change here.

BARYTHERIA, HYRACOIDEA, EMBRITHOPODA

Andrews' Orders Barytheria and Embrithopoda are of very doubtful origin and affinities and are retained as distinct for the present. The three-fold division of the Hyracoidea also follows Andrews.

- ANDREWS, C. W. 1906. A descriptive catalogue of the Tertiary Vertebrata of the Fayûm, Egypt, etc. British Museum (Natural History), London.
- MATSUMOTO, H. 1926. Contribution to the knowledge of the fossil Hyracoidea of the Fayûm, Egypt. Bull. Amer. Mus. Nat. Hist., LVI, 253-350.

SIRENIA

A subordinal division of the Sirenia was established by Hay and seems in accord with present knowledge. Personal study convinces me that Abel's views as to the affinities of *Desmostylus* with the Multi-tuberculata or Monotremata are untenable. Under the Dugongidæ are included several subfamilies sometimes raised to the rank of families, but rather clearly comprising diverse lines of a fairly unified stock and hence most fittingly retained in the present form. A summary of the whole Order, with an extensive bibliography, is in press.

- HAY, O. P. 1923. Characteristics of sundry fossil vertebrates. Pan-Amer. Geol., XXXIX, 101-120.
- SIMPSON, G. G. (In press.) Fossil Sirenia of Florida and the evolution of the Sirenia. Bull. Amer. Mus. Nat. Hist.

PERISSODACTYLA

The classification of the Perissodactyla follows Osborn rather closely, with slight modifications based on personal communication from Granger, Matthew, and Wood. The only unusual feature is the union of titanotheres and chalicotheres in one superfamily. They have been separated, even to being placed in distinct orders, but aside from the shape of the hooves they are in rather close structural agreement.

- OSBORN, H. F. 1929. The titanotheres of ancient Wyoming, Dakota, and Nebraska. U. S. Geol. Surv., Monograph 55.

ARTIODACTYLA

There is no more difficult taxonomic problem than the classification of the Artiodactyla. Numerous as they are, the recent forms present no special difficulties, but the extinct artiodactyls are so varied and so confusing in their resemblances and differences that they are not only hard to place themselves but give no consistent picture of the bases for primary division of the whole group.

The arrangement of Osborn and Matthew in Osborn's Age of Mammals (cited above) gives the sections Suina (entelodonts as well as Suoidea proper), Oreodonta, Tylopoda (camels only), Tragulina (Gelocidæ,

Hypertragulidæ, and Tragulidæ), and Pecora (Giraffidæ, Cervidæ, Merycodontidæ, Antilocapridæ, and Bovidæ), lumping all others in the manifestly unnatural group Primitive Artiodactyls.

The principal other noteworthy recent classifications of the order are those of Matthew and Stehlin. Although Stehlin's evidence is more fully presented, it seems to rely heavily on single characters, and the result is also rather inconvenient. It seems neither convenient nor natural to separate the Cænotherioidea and Dichobunoidea, when the even more diverse other families are all placed in a single division.

The arrangement of Matthew is here followed in essentials, but with the following chief changes:

His Palæodonta and Hyodonta are retained (as Dichobunoidea and Suoidea) but are united in the Suborder Bunodonta.

His Ancodonta is retained with the same content, but the presence of three quite distinguishable stocks is signaled by a superfamily division.

The Suborder Pecora has the same scope as in Matthew, essentially the classic ruminant unit, but it is also divided into superfamilies, which are probably natural in themselves, although their exact content may be in question. The Traguloidea, for instance, include a rather heterogeneous lot of forms and will perhaps be more restricted by future work.

Several families suppressed by Matthew are retained here: Agriochæridæ, Hypertragulidæ, Protoceratidæ, Gelocidæ, Palæomerycidæ, and Leptochoeridæ. This is done in most cases because doubtful and disputed affinities make their union with other families an assumption of knowledge and also make the practical use of the classification more difficult.

MATTHEW, W. D. 1929. Reclassification of the artiodactyl families. *Bull. Geol. Soc. Amer.*, XL, 403-408.

STEHLIN, H. G. 1906-10. Die Säugetiere des schweizerischen Eocaens. [Artiodactyla]. Pts. 4-6. *Abh. schweiz. pal. Ges.*, XXXIII, XXXV, XXXVI.

