

CHAPTER 2

DIVERSITY: THE ORDERS OF MAMMALS

Objectives.--This unit is intended to increase your acquaintance with the orders of living mammals. You should become familiar with adaptations (especially cranial and dental) of the various orders. Further, take this opportunity to build a sense for the relationships and diversity of the orders of mammals. At the conclusion of this unit, you should be able to key ANY mammalian skull to order, using the key below or another key. **(At the conclusion of the next unit, you should also be able to identify to order BY SIGHT--without the use of the key--the skull of any Coloradan mammal. Orders of Coloradan mammals are indicated with an asterisk in the key to orders.)**

The variety of mammals is remarkable. Extant mammals differ in weight by a factor of 10 million, from 3-gram shrews, bats, and mice (the mass of a U. S. penny) to 190-ton whales (the mass of three very full railway freight cars). They differ in length by a factor of 10^4 , from shrews and bats with bodies shorter than your little finger (50 mm) to whales the length of a gymnasium (35 m). There have been broad adaptive radiations in dental and dietary traits and modes of locomotion. This diversity is the underlying motif in this unit.

Several resources are available to you to help you meet your objectives. In the laboratory there will be a wide variety of museum specimens, skulls, skins, taxidermic mounts, and miscellaneous osteological materials. The laboratory involves using a key to orders of living mammals to identify specimens. Even if you can already identify a specimen to order by sight, you might wish to run it through the key anyway. This will allow a review of vocabulary and relationships.

Two tables provide summaries of data on mammals of the world. Table 2-1 is a synopsis of orders extant and extinct, with a note of their diversity and their distribution in time. Table 2-2 lists families of mammals of the world, their distribution, and tabulates approximate numbers of genera and species.

WANT ADDITIONAL MATERIAL? : In addition to the written materials in this manual, this is a good opportunity to get acquainted with several other published references. Vaughan (1986) is the standard textbook in mammalogy. Lawlor (1979) provided excellent, illustrated keys to the level of family and useful synopses of orders. Savage and Long (1986) is a beautifully illustrated appreciation of mammalian evolution. Your text (Pough et al. 2002) also is excellent. Eisenberg (1981) provided the detail in valuable appendices. Anderson and Jones (1984) cited a huge selection of literature. For a worldwide list of species of mammals, see Wilson and Reeder (1993). Walker's *Mammals of the World* is available in several editions. This reference includes an illustrated account of each mammalian genus; it improves with each edition. The series *Mammalian Species* includes detailed reviews of several of the species represented in the laboratory. There are other, semipopular, illustrated books for your use in the laboratory and in the library.

There are some other resources that you have paid for and of which you may wish to take advantage. The exhibit halls of the University of Colorado Museum are in Henderson Building, just west of the UMC. The lower east hall has a number of exhibits on mammals. Also, as residents of the Denver metropolitan area, you pay for the Denver Museum of Natural History and the Denver Zoological Gardens every time you buy anything that isn't groceries, through your generous support of the Scientific and Cultural Facilities District. Both are excellent facilities in their respective genres. Use them.

Just a suggestion: to summarize your observations and allow effective review, it might help to build a table of orders, diagnostic characters, examples seen, etc.

Keys.--This is the first of two laboratories that involves the use of taxonomic keys. Facility with the use of keys is an important skill to develop, if you have not yet had the opportunity to do so. The skill is partly transferable to other groups of organisms. All that you need to go from mammals to mushrooms is a different descriptive vocabulary. If the taxonomist's specialized terminology is baffling to you, by the way, you might wish to know about a book by Borror (1960), *Dictionary of Word Roots and Combining Forms*, which dissects technical terms to their classical roots, thus allowing you to see cognate terms and build mnemonic devices. Also, don't ignore the end-papers in Pough et al. (2002).

Class: **Mammalia**

Subclass: **Prototheria** (egg-laying mammals, platypus and echidna)

Subclass: **Theria** (therian mammals)

Infraclass: **Metatheria** ("Marsupials" marsupial mammals)

Infraclass: **Eutheria** (placental mammals)

KEY TO ORDERS OF LIVING MAMMALS OF THE WORLD

The following key is modified from that by DeBlase and Martin (1981). It is a complex key because it usually relies on characters of both skulls and "skins" and it uses fairly simple characters, demanding a minimal amount of specialized vocabulary. **An asterisk (*) indicates an order that occurs in Colorado, and that you must know on sight.** The key includes 22 orders. Please recall that there is no absolute agreement on this arrangement. The four marsupial orders were frequently considered a single order, Marsupialia. They are now known as the infraclass Metatheria. The Insectivora may be split into two or three distinct orders (Scandentia, Insectivora and Macroscelidea) and the order Dermoptera is, on occasion, included within the Insectivora. The Mysticeti and Odontoceti are often combined into a single order, Cetacea. Until fairly recently, seals, sea lions and walrus were considered to constitute an order Pinnipedia, distinct from Carnivora.

* * * * *

1	Teeth absent.	2
1'	Teeth present.	6
2	Greatest length of skull more than 500 mm.	3
2'	Greatest length of skull less than 500 mm.	4
3	Skull essentially symmetrical, nasal bones form part of roof of nasal passages; two external nares; baleen present.	MYSTICETI
3'	Skull asymmetrical, particularly in the region of the external nares, nasal bones form no part of roof of nasal passages, one external naris; baleen absent.	ODONTOCETI (in part)
4	Zygomatic arch complete; body with spines or well furred; if well-furred, the feet webbed.	MONOTREMATA
4'	Zygomatic arch incomplete; body with large, imbricate scales or well haired; feet never webbed.	5
5	Palate with conspicuous medial, longitudinal depression; body covered with large imbricate (overlapping) scales.	PHOLIDOTA
5'	Palate flat, without conspicuous medial, longitudinal depression; body furred or haired, never with large imbricate scales.	XENARTHRA (in part--anteaters)
6	Incisors never more than 3/3; angular process of dentary not projecting medially (inflected), usually directed outward or backward	7
6'	Incisors frequently more than 3/3; angular process of dentary projecting medially (inflected)	METATHERIA (Infraclass), DIDELPHIMORPHIA (order) *
7	Incisors 1/1, long and usually strongly curved.	8
7'	Incisors not as above, if 1/1 not strongly curved.	9
8	Postorbital bar present; foramen magnum opens ventrally.	

PRIMATES (in part--*Daubentonia*--aye-aye)

8'	Postorbital bar usually absent, if present foramen magnum opens posteriorly. . . .	
		RODENTIA*
9	Incisors 1/2, upper incisors triangular in cross section.HYRACOIDEA
9'	Incisors not as above, if 1/2, upper incisors not triangular in cross section. . . .	10
10	Incisors 2/1; first pair of incisors large and strongly curved, second pair small and peg-like and situated immediately behind first pair; anterior portion of maxilla perforated.	LAGOMORPHA*
10'	Incisors not as above, if 2/1, size and arrangement not as above and anterior portion of maxilla not perforated.	11
11	Upper incisors forming tusks (much longer than other teeth); cheekteeth lophodont; flexible proboscis (trunk) longer than greatest length of skull.	PROBOSCIDEA
11'	Upper incisors not as above, if tusk-like, then cheekteeth (if present) not lophodont; flexible proboscis absent, or much shorter than greatest length of skull.	12
12	External nares obviously displaced posteriorly, opening at or behind anterior margin of orbits; nasal bones reduced or absent; pelvic limbs absent externally.	13
12'	External nares not, or only slightly, displaced posteriorly, open well anterior to anterior margin of orbits; nasal bones usually well developed; pelvic limbs present externally.	14
13	Skull somewhat asymmetrical, particularly in the region of the external nares; rostrum long and pointed or broadly rounded; teeth conical.	ODONTOCETI (in part)
13'	Skull not asymmetrical; rostrum short and blunt; teeth not conical.	SIRENIA
14	Orbit and temporal fossa separated by postorbital bar or plate.	15
14'	Neither postorbital bar nor postorbital plate present.	22
15	Upper incisors (or incisiform teeth) absent.	16
15'	Upper incisors (or incisiform teeth) present.	17
16	Greatest length of skull usually less than 100 mm; narrow diastema between premaxilla- maxilla suture and first molariform tooth; horns or antlers absent; manus with five functional digits; nails present.	PRIMATES (in part--some lemurs)
16'	Greatest length of skull usually more than 100 mm; wide space between premaxilla- maxilla suture and first molariform tooth; horns or antlers frequently present; two or four functional digits on manus; hooves present	ARTIODACTYLA (in part--ruminants)*

17	Incisors 2/1, 2/2, or 2/3.	18
17'	Incisors 1/3 or 3/3.	20
18	Incisors 2/3; W-shaped cusp pattern present on occlusal surface of molars.	
	INSECTIVORA (in part--tree shrews)	
18'	Incisors 2/1 or 2/2; molars with cusps present or absent, if present not arranged in W-shaped pattern.	19
19	Cheekteeth lacking cusps, but having sharp lateral edges and a median longitudinal furrow (if cusps present the canine is bicuspid); forelimbs modified as wings.	CHIROPTERA (in part--Megachiroptera)
19'	Cheekteeth cuspidate, never as above; canine not bicuspid; forelimbs not modified as wings.	PRIMATES (in part--anthropoids)*
20	Incisors 1/3; molars selenodont; two digits present.	
	ARTIODACTYLA (in part--camels)	
20'	Incisors 3/3; molars secodont or with complex infolded pattern of cusps and ridges, never strictly selenodont; digits one, or four or more, never two.	21
21	Molars secodont, carnassial pair (P4/m1) well developed; digits number four or five; hooves absent	CARNIVORA (in part)*
21'	Molars with complex folded pattern of cusps and ridges; one hoofed digit on each foot.	PERISSODACTYLA (in part--horses)
22	First two lower incisors pectinate (resembling a comb); patagium (gliding membrane) extending from side of neck to manus to pes to side of tail.	
	DERMOPTERA	
22'	Individual incisors never resembling a comb (pectinate); patagium usually absent, if present, forelimb modified as a wing	23
23	Cheekteeth homodont, lacking complex folds and ridges.	24
23'	Cheekteeth heterodont, if homodont, having complex folds and ridges	26
24	Canines or caniniform teeth conspicuously longer than other teeth; one to three teeth in each premaxilla.	CARNIVORA (in part--aardwolf, some pinnipeds)
24'	Canines or caniniform teeth absent or not conspicuously longer than other teeth; if long, caniniform teeth are present, no teeth are present in premaxillae.	25
25	Incisors and canines absent; posterior cheekteeth dumbbell-shaped in occlusal view; each tooth composed of numerous microscopic, hexagonal prisms of dentine surrounding tubules in pulp cavity.	TUBULIDENTATA
25'	Incisors and/or canines or caniniform teeth present or absent; cheekteeth cylindrical or elliptical in occlusal view, never bilobed; never having dentine	

- prisms as above. **XENARTHRA** (in part--armadillos, sloths)*
- 26 Size large, greatest length of skull more than 200 mm. 27
- 26' Size moderate to small, greatest length of skull less than 200 mm. 29
- 27 Cheek teeth secodont, carnassial pair (P4/m1) usually well developed; digits with claws. **CARNIVORA** (in part)*
- 27' Cheek teeth not secodont, carnassials never developed; digits with hooves. . . 28
- 28 Canines triangular in cross section, usually with sharp edges; upper canines large, often curving upward and outward; pes with 2, 3, or 4 digits; if 3, two of about equal size, the third considerably smaller.
- ARTIODACTYLA (in part--hogs, hippos)
- 28' Canines (if present) not triangular in cross section, not sharp edged; upper canines (if present) small, never curving upward or outward; pes with three digits, central digit larger than two lateral digits which are about equal in size.
- PERISSODACTYLA (in part--rhinos, tapirs)
- 29 Forearm adapted for sustained flight; phalanges of manus greatly elongated, second through fifth digits wholly enclosed in patagium; upper incisors 0-2, total number of teeth never more than 38. . . **CHIROPTERA** (in part--Microchiroptera)*
- 29' Forearm not adapted for flight; phalanges of manus not greatly elongated, and digits never wholly enclosed in a patagium; upper incisors 0-3, total number of teeth variable, to 48 or 50. 30
- 30 Canine or caniniform tooth (most anterior tooth in maxilla) small and not clearly differentiated from premolars; incisors small or greatly enlarged (may be larger than canine or cheek teeth); carnassial pair never developed; zygomatic arch and/or auditory bullae often incomplete. **INSECTIVORA** (in part)*
- 30' Canines large and clearly differentiated from premolars; incisors always much smaller than canines or cheek teeth; carnassial pair usually well developed; zygomatic arch and auditory bullae both complete. **CARNIVORA** (in part)*

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Table 2-1. *Synopsis of orders of mammals.*

ORDER	DISTRIBUTION					DIVERSITY			
MONOTREMATA		X?			X*	Cr	2/2	3/3	3
METATHERIA	X*	X		X	X	UCr	8/13	80/193	260
INSECTIVORA	X*	X	X	X		UCr	6/16	61/228	377
MACROSCELIDEA			X*			LOI	1/1	4/7	19
SCANDENTIA	X*		X			MMi	1/1	5/5	16
DERMOPTERA	X* ¹	X				UPa	1/2	1/11	2
TILLODONTIA	X*		X*			LPa MEO	0/1	0/6	0
TAENIODONTA	X*		X			LPa UEO	0/1	0/9	0
CHIROPTERA	X*	X	X	X	X	MEo	17/20	170/196	917
PRIMATES	X*	X	X	X	X ²	UCr	11/17	51/149	180
XENARTHRA	X ³	X*	X			LEo	3/11	13/156	29
PHOLIDOTA	X* ⁴	X	X			Pa	1/1	1/10	7
TUBULIDENTATA				X*		Mi	1/1	1/5	1
LAGOMORPHA	X	X ³	X	X		UPa	2/3	12/50	65

RODENTIA 1752	X*	X	X	X	X		LEo		32/43	418/773	
CREODONTA	X*		X*	X			MCr	UOI	0/5	0/50	0
CARNIVORA 269	X*	X	X	X			MPa		10/17	109/346	
ARCHAEOCETI						X	LEo	MMi	0/2	0/14	0
ODONTOCETI						X	UEo		7/12	34/141	68
MYSTICETI						X	UEo		3/4	5/45	10
CONDYLARTHRA	X*	X	X				UCr	LOI	0/7	0/90	0
PANTODONTA	X*		X				Pa	OI	0/5	0/12	0
DINOCERATA	X*		X*				Pa	Eo	0/3	0/8	0
XENUNGULATA		X*					UPa	UPa	0/1	0/1	0
LITOPTERNA		X*					UPa	Q	0/3	0/42	0
NOTOUNGULATA	X	X*	X				Pa	Q	0/14	0/122	0
ASTRAPHOTHERIA		X*					UPa	UMi	0/2	0/11	0
HYRACOIDEA			X	X*			LMi		1/2	3/10	7
PROBOSCIDEA	X	X ³	X	X*			UEo		1/6	2/24	2
EMBRITHOPODA				X*			LOI	LOI	0/1	0/1	0
SIRENIA	X	X	X	X*	X	X	MEo		2/2	3/23	5
DESMOSTYLIA			X ⁵				LMi	LPI	0/1	0/5	0
PERISSODACTYLA	X*		X*	X			LEo		3/12	5/171	18
ARTIODACTYLA	X*	X	X	X			LEo		8/25	79/506	184
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34 Orders	22	16	21	16	6	4			122/260	1162/3441	4174 species

*Continent of earliest record and/or presumed origin (after Romer, 1966).

¹Earliest records North America; extinct there lower Eocene.

²Homo sapiens only.

³Late arrival--Pliocene?.

⁴Questionable, pending better understanding of palaeoanodonts, Paleocene-Oligocene, North America.

⁵North Pacific Basin, only.

Sources: numbers of taxa follow Anderson and Jones (1984), Romer (1966), Vaughan (1986); numbers of extinct genera to be taken *cum grano salis*.

Table 2-2. *Families of mammals of the world (after DeBlase and Martin, 1981).*

Family	Common Name	Genera	Species	Distribution
Order MONOTREMATA				
Ornithorhynchidae	platypus	1	1	Australia
Tachyglossidae	echidnas	2	3	Australia, New Guinea
Order MARSUPIICARNIVORA				
Didelphidae	opossums	11	70	Neotropical and Nearctic
Microbiotheriidae	monito del monte	1	1	Chile
Thylacinidae	Tasmanian "wolf" or "tiger"	1	1	SE Australia
Dasyuridae	native "cats," marsupial "mice," Tasmanian devil	14	49	Australia
Myrmecobiidae	numbat or banded anteater	1	1	SW Australia
Notoryctidae	marsupial "mole"	1	1	W Australia
Order PERAMELINA				
Peramelidae	bandicoots	7	16	Australia
Thylacomyidae	rabbit-eared bandicoots	1	2	SW Australia
Order DIPROTODONTA				
Phalangeridae	phalangers and cuscuses	3	11	Australia
Burramyidae	pigmy phalangers	4	7	Australia
Petauridae	ringtails and gliding phalangers	5	22	Australia
Macropodidae	kangaroos and wallabies	17	56	Australia
Phascolarctidae	koala	1	1	E Australia
Vombatidae	wombats	2	3	SE Australia
Tarsipedidae	honey possum	1	1	SW Australia
Order PAUCITUBERCULATA				
Caenolestidae	shrew or rat opossums	3	7	Western South America
Order INSECTIVORA				
Suborder Lipotyphla				
Erinaceidae	hedgehogs and moon rats	10	14	Africa, Eurasia
Talpidae	moles and desmans	15	ca. 22	Holarctic, Oriental
Tenrecidae	tenrecs and otter shrews	15	32	Madagascar and west-central Africa
Chrysochloridae	golden moles	7	18	Central and southern Africa
Solenodontidae	solenodons	2	2	Cuba, Hispaniola
Soricidae	shrews	23	ca. 291	Holarctic, Africa, Asia, northern South America
Suborder Menotyphla				
Macroscelididae	elephant shrews	4	15	Africa
Tupaiaidae	tree shrews	5	15	Southeast Asia
Order DERMOPTERA				
Cynocephalidae	colugos ("flying lemurs")	1	2	Southeast Asia

Order CHIROPTERA

Suborder Megachiroptera

Pteropodidae	Old World fruit bats	38	ca.150	Australia, South Asia, Africa, south Palearctic, some oceanic islands
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Suborder Microchiroptera

Rhinopomatidae	mouse-tailed bats	1	3	North Africa, southern Palearctic, western Asia
Emballonuridae	sac-winged & sheath-tailed bats	12	44	N Neotropics, Africa, S Palearctic, Asia, Australia
Craseonycteridae	bumble bee bat	1	2	Thailand
Noctilionidae	bulldog bats	1	2	Neotropics
Mormoopidae	leaf-chinned bats	3	8	Neotropics
Nycteridae	hispid & hollow-faced bat	1	13	Africa, Asia
Megadermatidae	false vampire bats	4	5	Africa, Asia, Australia
Rhinolophidae	horseshoe bats	11	ca. 128	Most of Eastern Hemisphere
Phyllostomatidae	New World leaf-nosed bats	49	137	Neotropics, southern Nearctic
Natalidae	funnel-eared bats	1	4	Neotropics
Furipteridae	smoky bats	2	2	Neotropics
Thyropteridae	disk-winged bats	1	2	Neotropics
Myzopodidae	sucker-footed bat	1	1	Madagascar
Vespertilionidae	common bats	34	ca. 283	Worldwide
Mystacinidae	short-tailed bat	1	1	New Zealand
Molossidae	mastiff bats	14	82	All regions except northern Holarctic

Order PRIMATES

Suborder Strepsirhini

Lemuridae	lemurs	6	13	Madagascar
Indriidae	indri, sifaka	3	4	Madagascar
Daubentoniidae	aye-aye	1	1	Madagascar
Lorisidae	lorises, potto	4	5	Asia, Africa
Galagidae	galagos	1	6	Africa

Suborder Haplorhini

Infraorder Tarsii

Tarsiidae	tarsiers	1	2	Indonesia, Philippines
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Infraorder Platyrrhini

Callitrichidae	marmosets, tamarins	4	14	Neotropics
Callimiconidae	Goeldi's marmoset	1	1	Neotropics
Cebidae	New World monkeys	11	29	Neotropics

Infraorder Catarrhini

Cercopithecidae	Old World monkeys	12	73	Africa, Asia
Hylobatidae	gibbons	2	7	Southeast Asia
Pongidae	gorilla, chimps, orang	3	4	Central Africa, Java, Borneo
Hominidae	humans	1	1	Cosmopolitan

Order XENARTHRA=EDENTATA

Myrmecophagidae	anteaters	3	4	Neotropics
Bradypodidae	tree sloths	2	5	Neotropics
Dasypodidae	armadillos	7	16	Neotropics

Order PHOLIDOTA					
Manidae	pangolins	1	7	Africa, South Asia	
Order MYSTICETI					
Balaenidae	right whales	2	3	All oceans except tropical and South Polar	
Eschrichtiidae	gray whale	1	1	North Pacific coasts	
Balaenopteridae	rorquals	2	6	All oceans	
Order ODONTOCETI					
Platanistidae	freshwater dolphins	4	5	Asia, Neotropics	
Delphinidae	dolphins	16	31	All oceans and seas	
Phocoenidae	porpoises	3	6	All oceans except Arctic and Antarctic	
Monodontidae	narwhal and beluga	2	2	Arctic Ocean, adjacent rivers	
Physeteridae	sperm whales	2	3	All oceans	
Ziphiidae	beaked whales	6	18	All oceans	
Order CARNIVORA					
Suborder Caniformia					
Canidae	dogs, wolves, foxes, jackals	13	35	Holarctic, Neotropics, Africa, Asia; introduced in Australia	
Ursidae	bears	6	7	Holarctic, Asia, NW Neotropics	
Otariidae	walrus, sea lions or eared seals	8	14	Colder coastlines of Arctic Pacific, Atlantic, Indian oceans	
Ailuropodidae	giant panda	1	1	SW China	
Procyonidae	raccoons, red panda and allies	8	16	Nearctic, Neotropics, SW China	
Mustelidae	weasels, skunks, and allies	27	67	Holarctic, Neotropics, Africa, Asia	
Phocidae	earless seals	10	19	All oceans and seas, L. Baikal	
Suborder Feliformia					
Viverridae	civets, mongooses and allies	36	72	Africa, Asia, Mediterranean	
Hyaenidae	hyaenas, aardwolf	3	4	Africa, south-central Palearctic	
Felidae	cats	19	37	Holarctic, Neotropics, Africa, Asia	
Order LAGOMORPHA					
Ochotonidae	pikas	1	ca. 14	Western Nearctic, Palearctic	
Leporidae	rabbits and hares	8	ca. 49	Worldwide, except SE Asia, Madagascar, Australia	
Order RODENTIA					
Suborder Sciuromorpha					
Aplodontidae	sewellel or mountain "beaver"	1	1	California to British Columbia	
Sciuridae	squirrels	51	ca. 261	Worldwide, except southern Neotropics, Madagascar, Australia	
Geomyidae	pocket gophers	8	ca. 40	Southern and western Nearctic, NW Neotropics	
Heteromyidae	kangaroo rats, pocket mice	5	ca. 75	Western Nearctic and northern Neotropics	
Castoridae	beavers	1	2	Holarctic	
Anomaluridae	scaly-tailed squirrels	4	ca. 12	Western and central Africa	
Pedetidae	springhaas	1	2	Southern and eastern Africa	

Suborder Myomorpha				
Cricetidae	New World rats and mice and allies	97	ca. 567	Worldwide, except Indo-Malayan region, Australia, and some islands
Spalacidae	mole rats	1	3	Near East, southeastern Europe
Rhizomyidae	bamboo rats	3	18	East Asia, east-central Africa
Muridae	Old World rats and mice	98	ca. 457	Worldwide, except Antarctica, Nearctic, Neotropics
Gliridae	dormice	7	23	Western Palearctic, Africa
Platacanthomyidae	spiny dormice	2	2	Asia
Seleviniidae	dzhalsman	1	1	Central Asia
Zapodidae	jumping mice, birch mice	4	11	Holarctic
Dipodidae	jerboas	10	27	Central Palearctic, northern Africa
Suborder Hystricomorpha				
Hystricidae	Old World porcupines	4	15	Africa, southern Palearctic, Asia
Erethizontidae	New World porcupines	4	8	Nearctic, northern Neotropics
Caviidae	cavies, Patagonian "hares"	5	12	Neotropics
Hydrochoeridae	capibaras	1	2	Neotropics
Dinomyidae	pacarana	1	1	Neotropics
Dasyproctidae	agoutis and pacas	4	ca. 11	Northern and central Neotropics
Chinchillidae	chinchillas and viscachas	3	6	Southern Neotropics
Capromyidae	hutias	3	11	West Indies
Myocastoridae	nutria or coypu	1	1	southern Neotropics
Octodontidae	octodonts	5	8	Central Andes
Ctenomyidae	tucu tucos	1	ca. 26	Southern Neotropics
Abrocomidae	chinchilla rats	1	2	Central Andes
Echimyidae	spiny rats	14	ca. 43	Northern Neotropics
Thryonomyidae	cane rats	1	6	West and Central Africa
Petromyidae	dassie rat	1	1	Southwestern Africa
Bathyergidae	mole rats	5	ca. 22	Africa
Ctenodactylidae	gundis	4	8	Northern Africa
Order TUBULIDENTATA				
Orycteropodidae	aardvark	1	1	Africa
Order PROBOSCIDEA				
Elephantidae	elephants	2	2	Africa, Asia
Order HYRACOIDEA				
Procaviidae	hyraxes	3	11	Africa, south-central Eurasia
Order SIRENIA				
Trichechidae	manatees	1	3	Circumtropical
Dugongidae	dugong or sea cow	1	1	Circumtropical
Order PERISSODACTYLA				
Equidae	horses, asses, zebras	1	6	Africa, Eurasia
Tapiridae	tapirs	1	4	Neotropics, Southeast Asia
Rhinocerotidae	rhinoceroses	4	5	Africa, Southeast Asia

Order ARTIODACTYLA

Suborder Suiformes

Suidae	hogs	5	8	Africa, Eurasia, Celebes
Tayassuidae	peccaries	2	3	Neotropics, SW North America
Hippopotamidae	hippos			

Suborder Tylopoda

Camelidae	camels, llamas and allies	2	4	Western South America, southern Eurasia
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Suborder Ruminantia

Tragulidae	chevrotains	2	4	Africa, Asia
Cervidae	deer	16	ca. 37	Holarctic, Neotropics, Asia
	giraffe, okapi	2	2	Africa
Antilocapridae	pronghorn	1	1	Central North America
Bovidae	cattle, sheep, goats, and allies	44	ca. 111	Holarctic, Africa, Asia

NORTH AMERICA

SOUTH AMERICA

EURASIA

AFRICA

AUSTRALIA

OCEANIC

ORIGIN

(earliest record)

EXTINCTION

(latest record)

Families

Living/total

Genera

Living/total

Living Species