

LAB 4: AFROSORICIDA*, ERINACEOMORPHA, SORICOMORPHA, MACROSCELIDEA*, DERMOPTERA*, PHOLIDOTA, CINGULATA, PILOSA & SCANDENTIA*

Sources: Martin et al., chapters 12, 13, 15, 17, 18, 21; this handout

In General:

We have representatives of Erinaceomorpha, Soricomorpha, Pholidota, Cingulata and Pilosa. **No specimens are available for the orders flagged with an asterisk.** You should read the appropriate sections in the text and lab books to familiarize yourself with these groups. *You must be able to identify all specimens to family and Connecticut specimens to genus.* The names you must know are shown in bold. Note that you can look at photographs of representative skulls at the following websites (you are not responsible for knowing the Orders we don't have representatives of in the lab):

<http://1kai.dokkyomed.ac.jp/mammal/en/mammal.html> <http://animaldiversity.ummz.umich.edu/site/index.html>

Taxonomic Note 1:

Until recently, the Afrosoricida, Erinaceomorpha and Soricomorpha were all included within a single Order, Insectivora. Molecular studies have shown convincingly that Insectivora is not a monophyletic group and that some of its members (Afrosoricida) are associated with a large African clade of mammals including elephant shrews (Macroscelidea), aarvark (Tubulidentata), elephants (Proboscidea), hyraxes (Hyracoidea) and sirenians (Sirenia) known as the Afrotheria. This finding is, perhaps, not surprising given how diverse the 'insectivores' are. Primarily they were united on the basis of their retention of ancestral or primitive characters.

Shared, primitive characters: small to medium-sized; pentadactyl; plantigrade; usually long, pointed snouts; pinnae and eyes usually small or absent; small braincase; ring-shaped tympanic bone instead of an auditory bulla; male testes usually abdominal or inguinal, but if external, scrotum is anterior to penis; uterus bicornuate; cloaca present in some groups; jugal bone reduced or absent; public symphysis reduced; teeth are rooted; tribosphenic molars in tenrecids, chrysochlorids, solenodontids and some soricids; otherwise, molars are sharply cusped for slicing insect cuticle and either have W-shaped cusps (dilambdodont) or V-shaped cusps (Zalambdodont); many species retain the primitive eutherian dental formula: 3/3, 1/1, 4/4, 3/3

Taxonomic Note 2:

Until recently, the Orders Cingulata (armadillos) and Pilosa (anteaters and sloths) were included in a single order either called the Edentata or the Xenarthra. Since studies show that Cingulata and Pilosa are each other's closest relatives, it really doesn't matter much whether we divide them into two orders or lump them into a single Xenarthra (as your textbook does). By dividing them, we emphasize the large morphological differences between the groups. Nevertheless, all the xenarthran taxa share certain characteristics:

Shared characters: extra intervertebral articulations (joints) called 'xenarthra' on lumbar and posterior thoracic vertebrae; teeth lost or reduced; loss of incisors and canines; cheekteeth (if present) single-rooted, sub-cylindrical, lack enamel (covered with hardened dentine with softer dentine in center); transverse processes of anterior caudal vertebrae fused with ischia of pelvic girdle.

Order ERINACEOMORPHA

Family Erinaceidae (hedge hogs)

Diagnosis: zygomatic arch present, formed by jugal bone and by zygomatic processes of maxilla and squamosal; no postglenoid process; labial styles of upper molars forming only a low cingulum; crowns of upper molars quadrate; dilambdodont; occiput flat or concave; auditory bullae incomplete, tympanic annular and not fused to cranium; eyes and ears well-developed; snout pointed and more-or-less elongate; plantigrade, pentadactyl; tail present, variable in length; mammae from two to five pairs; cranial sutures distinct to advanced age; dental formula 2-3/3, 1/1, 3-4/2-4, 3/3 = 36-44; first upper incisor and sometimes the first lower incisor enlarged and caniniform; dentition more for omnivorous than for insectivorous diet; testes large and abdominal; spines present, or sometimes absent.

Habits: crepuscular, nocturnal, and omnivorous in diet, animal matter predominates; some hibernate and some aestivate; most polyestrous; ovulation is in response to copulation

Range: Africa, Europe, Asia south and east to Borneo, absent in Madagascar

Genera: *Erinaceus*, *Hemiechinus*, *Podogymnura*, *Echinosorex*, *Hylomys*, *Paraechinus*

Specimen: *Erinaceus* (skin)

Know: **Erinaceidae**

Order SORICOMORPHA

Family Talpidae (moles)

Diagnosis: basisphenoid, auditory bullae and zygomatic arches (incorporating jugal) present; no postglenoid process; crowns of molars with W-shaped ectolophs (dilambdodont); labial styles well-developed; occipital region of skull formed by supraoccipital and exoccipitals; baculum present.

small, usually fossorial; snout elongate; eyes small, sometimes hidden beneath skin; ears usually without pinnae; legs short, forelimbs and manus usually greatly modified for digging, in some for swimming; three or four pairs of mammae; dental formula 2-3/1-3, 1/0-1, 3-4/3-4, 3/3 = 34-44; cranial sutures obscured at an early age; humerus extremely broad and short; penis pendulous and posteriorly directed.

Habits: predominantly fossorial, some are aquatic or amphibious; omnivorous, but feed predominantly on insects and other small animals; active at any time of day, especially after rain; construct nest chamber and permanent tunnels from which feeding burrows radiate; probably monoestrous.

Range: North America, Europe, Asia

Genera: *Neurotrichus*, *Scapanus*, *Scalopus*, *Parascalops*, *Condylura*, *Talpa*, *Desmana*, *Uropsilus*, *Galemys*, *Scaptonyx*, *Urotrichus*, *Scapanulus*

Specimens: *Parascalops breweri* (hairy-tailed mole) (skin + skull)
Condylura cristata (star-nosed mole) (skin + skull)
Scalopus aquaticus (eastern mole) (skin + skull)

Know: **Talpidae**

Parascalops
Condylura

Family Soricidae (shrews)

Diagnosis: skull long and narrow; no zygomatic arch or postorbital process; tympanic annular, no bulla; molars dilambdodont, labial styler walls absent; first upper incisor long, distally hooked, and having a cusp projecting ventrally at base; first lower incisor procumbent; premolars unicuspid except for dp4 (deciduous lower premolar 4) and P4 (permanent upper premolar 4); basisphenoid not forming part of auditory bulla

generally small; snout long and pointed; eyes small but visible; ears usually with visible pinnae; feet pentadactyl; tail long or short; mammae vary from 6-10; odoriferous disc glands sometimes present; dental formula variable but dentition characterized by a series of unicuspid teeth between the procumbent, hooked first incisors and the molariform last premolar; deciduous teeth shed *in utero*; no baculum.

Habits: insectivorous and carnivorous, vegetable matter sometimes taken; active at any time of day; feed continuously; most live only one to two years; generally bear only one litter during lifetime; some amphibious.

Range: Cosmopolitan - except polar regions, Australia, and S. South America

Genera: *Notiosorex*, *Sorex*, (*Microsorex*), *Blarina*, *Cryptotis*, *Suncus*, *Neomys*, *Crocidura*, *Soriculus*, *Blarinella*, *Paracrocidura*, *Sylvisorex*, *Feroculus*, *Solisorex*, *Myosorex*, *Diplomesodon*, *Anourosorex*, *Chimarrogale*, *Nectogale*, *Scutisorex*

Specimens: subfamily Soricinae (New World, pigmented teeth)
Blarina brevicauda (short-tailed shrew) (skin + skull)
Cryptotis parva (least shrew) (skin + skull)
Sorex cinereus (masked shrew) (skin + skull)
S. fumeus (smoky shrew) (skin + skull)
S. palustris (water shrew) (skin)
S. dispar (long-tailed shrew) (skin)
S. (Microsorex) hoyi (Thompson's pygmy shrew) (skin + skull)

subfamily Crocidurinae (Old World, unpigmented teeth)
Crocidura (skin + skull)

Know: **Soricidae**
Blarina
Cryptotis

Order PHOLIDOTA

Family Manidae (pangolins)

Diagnosis: teeth absent; skull conical, without crests or ridges; jugal, usually lacrimal and interparietal lacking; nasals large, broadly expanded at base; frontals larger than parietals; tympanic forming a bulla that is not closed dorsal to auditory meatus and is not fused with other elements; palate long and narrow; pterygoids separate, extending posteriorly to level of bullae; mandible small, no angular or coronoid processes; plantigrade; pentadactyl; manus and pes having sharp recurved claws; manus functionally tridactylous; dorsal surface of body covered with imbricate, epidermal scales of varying sizes; tongue

elongate, vermiform, extensile; penis well-developed; no scrotum, testes inguinal, subdermal; uterus bicornuate; placenta diffuse, non-deciduate; insectivorous; hindlimbs stouter and longer than forelimbs; venter not scaled; eyes small; pinnae small, reduced to a thickened ridge, or absent; mouth small and ventral; scales vary in shape and are movable

Habits: insectivorous, feeding principally on termites; burrow up to six meters deep; most terrestrial, some arboreal; monoestrous, bearing one to two young per litter; have poor vision and hearing, but acute sense of smell; roll into a ball like armadillos (*Dasypodidae*) when alarmed

Range: Africa south of the Sahara and South East Asia, including Indonesia

Genus: *Manis*

Specimens: *Manis* (skin + skull)

Know: **Manidae**

Order CINGULATA

Family *Dasypodidae* (armadillos)

Diagnosis: teeth subcylindrical, varying in number from 7-9/7-9 to 25/25, absent from premaxillae; zygomatic arch complete; mandible elongate; third trochanter present; tibia and fibula fused proximally and distally; manus and pes with powerful recurved claws; major part of skin ossified; ossified part consisting of regularly arranged bony scutes forming an armor composed typically of five shields: cephalic, scapular, dorsal, pelvic, and caudal; scutes covered by bony epidermal plates; movable bands between plates; body hair usually reduced; uterus simple; vagina simple; placenta discoid, villous, and hemochorial; mammae pectoral; penis large and pendulous; legs short; body heavy; snout varies from short to long; tail conical.

Habits: insectivorous and herbivorous; dig burrows; poor temperature control; gain bouyancy for swimming by swallowing air; delayed implantation characteristic; polyembryony the rule with as many as 12 identical twins being produced from one ovum; young precocial at birth; good vision, hearing and smell; roll into ball when alarmed, protecting venter.

Range: Americas (Kansas south to central Argentina)

Genera: *Chaetophractus*, *Euphractus*, *Zaedyus*, *Priodontes*, *Cabassous*, *Tolypeutes*, *Dasypus*, *Chlamyphorus*

Specimens: *Dasypus* (skin + skull + mounted skeleton)
Tolypeutes (skin + skull)

Know: **Dasypodidae**

Order PILOSA

Family Myrmecophagidae (anteaters)

Diagnosis: teeth absent (edentulous); skull elongate; jugals small zygomatic arch incomplete; premaxillae small; lacrimals well developed; mandible weak; tongue long, vermiform, extensile, covered with viscous secretion; third trochanter absent; third digit of manus enlarged, having long, falcate claw, other claws being reduced or suppressed; four or five subequal clawed pedal digits; skin thickly covered with hair; tail long; uterus simplex; mammae pectoral or abdominal; fur dense, coarse and long to short and smooth; placenta discoid, hemichorial; pterygoids meet at midline, considerably extending hard palate.

Habits: eat mostly ants and especially termites, seeking food in trees or on ground; use powerful foreclaws to rip open termite mounds and use long tongue to pick up insects; walk with a shuffling gait and bear weight on side of fourth digit of forelimb; *Tamandua* has prehensile tail to aid in climbing; nocturnal, diurnal, or both; monestrous, bearing single young annually.

Range: Southern Mexico to South America east of the Andes, to Paraguay

Genera: *Myrmecophaga*, *Tamandua*

Specimens: *Myrmecophaga* (skull)
Tamandua (skin + skull)

Know: **Myrmecophagidae**

Family Cyclopedidae (silky anteater)

Diagnosis and Habits: As for Myrmecophagidae, plus: lack fusion of caudal transverse processes and ischia; fur is fine, soft and wooly; small body size (43 cm total length, 230 g); nocturnal, feeding in trees; prehensile tail

Range: Southern Mexico to Brazil and Bolivia

Genera: *Cyclopes*

Specimens: *Cyclopes* (skin + skull)

Know: **Cyclopedidae**

Family Megalonychidae (two-toed tree sloths)

Diagnosis: teeth 5/4-5, subcylindrical, hypsodont, having central axis of vaso-dentine surrounded by thin covering of hard dentine and thick outer layer of cement, no enamel; face short; orbits close to sagittal plane and directed anteriorly; premaxillae greatly reduced; pterygoids not meeting on midline; mandible well developed and with strong coronoid process; jugal terminating posteriorly in a flared process; usually 8 cervical vertebrae—can rotate head up to 270°; no third trochanter; exposed digits never exceeding three; syndactylous except for the strong, recurved claws; forelimbs markedly exceed hindlimbs in length; tail short or rudimentary; pinnae greatly reduced; uterus simple and globular; pelage long and crisp, typically with algae imparting greenish tinge; claws sharp and long; face small; head rounded; heterothermic; placenta diffuse, becoming discoid, labyrinthine, and endothelio-chorial; penis small; seminal vesicles rudimentary; vagina bipartite in virgin state.

Habits: strictly herbivorous, essentially monophagous, eating only one type of leaf; hang from branches suspended by limbs, and move by a very slow hand-over-hand motion; cannot stand up on limbs; swim well; are both diurnal and nocturnal; monoestrous, giving birth to one young; young precocial at birth; possess color vision; poorly developed sense of hearing but well-developed sense of smell; climb to ground to defecate at base of tree where they are frequently preyed upon by large predators, especially jaguar; often grow algae in fur making them appear green

Range: Central America south through northern South America

Genera: *Choloepus*

Specimens: *Choloepus* (skin + skull)

Know: **Megalonychidae**

Family Bradypodidae (three-toed sloths)

Diagnosis and Habits: As for Megalonychidae

Range: Central America south through northern South America

Genera: *Bradypus*

Specimens: *Bradypus* (skin)

Know: **Bradypodidae**

Orders For Which We Lack Specimens:

Order Afrosoricida (golden moles; tenrecs)

Order Macroscelidea (elephant shrews)

Order Dermoptera (colugos or 'flying lemurs')

Order Scandentia (tree shrews)