Mammalogy Laboratory 2 – Monotremes, Marsupials, Xenarthra, Afrotheria, & Insectivora (i.e., Eulipotyphla)

Throughout the semester, you will be responsible for anything in bold on the lab handouts.

Order Monotremata (egg-laying mammals)

Family Ornithorhynchidae (Platypus)

Range: E. Australia

Genus: ***Ornithorhynchus***

Family Tachyglossidae (echidna)

Range: Australia and New Guinea

Genera: ***Tachyglossus****, Zaglossus*

Material in the Lab:
We are very fortunate to have ***Tachyglossus*** and ***Ornithorhynchus*** skulls. There are pre- and post-frontal bones on these skulls are difficult to make out because the sutures are completely closed. *Tachyglossus* is myrmecophagous; it eats ants. It shows many adaptations for this diet that we'll see recurring in lecture. These include, a very long rostrum, teeth reduced or absent, a very long and slender dentary, and powerful forearms (obviously you can't tell that from this skull).

Metatheria (marsupial mammals)

Diagnosis: choriovitelline (yolk-sac) placenta in most; marsupium or marsupial folds present in many species; mammae distinct, abdominal, varying in number, within marsupium when it is present; vagina and uterus paired, lateral; testes scrotal (except Notoryctidae), scrotum anterior to penis; baculum absent; lower jaws only rarely with same number of incisors as upper jaws; auditory bullae has contribution from alisphenoid; large palatine vacuities often present; **jugal participating in mandibular fossa**; **angular process inflected**; **epipubic bones present**.

Range: Australian region, North, Central and South America.

Order Didelphimorphia

Family Didelphidae (New World opossums)

Range: U.S. south through South America

Diagnosis: Marsupium either essentially absent (*Marmosa, Philander*), consisting of two folds of skin enclosing nipples, or well developed (*Didelphis, Caluromys, Chironectes*); five toes on each foot; hallux opposable, 5/4 incisors; tail more or less prehensile, naked for at least part of its length.

Representative Genera: *Marmosa, Philander, Didelphis, Caluromys, Chironectes, Lutreolina, Chironectes, Glironia.*

Material in the Lab: ***Didelphis virginiana*** **(skin, skull, and skeleton).**
Monodelphis **(skull fragment).**

There are a few records of *Didelphis virginiana* from Idaho. However, it is likely that this species does not occur in the state.

Note the tribosphenic molars, and be able to identify the **epipubic bones**, **jugal contribution to the mandibular fossa**, **medial inflection of the angular process**.

Order Dasyuromorphia

Family Dasyuridae (Phascogales, quolls, dunnarts, Tasmanian devil).

Range: Australia, Tasmania, New Guinea.

Diagnosis: Marsupium present, opening posteriorly; plantigrade foot posture; five toes on front foot, four or five on hind foot; four over three incisors; molars tritubercular; tail usually long (except in *Sarcophilus*).

Representative Genera: *Antechinus, Dasyurus, Sarcophilus, Sminthopsis.*

Material in the Lab: ***Sarcohpilus*** (skull).

Order Diprotodontia

Family Macropodidae (kangaroos, wallabies, etc).

Range: Australia, Tasmania, New Guinea

Diagnosis: marsupiun well-developed, open anteriorly, containing four mammae (usually only two are functional); usually 3/1 incisors (diprotodont); molars quadritubercular or transversely bunodont, lower canines always absent, large diastema; no hallux; fourth digit of hindfoot long and strong, fifth digit moderately long, second and third digits reduced and syndactylous (not visible in skeleton); size variable; tail long, usually thick at the base, hairy, non-prehensile, used as a prop for balancing; elongate hind limbs used for bipedal jumping, front limbs small.

Representative Genera: *Macropus, Wallabia, Dendrolagus, Bettongia, Thylogale, Petrogale, Setonix, Dorcopsis*.

Material in Lab: ***Macropus*** skull and skeleton.

Family Phascolarctidae (Koala).

Range: Western Australia

Diagnosis: marsupium well-developed, opens posteriorly, containing two mammae; 3/1 incisors; molars with crescent-shaped ridges; lower canines absent; large diastema; tail vestigial; cranium robust and broad, lacking saggital crest; broad zygomatic arch; opposable hallux (big toe); second and third digits of hindfoot syndactylous.

Monotypic: *Phacsolarctus cinereus*.

Material in lab: ***Phascolarctus*** (skull)

Family Vombatidae (Wombats)

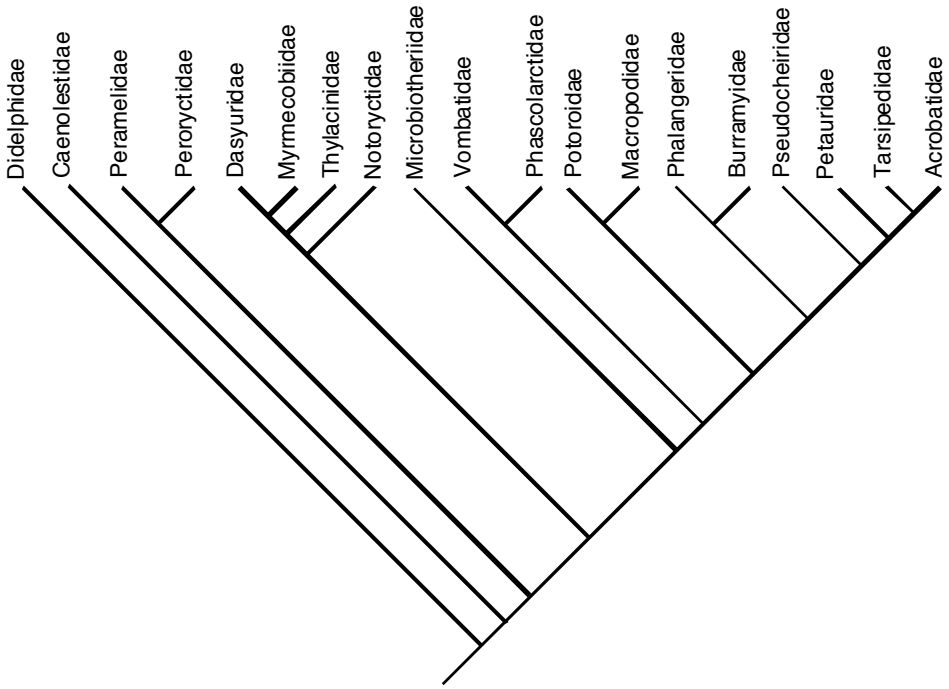
Range: Eastern and South-central Australia

Diagnosis: Diagnosis: marsupium well-developed, opens posteriorly. Stocky body with robust skull; 1/1 incisors, large diastema, grinding cheek teeth; robust zygomatic arch, ventral fossa on jugal where masseter attaches; short rostrum; second and third digits of hindfoot syndactylous.

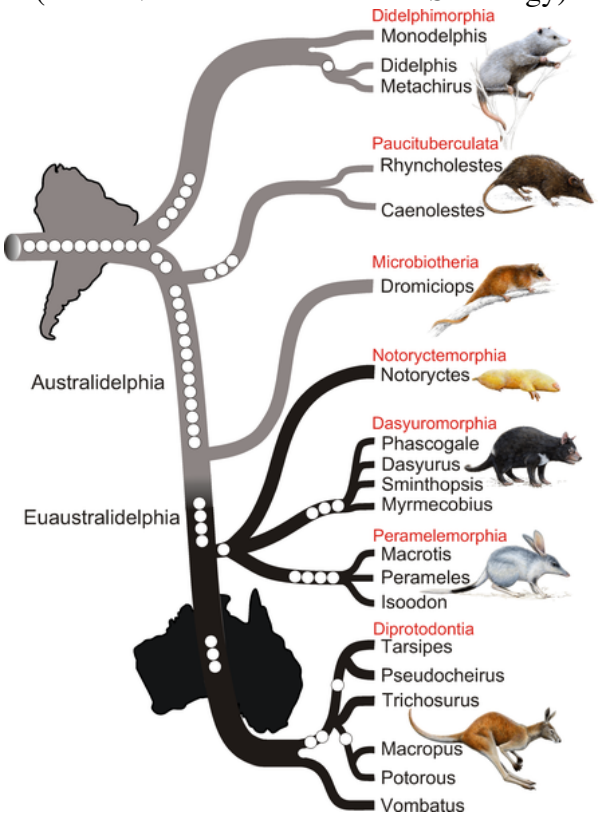
Two Genera: *Vombatus* and *Lasiorhinus*.

Material in lab: ***Vombatus*** (skull)

ALTERNATIVE PHYLOGENIES OF MARSUPIALS
(from Cardillo et al., 2004. J. Zool., 264:11)



(From Nillson et al. 2010. PLoS Biology).



CLASSIFICATION OF LIVING MARSUPIALS

(modified from Marshall, Case, and Woodburne, 1990)

Class Mammalia

Subclass Theria

Infraclass Metatheria

Order Didelphimorphia
Family Didelphidae (opossums)

Order Paucituberculata
Family Caenolestidae (shrew or rat opossum)

Order Microbiotheria
Family Microbiotheridae (montio del monte)

Order Dasyuromorphia
Family Dasyuridae (native cats, marsupial mice, Tasmanian devil)
Family Thylacinidae (Tasmanian wolf)
Family Myrmecobiidae (banded anteater)

Order Peramelina
Family Permalidae (including Thylacomyidae; Bandicoots)

Order Notoryctemorphia
Family Notoryctidae (Marsupial mole)

Order Diprotodontia
Family Phascolarctidae (koala)
Family Vombatidae (wombats**)**
Family Macropodidae (kangaroos and wallabies)
Family Potoroidae (betongs and potoroos)
Family Phalageridae (phalangers)
Family Burramyidae (pigmy phalanger/ pigmy possum)
Family Pseudocheiridae (ring-tailed possums)
Family Petauridae (sugar gliders)
Family Acrobatidae (feather-tailed glider/pen-tailed glider)
Family Tarsipedidae (honey possum)

Order Xenarthra (Edentata)

Note: This group is often split into two orders, Cingulata (armadillos) and Pilosa (sloths and anteaters). However, since there has never been phylogenetic support for the non-monophyly of Xenarthra, in the interest of stability, we will only recognize the single order **Xenarthra**.
A recent Xenarthran phylogeny (Gibb et al., 2015) is on the course website.

Diagnosis: incisors and canines absent; cheek teeth, when present peg-like, without enamel, and having a single root; deciduous teeth absent except in armadillos; tympanic bone annular, rarely inflated; coracoid process more strongly developed than in other eutherians; uterus simplex; xenarthrous process, a second point of articulation (in addition to zygapohyses) between successive vertebrae.

Range: South, Central, and North America (north to Kansas)

Family Myrmecophagidae (ant eaters)

Diagnosis: teeth absent; skull elongate; jugals small, zygomatic arch incomplete; premaxillae small; lacrimals well-developed; mandible weak and slender; tongue long and vermiform, extensible, and covered with a viscous saliva; third digit of manus enlarged, with long claw, other claws reduced; skin thickly covered with hair; tail long; uterus simplex; legs short.

Habits: **myrmecophagous**; seek food in trees or on ground; use powerful claws to rip open termite mounds and use long tongue to pick up insects; nocturnal, dirunal or both; monestrous, bearing one young per year.

Range: Southern Mexico to northern Argentina

Material in Lab: ***Tamandua*, *Myrmecophaga****
*Not an Idaho form.

Other Genus: *Cyclopes*

Family Megalonychidae (two-toed sloths)

Diagnosis: teeth peg-like and ever-growing (hypsodont), with central axis of vaso-dentine surrounded by thin covering of harder dentine, no enamel; face short; orbits close to sagittal plane (in front of face); permaxillae greatly reduced; mandible well-developed, with strong coronoid process; jugal terminates posteriorly with a flared process, zygomatic arch incomplete; syndactylous, except for strong recurved claws; forelimbs exceed hind limbs in length; tail short; pinnae greatly reduced; pelage long and crisp, typically with algae that impart a greenish tinge; heterothermic.

Habits: **arboreal foliavore**, essentially eating only one type of leaf; hang from branches suspended by limbs; can turn head 270 degrees; monestrous; climb to ground to defecate at the base of tree, where they are frequently preyed upon by large predators, especially jaguar.

Range: Central America through northern South America

Material in Lab: ***Choloepus****

*Not an Idaho form.

Family Dasypodidae (armadillos)

Diagnosis: teeth subcylindrical, absent from premaxillae; zygomatic arch complete; mandible elongate; tibia and fibula fused proximally and distally; manus and pes with strong recurved claws; major part of skin ossified; ossified region consisting of regularly arranged bony scutes, forming an armor composed of typically five shields: cephalic, scapular, dorsal, pelvic, and caudal; scutes covered by epidermal plates; moveable bands between plates; body hair usually reduced.

Habits: insectivorous and herbivorous; dig burrows; poor temperature control; gain buoyancy for swimming by swallowing air; polyembryonic, with as many as 12 (usually 4) identical individuals produced from one fertilized ovum; young precocial at birth; roll into a ball when alarmed.

Range: Kansas to central Argentina

Material in Lab: ***Dasypus**** (skin and skull)

*Not an Idaho form.
Other Representative Genera: *Tolypeutes, Chlamyphorous, Euphractus, Priodontes, Cabassous*

Order Proboscidea (Elephants)

Diagnosis: Largest terrestrial animals; nose extended into a long muscular, flexible proboscis with nostrils at end; legs pillar-like (columnar), with long upper segments; numerous air cells in walls of cranium and naso-maxillary region (note photo in *Walker's Mammals of the World*); five toes on each foot, most bearing small hoofs; cheek teeth lophodont, usually with only one functional at a time, worn away anteriorly and replaced posteriorly; jugal participates in glenoid fossa.

There are five fossil families, only one of which is extant.

Family Elephantidae (Asiatic and African elephants)

Diagnosis: Same as for order.

Habits: Herbivores; usually on young per litter, gestation period between 18 and 24 months; live in herds of up to 400 individuals.

Range: sub-Saharan Africa, and Oriental region.

Extant Genera: *Loxodonta, Elephas*

Material in Lab: ***Mammuthus*** **(Woolly mammoth)**

Order Afrosoricida

This order includes two families, the Tenrecidae and the Chrysochloridae. We only have representation of the former (tenrecs). The entire order is restricted to Madagacsar and central and southern Africa. Chrysochlorids (the golden moles) are fossorial. Both families have been considered members of the order Insectivora, although recent moleculr phylogenies refute that hypothesis rather convincingly.

Family Tenrecidae (Tenrecs)

Diagnosis: Small animals (9-58 cm); eyes well-developed; pelage variable, some forms with spines; zygomatic arch incomplete (jugal is missing); annular tympanic bone; incisors small and simple.

Habits: crepuscular, nocturnal, and omnivorous; most are polyestrous; ovulate in response to copulation, some are semi-arboreal.

Range: Madagascar

Material in Lab: ***Echinops*** (skin)

Other Representative Genera: *Hemicentetes, Oryzorictes*

Order Insectivora (Eulipotyphla or Soricomorpha)

Diagnosis: maxilla extending into orbital wall, separating lacrimal from palatine; orbital wing of palatine reduced, largely confined to floor of orbit; jugal reduced or absent; zygomatic arch sometimes incomplete; tympanic lost; teeth sharp-cusped, rooted, crowns covered with enamel; deciduous upper and lower fourth premolars never resembling a normal tribosphenic molar.

Range: North America, N. South America, Greater Antilles, Europe, Africa, Asia.

Family Talpidae (moles)

Diagnosis: basisphenoid, auditory bullae, and zygomatic arches present; no postglennoid process; dilambdodont; occipital region of skull formed by supraoccipitals and exoccipitals; fossorial; snout elongate; eyes small sometimes hidden beneath skin; ears without pinnae; legs short, forelimbs, manus greatly modified for digging (or swimming in *Condylura*); humerus extremely broad and short; penis pendulous and directed posteriorly.

Habits: predominantly fossorial, some are aquatic/amphibious; omnivorous, but feed predominantly on invertebrates; active almost constantly; probably monestrous.

Range: North America, Europe, Asia

Material in Lab: ***Scapanus townsendii****

*Not an Idaho mammal

Note that ***Scapanus orarius*** (coast mole) is known from a small area in west-central Idaho.

Other Representative Genera: *Parascalops, Condylura, Scalopus, Talpa, Desmana*

Family Soricidae (shrews)

Diagnosis: skull long and narrow; no zygomatic arch; tympanic annular; no bullae; dilambdodont; first upper incisor long, distally hooked, and having cusps projecting ventrally at base; premolars unicuspid, except for P4; eyes small but visible; ears usually with visible pinnae; deciduous teeth shed in utero.

Habits: insectivorous and carnivorous; active nearly constantly; rather short lived (usually < 1 year); very high basal metabolic rate.

Range: Cosmopolitan

Material in Lab: ***Sorex*** *vagrans* **(vagrant shrew)**
S. *cinereus* **(masked shrew)**
S. palustris **(water shrew)**
S. *monticolus* **(dusky or mountain shrew)**
S. merriami **(Merriam's shrew)**
Blarina* **(short-tailed shrews)**

*Not an Idaho form.

These species are very difficult to identify; identification relies on size and pigmentation patterns of teeth. Use the key in the lab (Junge and Hoffman 1981) to see how difficult it can be. ***S. palustris*** & ***S. merriami*** are easy enough from the pelage, but *S. monticolus*, *S. vagrans* and *S. cinereus* can be very difficult; **be able to identify these three to genus**.

Idaho forms not represented: ***S. hoyi*** **(pigmy shrew)**

There are records of *S. nanus* (dwarf shrew) in Idaho.

Other Representative Genera: *Crocidura, Cryptotis, Notiosorex, Suncus, Myosorex, Blarinella, Paracrocidura*.