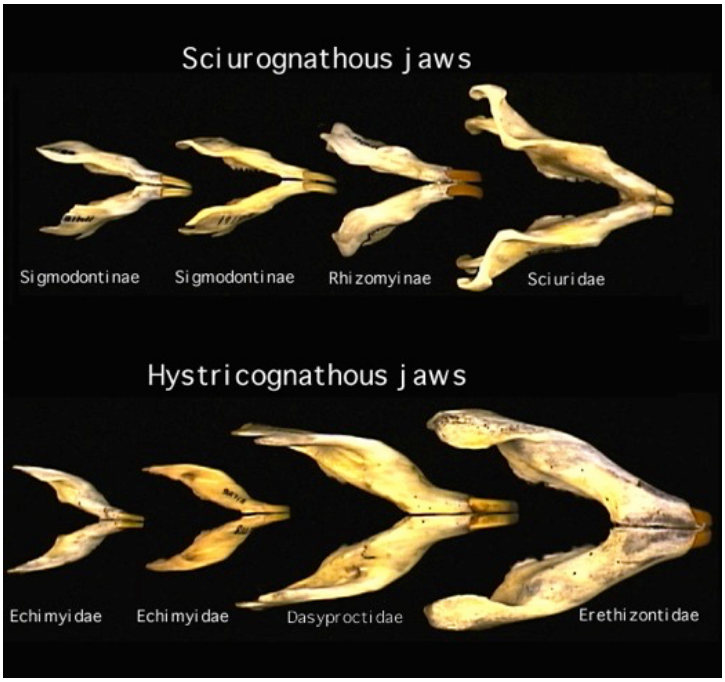
Mammalogy Laboratory 4 - Rodents I: Hystricomorpha, Sciuromorpha

General Comments: We'll spend two weeks on the order **Rodentia**. This may seem like a lot of time, but almost half (~2552 species) of all living species of mammals are rodents. Most forms are primarily herbivorous, but some (e.g., *Onychomys*) are quite carnivorous. Living rodents range in size from only a few grams (pigmy mice: *Baiomys*) to over 60 kg (capybara: *Hydrochaeris*). Most molecular phylogenies indicate that the 30 or so families can be placed into 5 clades and these largely correspond to morphologically diagnosable suborders. As we discussed in lecture, these clades can be diagnosed using a combination of two characters: jaw morphology and zygomasseteric condition.

Diagnosis: Single pair of semicircular, ever-growing incisors which have enamel only on the anterior surface; canines absent, large diastema present; mandibular symphysis flexible; orbit broadly united with temporal fossa; premaxilla has processes reaching to frontals.

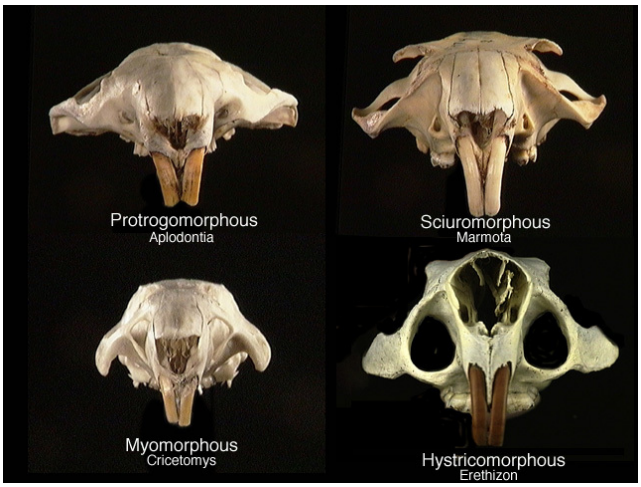
Range: Cosmopolitan (Not native to New Zealand)

Jaw morphology: There are two major types of jaws among rodents. **Sciurognathous**, or squirrel-like, jaws have the incisive alveolus (socket of first incisor), in the same plane as the angular process. In **hystricognathous** or old-world porcupine-like jaws, the incisive alveolus is in a plane that is medially offset from the plane of the angular process.



Zygomasseteric condition: There are four arrangements of masseter attachment with the zygomatic arch. In the **protrogomorphous** condition (which is ancestral), the infraorbital canal is small, and the masseter attaches to the ventral surface of the zygomatic arch. In the **scuiromorphous** condition, the infraorbital canal is also small, but the lateral masseter passes

under the zygomatic arch to attach on the rostrum. In the **hystricomorphous** condition, the infraorbital canal is greatly enlarged, and the medial masseter passes through it to attach to the rostrum. In the **myomorphous** condition, the infraorbital canal is only slightly enlarged, and a small portion of the medial masseter passes through it to attach on the rostrum.



Suborder Hystricomorpha (Ctenohystrica)

Families:

Hystricidae	Thryonomyidae
Petromuridae	Bathyergidae
Erethizontidae	Caviidae
Chinchillidae	Hydrochaeridae
Dasyproctidae	Ctenomyidae
Myocastoridae	Dinomyidae
Agoutidae	Echimyidae
Abrocomidae	Capromyidae
Octodontidae	Ctenodactylidae

Suborder Sciuromorpha

Families:

Aplodontidae
Sciuridae
Gliridae

Suborder Castorimorpha

Families:

Castoridae
Geomyidae
Heteromyidae

Suborder Myomorpha
Families:
Muridae (Note subfamilies)
Murinae Deomyinae
Gerbillinae Lophiomyinae
Calomyscidae
Platacanthomyidae
Spalacidae
Nesomyidae
Cricetidae (Note subfamilies)
Arvicolinae Cricetinae
Sigmodontinae Tylomyinae
Neotominae
Dipodidae

Suborder Anomaluromorpha
Families:
Anomaluridae
Pedetidae

Suborder Hysrticomorpha

Diagnosis: **Hystricognathous mandible**; pterygoid fossa opens into orbit or braincase; **hystricomorphous zygomasseteric condition.**

Distribution: Three families endemic to Africa, one Old World family occurs in southern Europe, most families are South and Central American, with one ranging into North America

Family Erethizontidae (New World porcupines)

Diagnosis: Feet modified for arboreal life; some hairs modified into sharp, short spines, with minute imbricate, proximally directed barbs; bullae prominent; paroccipital process not elongate; teeth brachydont, with re-entrant folds of enamel.

Habits: Arboreal; herbivorous; solitary; nocturnal.

Range: North, Central and South America

Representative Genera: *Erethizon, Coendu*

Material in Lab: ***Erethizon dorsatum*** (porcupine)

Family Myocastoridae (nutria or coypu)

Diagnosis: Robust; pes much larger than manus and having four toes webbed; pollex vestigial; paroccipital processes elongate; cheek-teeth decrease in size and converge anteriorly, hypsodont; fur soft and thick; tail moderately long, scaly, round in cross section, and poorly haired.

Habits: Semi-aquatic; eat aquatic vegetation; burrow in banks; can submerge for up to 1/2 hour.

Range: Native to southern South America, have been widely introduced in southern North America, where they have become pests.

Genus: ***Myocastor*** *coypu****** (nutria)

*Not an Idaho Species

Suborder Sciuromorpha

Diagnosis: **Sciurognathous mandible, Scuiromorphous or Protrogomorphous zygomasseteric condition.**

Distribution: Cosmopolitan (worldwide).

Family Aplodontidae (Mountain Beaver)

Diagnosis: Cheek-teeth ever-growing; P^3 minute**;** infraorbital foramen small, not transmitting any portion of the masseter - protrogomorphous; zygomatic plate narrow; neck of bulla long and directed horizontally outward; palate broad, extending behind tooth rows; pentadactyl.

Habits: Dig burrows with many openings; feed on succulent stems; short estrous; bear 2-6 young after gestation of 28-30 days.

Range: Mountains of Pacific Northwest.

Genus: ***Aplodontia****

*Not an Idaho Species

Family Sciuridae (squirrels, marmots, chipmunks)

Diagnosis: Cheek-teeth rooted, usually characterized by prominent cusps or ridges; post-orbital process usually well-developed; angular process slightly inflected; palate broad; tail always fully haired, often bushy; **Sciuromorphous**, with **infraorbital foramen small**; zygomatic plate broadened, tilted upward; incisive foramina usually short and considerably anterior to tooth-rows.

Habits: Diurnal, nocturnal or crepuscular; arboreal or terrestrial; herbivorous, but occasionally eat insects; some aestivate or hibernate.

Note: Recent phylogenetic and craniometric analyses (Helgen et al. 2009. J. Mammal. 90:270) have indicated that the genus *Spermophilus* is paraphyletic. Therefore, it's been split into 8 genera. Recent suggestions to recognize western chipmunks under the genus *Neotamias* are not based on non-monophyly of *Tamias* (*sensu lato*, or broad sense); we will therefore not follow them.
Range: Cosmopolitan except for Australia, Madagascar, and southern South America.

Material in Lab: ***Callospermophilus lateralis*** (golden-mantled ground squirrel)
***Ictidomys** tridecemlineatus* (thirteen-lined ground squirrel)
Urocitellus armatus (Uinta ground squirrel)
U. beldingi (Belding's ground squirrel)
U. brunneus (Idaho ground squirrel)
U. columbianus (Columbian ground squirrel)
U. elegans (Wyoming ground squirrel)
U. mollis (Piute ground squirrel)
***Ammospermophilus** leucurus* (white-tailed antelope ground squirrel)
Marmota monax (woodchuck)
M. flaviventris (yellow-bellied marmot)
M. caligata (hoary marmot)
***Cynomys** ludovicianus* (black-tailed prairie dog)
Tamias* (*Neotamias*) *amoenus (yellow-pine chipmunk)
T.* (*Neotamias*) *dorsalis (cliff chipmunk)
T.* (*Neotamias*) *minimus (least chipmunk)
T.* (*Neotamias*) *ruficaudus (red-tailed chipmunk)
T.* (*Neotamias*) *umbrinus (Uinta chipmunk)
T. striatus (eastern chipmunk)
Tamiasciurus hudsonius (red squirrel)
[+]***Sciurus niger*** (eastern fox squirrel)
[+]***S. carolinensis*** (eastern gray squirrel)
S. aberti (tassel-eared squirrel)
Glaucomys sabrinus (northern flying squirrel)

Idaho forms not in Lab:
Urocitellus canus (Merriam's ground squirrel)
Otospermophilus variagatus (rock squirrel) – occursw in extreme SE Idaho.

*Not found in Idaho
[+]Introduced in Idaho

Learn the skulls to genus and the skins to species (for taxa with species epithets in bold).

Key to North American genera of sciurids (north of Mexico):

1. Membrane present for gliding; zygomatic plate low, tilted only slightly upwards……*Glaucomys*
   No gliding membrane; zygomatic plate tilted upwards substantially……...….....2

2. No infraorbital canal, the infraorbital foramen piercing the zygomatic plate of the maxillae…….....*Tamias*
Infraorbital canal present…….....3

3. Zygomatic breadth greater than 48 mm…….....*Marmota*
Zygomatic breadth less than 48 mm…….....4

4. Zygomata not parallel but converging anteriorly, with anterior twist nearly to horizontal plane …5
Zygomata nearly parallel and nearly vertical throughout….....…….....7

5. Maxillary tooth rows strongly convergent…….....….….....*Cynomys*
Maxillary tooth rows not strongly convergent…….....6

6. Small masseteric turbercle directly below narrowly oval infraorbital canal.....*Ammospermophilus*
Medium to large masseteric tubercle, cranium not subrectangular from dorsal aspect .....…
.....…….....*Spermophilus* (*sensu lato*), which includes *Urocitellus, Callospermophilus,* and *Ictidomys* (among others).

7. P^3 vestigial or absent…….....*Tamiasciurus*
P^3 well developed .....…….....*Sciurus*