Mammalogy (BIOEE 451)
Lab 3 – Mammalian reproduction
Mammalian Diversity: (Afrotheria) Orders Afrosoricida, Macroscelidea, Tubulidentata, Proboscidea, Hyracoidea, Sirenia

Business:

1. **Practical next Wednesday –** We need to schedule a time for practical review. The practical will begin promptly at 1:40 p.m. on February 21. If you are concerned that you will not be able to make it to the Lab of Ornithology by then, please let me know now. Once the practical begins, the door to the lab will be locked. Late-comers will not be admitted. When you enter you will place all bags, coats, and hats by the door and go to the station to which you are assigned. Questions at each station will be written on an upside-down card. When the starting signal is given, turn the card over and write the answers to the questions on the appropriate lines of your answer sheet. When you are finished answering the questions, turn the card back over and wait for the signal to move to the next station. The 100 point practical will include ~50 questions distributed among ~25 stations. You will be given 2 minutes at each station, and you will not be allowed to return to a station.
2. **Turn in journals –** Turn in your journals to me (or my mailbox in Corson Hall) by Friday at 4:00 p.m. Late journals will lose points at a rate of 5 points per day.

Goals for this lab:

1. Learn the elements of the female and male reproductive systems in eutherians and metatherians, including the major events that occur within the ovaries and testes
2. Understand how the placenta forms and how the fetal circulatory system differs from that of postnatal young
3. Understand the developmental process for fetal mammals, and the difference between altricial and precocial young
4. Learn about the orders of the Afrotheria

Station 1: Female reproductive systems

(Martin et al. – p. 54; Vaughan et al. – pp. 18, 77)

All female mammals share certain elements of their reproductive systems (e.g., **ovary**, **infundibulum**, **Fallopian/uterine tube/oviduct**, **uterus**, **vagina**), but the design and arrangement of these structures varies considerably among taxa. For example, metatherians have two lateral vaginae (plus a medial vagina or "pseudovaginal canal"), while prototherians and eutherians have only one (see Fig. 9.2 in Martin et al.). Within the Eutheria, there is substantial variation as well. Eutherian mammals may have **duplex**, **bicornuate/bipartite**, or **simplex** uteri. In the duplex condition, the female has two completely separate uteri that open via separate muscular cervices into the vagina. The anterior end of bicornuate or bipartite uteri are separate structures or "horns", but the two **uterine horns** merge together before opening into the vagina via a single cervix. In a bipartite uterus, the body of the uterus where the uterine horns meet is partially cleft by a partition. In a bicornuate uterus there is no obvious partition. Whether or not a given species has a bicornuate or bipartite uterus is not always obvious, since these seem to be the endpoints on a continuum of variation. For this reason we are grouping them together in this lab.

The final type of uterus that we will examine is the simplex uterus. In this type of uterus (found in humans), the Fallopian (uterine) tubes lead directly into a single, large uterus.

At this station you will find the reproductive tracts of several different female mammals. Please wear gloves when handling the fluid preserved specimens, and keep the specimens covered with moistened towels/cotton when not being examined.

- Examine the reproductive tract of the marsupial, *Didelphis virginiana*. In the center you will find the thick-walled **medial vagina**, and the two **lateral vaginae** (connected to the rest of the structure by heavy membranes) are on either side. The two **uteri** and their associated **ovaries** (visible attached to at least one of the uteri) extend up from the medial vagina. The heavily muscled **bladder** (not part of the reproductive system, obviously) enters the **urogenital sinus** below the medial vagina.

The remaining examples at the station are three eutherian reproductive tracts. You should be able to identify the **ovaries**, **infundibulum** (funnel-shaped membrane at the end of the Fallopian tubes), **Fallopian tubes**, **uterus**, **cervix**, and **vagina** in each.

- The rabbit exemplifies the duplex condition. Note the two distinct uteri and cervices.
- The cow (and the pig at Station 3) has a bicornuate uterus. In this example, the uterus and vagina are easily identified because they are separated by the large and muscular cervix.
- The model of the human reproductive tract demonstrates the simplex uterus.

As you no doubt know, **egg cells** (**oocytes**) originate in the ovaries. They begin as primary oocytes within a growing structure called a **follicle**. As the follicle matures, fluid builds up inside it until a hormonal signal causes the follicle itself to rupture through the outer wall of the ovary. During this process (**ovulation**), the oocyte is sent adrift into the female's body cavity. Happily, it does not have far to go or it could get lost. A funnel-shaped membrane called the infundibulum gathers up ovulated oocytes and carries them via ciliary action into the Fallopian tube (where fertilization occurs in non-monotremes; in monotremes fertilization occurs in the infundibulum) and eventually the uterus for implantation. The ruptured follicle in the ovary collapses and develops into the **corpus luteum**, which secretes progesterone, a hormone that promotes the maturation of the endometrium in the uterus. The endometrium is where the fertilized egg will implant and eventually develop into an embryo.

- Examine the pig ovaries at this station. Identify the infundibulum. Note the bulbous structures under the surface of the ovary. These are either developing follicles or corpus lutea.
- Open the sectioned ovary and identify a follicle and corpus luteum inside it.
- Using the available picture as a guide, try to identify the follicle and corpus luteum on the microscope slide of the pig ovary (note – in the slides that we have, corpus lutea are not very clear).

Methodology note – Mammalogists usually record reproductive information when they trap and dissect an animal. For females, this can include information regarding the presence and size of embryos in the uterus. If there are no embryos, mammalogists look for evidence that the animal has had offspring in the past. This is done by examining the uterus for placental scars – black or white dots in the uterine lining.

- The jar at this station with the placental scar demonstration has two uteri. One is from a virgin female deer mouse (no placental scars), and the other is from a mouse that has had several offspring. Count the placental scars to see how many offspring the latter female had.

Live females can be palpated in the field to determine if they are pregnant and if they are, the number and approximate age of fetuses can also be determined by someone experienced with the species. In addition, the condition of nipples or teats is often examined to determine whether the female is lactating at the time of capture or has recently lactated.

Station 2 – Male reproductive system:

(Vaughan et al. – pp. 17-19)
The reproductive system of male mammals is less complex than that of females. Sperm are produced in the **testis**, mature in the **epididymis** (coiled structure attached to the outside of the testis), and travel through the **vas deferens** to the **urethra** during ejaculation. In some monotremes and metatherians, the penis (like the female's vaginae) is bifid, meaning that it is split into two branches. Though this is not the case for eutherians, the latter may have very complex penile designs (see e.g., Figure 2-7 of Vaughan et al.).

Rigidity of the penis during copulation, which is necessary for penetration of the female's vagina, is maintained in most mammals through engorgement of the **corpus cavernosa**, cylinders of spongy tissue that fill with blood during sexual stimulation.

- Note the paired corpus cavernosa and the thick-walled urethra in the human penis demonstration.

As we briefly mentioned last week, some mammals (e.g., non-human primates, rodents, carnivores, bats, and some insectivores) also have bacula to help maintain rigidity and aid in copulation. For some this bone is a simple rod. In other mammals, bacula may have a urethral groove, hook, or other modifications (see the examples at this station and Figure 6.2 in Martin et al). The function, if any, of these morphological variants is not always clear, though hooked bacula may allow the penis to be held in place inside the vagina during copulation. This would presumably have the adaptive function of increasing the time of copulation and therefore the potential for successful insemination. Many mammals lack bacula (e.g., metatherians, humans, equids, lagomorphs).

- At this station (and the dissected pig at station 3) you will find examples of the reproductive systems of male metatherian (*Didelphis virginiana*) and eutherian (*Mustela*) mammals. You should be able to identify the **testes**, **epididymis**, and **vas deferens** in each. The **urethra** is visible in the opossum and the pig. Also, note the **bifid penis** in the opossum.

Gametogenesis (i.e., the process by which sex cells are created) occurs in the **seminiferous tubules** of the testes. Within the seminiferous tubules, spermatocytes undergo meiosis to produce spermatids, which eventually develop into flagellated sperm. As gametogenesis proceeds, the developing gametes move from the outside edge of the seminiferous tubule to the center. From there they work their way into the epididymis, where they complete maturation and are stored.

- Examine the microscope slide of the pig testis. Identify the seminiferous (spermatic) tubules and the developing gametes. Note the darkly stained elongated sperm cells in the center of each seminiferous tubule.

<u>Station 3 – Prenatal development in pigs:</u>

(Vaughan et al. – Chapter 20)

Once the fertilized egg (**zygote**) becomes implanted in the lining of the uterus (**endometrium**), development of the embryo commences. The **placenta**, which mediates the transfer of nutrients, oxygen, and waste between highly vascularized tissue of the mother and fetus, begins to form as the **trophoblast** cells that surround the zygote multiply and invade the endometrium. As you have learned in lecture, there is substantial variation in the structure of mammalian placentae. Placentae are formed from connections between fetal membranes (the **chorion** and either the **yolk sac** or **allantois**; see Figure 20-3 in Vaughan et al.) and the maternal endometrium, but the degree to which the fetal tissues invade and break down the endometrium varies considerably. Today we will focus largely on the pig, which has a **chorioallantoic placenta** like all eutherians.

In pigs, neither the epithelial lining of the endometrium, nor the chorioallantoic membrane, breaks down during placental development. In the placenta, six tissues separate maternal (uterine blood vessels, endometrium connective tissue, epithelial lining) and fetal (fetal blood vessel, chorioallantoic connective tissue, trophoblast) blood supplies. This type of placenta (called an **epitheliochorial placenta**) separates easily from the endometrium during the birth process, with a minimum of broken blood vessels (and, therefore, very little bleeding). Why would it be adaptive to have a more invasive and difficult to separate placenta?

Microscope 1 at this station shows a thin section of a human placenta. This type of placenta (called a **hemochorial placenta**) is more invasive than that of the pig. Maternal blood directly bathes the fetal portion of the placenta; thus, only three tissues separate maternal and fetal blood supplies (fetal blood vessel, chorioallantoic connective tissue, trophoblast). At birth, when the placenta pulls away from the uterine wall, the endometrium is shed, leading to bleeding.

- Using the picture as a guide, identify the maternal blood cells and fetal tissue layers that make up the human placenta.

Now that you understand how the placenta is formed at the cellular level, examine the pregnant pig uterus to apply your knowledge at the macro scale. Each bulge in the uterus contains a pig fetus and we have opened one for study.

- Note the thick endometrium that envelopes the fetus. In this case it has already pulled away from the uterine wall, though it is unclear if this occurred before or after the specimen was preserved. Find the fetus inside the endometrium. The fetus is secondarily wrapped within the **amnion**, a fluid-filled sac that protects it. The **umbilical cord** connects the blood supply of the developing fetus to the placenta. Follow the umbilical cord to the placenta, and note the tight connection between the fetal and maternal tissues.

- Examine the slide of pig embryo cross sections at microscope #2 (these sections are through an embryo with a crown-rump length of 10 mm; this corresponds to approximately day 20 or 21 of a 115 day gestation) and the developmental series of fluid-preserved embryos (these range from day 6 to day 70 of gestation). It should be apparent that most of the major organs are in place fairly soon after the embryo begins development. For most of the gestation period the embryo is simply growing, rather than developing new organs and organ systems. Pigs are born at a crown-rump length of about 30 cm.

Though the organ systems are in place early in development, the fetal circulatory system does not function in the womb as it will after birth. This is due to the need to route most blood away from the lungs (which are growing, but non-functional with respect to breathing in the fetus) and to/from the placenta. Most blood is also shunted past the liver, which is not yet functioning in digestion for the fetus. Three important shortcuts in blood circulation accomplish this rerouting. These are 1) the **foramen ovale** (hole between the heart's atria), which allows blood to flow directly from the right atrium to the left, 2) the **ductus arteriosis**, a shortcut that joins the pulmonary trunk to the aorta, and 3) the **ductus venosus**, which allows blood from the placenta to bypass the liver and flow directly into the inferior vena cava on its way to the heart.

- Identify these structures in the demonstration dissection of the fetal pig at this station. Also, note in the cross-section of the umbilical cord the large umbilical vein, which carries oxygenated blood from the placenta to the fetus, and the two thick-walled umbilical arteries, which carry deoxygenated blood from arteries in the legs.

<u>Station 4 – Developmental stage of young at birth:</u>

(Vaughan et al. – pp. 354-355)

Mammalian young can be divided into two broad categories: altricial and precocial. Altricial young are relatively helpless at birth. They are usually blind (membranes cover the eyes), have poor locomotor ability, and are unable to regulate their body temperature. Species with altricial young typically have relatively short gestation and suckling periods, large litters, and live under unstable environmental conditions. Marsupial offspring represent the most altricial of mammalian young. In contrast, precocial young are well-developed. They are well-furred, able to see, and within minutes of birth they may be on their feet. Such species have long gestation periods and the bond between mother and offspring is prolonged and complex. Mothers typically only have one or two offspring at a time.

At this station we have a range of late-stage fetal mammals representing altricial and precocial species. At the extreme altricial end of the spectrum are the young *Didelphis* attached to their mother's nipples. As we have seen, marsupials are so underdeveloped at birth that they are little more than a pair of arms and a sucking mouth. Carnivores also have altricial young, though they are not as poorly developed as the offspring of some other eutherians, such as shrews and rodents. Examine the *Canis* and *Leopardus* specimens. Note that both are substantially better-developed than opossum young are, but both would be blind at birth and entirely dependent on their mother for food and warmth. Chiropterans (bats) are also altricial at birth, depending entirely on their mothers for survival. Lastly, the white-tailed deer fawn (*Odocoileus virginianus*) represents a species with precocial young. Deer are able to walk immediately after birth, and they will start eating vegetation within days. Note that the fawn is already exhibiting its distinctive dappled coat, and eyes, ears, nose, and hooves are already well-developed.

<u>Station 5 – Mammalian diversity – Afrotheria</u>

(Martin et al. – Chapter 12, 21, 24, 25; Vaughan et al. – Chapter 8, 14, 15, 19)

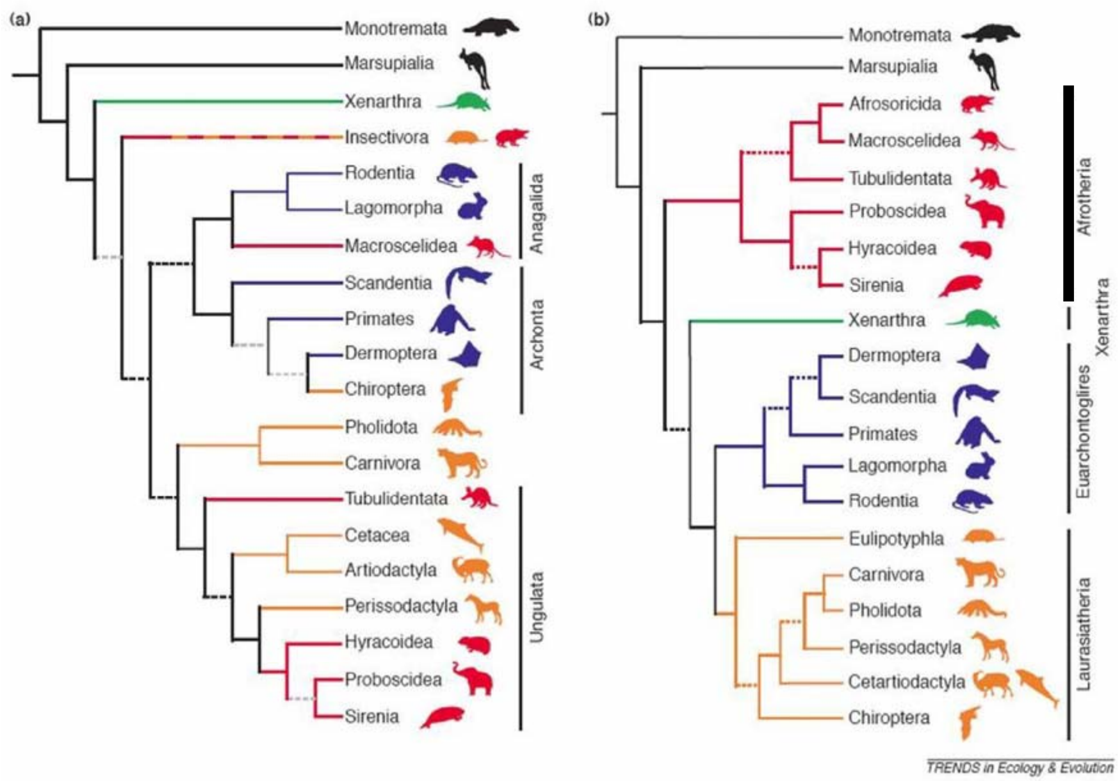
Note – if you have questions about the geographic distributions of these animals, consult the world map

Classification: Class Mammalia

- **Subclass Eutheria**
  - **Superorder Afrotheria**
    - **Order Afrosoricida**
      - Suborder Tenrecomorpha
        - **Family Tenrecidae**
      - Suborder Chrysochloridea
        - **Family Chrysochloridae**
    - **Order Macroscelidea**
      - **Family Macroscelididae**
    - **Order Tubulidentata**
      - **Family Orycteropodidae**
    - **Order Hyracoidea**
      - **Family Procaviidae**
    - **Order Proboscidea**
      - **Family Elephantidae**
    - **Order Sirenia**
      - Family Dugongidae
      - **Family Trichechidae**

For the rest of the semester we will study eutherian diversity. As you explore the amazing variety of forms that have resulted from the radiation of these placental mammals, keep in mind the characteristics that separate them from marsupials and monotremes. For example, the ancestral dental condition for eutherians is 3/3 1/1 4/4 3/3, total 44. As you examine skulls, consider how highly derived they are (i.e., how much they differ from the ancestral state) based on modifications to their dentition. Note the relatively large tympanic bullae and the mandibular fossa that typically sits solely in the squamosal. Placental mammals are generally considered to exhibit more highly developed social systems and complex behavior, which may be influenced by differences in neuroanatomy (e.g., the corpus collosum that connects the cerebral hemispheres) and reproduction (e.g., long gestation periods, larger maternal investment in offspring).

Though the phylogenetic relationships within Mammalia are still in flux, in this class we are following the classification scheme suggested by recent molecular studies of mammalian diversity (see Figure B below). In the molecular phylogeny, the basal eutherian lineage is a diverse and fascinating group of orders known collectively as the Afrotheria ("African beasts"). Though representatives of the Afrotheria currently live on several continents, they are thought to have arisen from a common ancestor that lived in Africa over 65 million years ago. There are no obvious morphological features to unite the Afrotheria, which explains why they were historically considered to have very different phylogenetic affinities (see Figure A below). We begin our tour of eutherian diversity with the Afrotheria, which can be divided into 6 orders.



Mammalian phylogenies based on morphological (a) and molecular (b) data.

Order Afrosoricida, Family Tenrecidae

Distinguishing characters:	lack jugals – zygomatic arch is incomplete; small incisors; cheek teeth are usually zalambdodont (V-shaped); males lack a scrotum – testes reside within body cavity; dental formula varies considerably – 2-3/2-3, 1/1, 2-3/2-3, 2-4/2-3
Number of species:	30
Representative species:	Tail-less tenrec, *Tenrec ecaudatus* Lesser hedgehog tenrec, *Echinops telfairi*
Geographic distribution:	Madagascar and central Africa
Diet:	varies, but generally omnivorous; may eat invertebrates, small vertebrates, plants, fruit
Habitat:	variable; semi-arid to rain forest
Behavior:	typically nocturnal; may be solitary or live in small groups
Size:	40 – 390 mm (head and body)
Reproduction:	1 litter of 1-32 offspring per year; 50-64 day gestation period
Lifespan:	up to 6 years
Other notes:	many tenrecs do not maintain a constant body temperature (body temperature cools when at rest)

The tenrecs have undergone a dramatic adaptive radiation, allowing them to exploit many different niches. Because they have been shaped by natural selection to occupy niches that other animals occupy elsewhere, they present several stunning examples of convergent evolution. Species in various genera bear striking resemblances to otters, shrews, hedgehogs, and moles.

Order Afrosoricida, Family Chrysochloridae

Distinguishing characters:	conical skull; no external eyes; no pinnae; forefoot has large claws on 3^{rd} (and sometimes 2^{nd}) digit; upper molars zalambdodont; urinary and reproductive tracts open into common passage (urogenital sinus); enlarged malleus; dental formula 3/3, 1/1, 3/3, 2-3/2-3
Number of species:	21
Representative species:	Grant's golden mole, *Eremitalpa granti*
Geographic distribution:	Africa
Diet:	primarily invertebrates, some small vertebrates
Habitat:	arid to montane to swampy
Behavior:	generally solitary and territorial
Size:	70 – 235 mm
Reproduction:	1 litter of 1-3 young per year
Lifespan:	unknown
Other notes:	limbs are held under body rather than out to sides as in talpid ("true") moles; enlarged malleus has been suggested to be an adaptation for listening to vibrations in the earth produced by potential prey

Order Macroscelidea, Family Macroscelididae

Distinguishing characters:	hind limbs longer than forelimbs (as in rabbits); elongated snouts; large eyes and ears; upper canine has two roots; quadrate molars; dental formula 1-3/3, 1/1, 4/4, 2/2-3; palatal fenestrae; shrew-like skull, but with complete auditory bullae and zygomatic arches
Number of species:	15
Representative species:	Rufous elephant shrew, *Elephantulus rufescens*
Geographic distribution:	north and central Africa
Diet:	primarily insects, but also some plant material
Habitat:	varies; arid and semi-arid scrubland to dense forest
Behavior:	largely diurnal, but may forage at night; territorial; monogamous
Size:	25 – 550 g
Reproduction:	small litters (1-4) of precocial young; gestation period ~ 40-65 days
Lifespan:	up to 4 years
Other notes:	elephant shrews make extensive runways in their territories; they move quickly when in open areas and excel at hopping/running; monogamous pairs may defend their territory cooperatively

Order Tubulidentata, Family Orycteropodidae

Distinguishing characters:	elongate and conical skull; fleshy tentacles on nasal septum; most elaborate turbinate bones of any mammal; large pinnae; long, sticky tongue; thick skin with sparse hair; dental formula 0/0 0/0 2-3/2 3/3;

	rootless teeth with no enamel; columns made up of hexagonal prisms of dentine
Number of species:	1
Representative species:	Aardvark, *Orycteropus afer*
Geographic distribution:	sub-Saharan Africa
Diet:	insectivorous, especially termites; wild cucumber; mice
Habitat:	grassy plains, bushland, savannah; wherever termites are found
Behavior:	excellent diggers; excavate extensive burrows; bury feces; dig into termite mounds to extract food
Size:	40 – 100 kg
Reproduction:	polygamous; 1 litter of 1-2 young per year
Lifespan:	unknown
Other notes:	Aardvarks may offer a seed dispersal mechanism for a wild cucumber, which they seek out as a water source. The cucumber develops beneath the ground so opportunities for passive seed dispersal are limited. The aardvark digs it up, eats it, and when it buries its feces, the cucumber seeds are replanted somewhere else.

- Examine the aardvark's teeth beneath the dissecting scope. Can you make out the thousands of dentine prisms that make up each tooth?
- Compare the aardvark skull to those of other termite-eating animals. We have discussed the ways in which these skulls have converged (elongated rostrum, generally reduced dentition), but now consider the ways that they differ (e.g., the teeth that they do have differ markedly). What may be responsible for those differences?

Order Hyracoidea, Family Procaviidae

Distinguishing characters:	3 toes on hind feet with hoof-like nails; mesaxonic feet (weight-bearing axis passes through 3rd digit as in horses); short rostrum; postorbital bar; jugal contributes to mandibular fossa; triangular upper incisors; rootless incisors have enamel only on anterior surface; diastema behind incisors; lophodont molars; dental formula 1/2, 0/0, 4/4, 3/3
Number of species:	4
Representative species:	Southern tree hyrax, *Dendrohyrax arboreus*
Geographic distribution:	Africa and Middle East
Diet:	leaves, bark, grass, some invertebrates
Habitat:	arboreal or in rocky outcrops
Behavior:	solitary (arboreal) or in colonies (rock-dwelling)
Size:	~2 – 5 kg; 30 – 60 cm
Reproduction:	long gestation (210-240 days); 1-4 young per litter
Lifespan:	up to 12 years
Other notes:	glands in foot pads keep pads moist and elastic, improving traction; muscles can turn pad into suction cup for climbing; skin gland on back produces secretions thought to be involved in communication

- Compare the skull of the hyrax to that of the beaver (rodent) and wombat (rodent-like marsupial). How are they similar? How do they differ?
- Examine the pads on the feet of the hyrax. As mounted skins they are dry and hard, but it is easy to see that in life they are soft and supple, almost like climbing shoes. Also, note the streak of differently colored fur in the middle of the animal's back. This is where the gland that is mentioned in the notes above is found.
- What other animal have you seen that has wicked triangular incisors? Is there common ground between that animal and the hyrax?

Order Proboscidea, Family Elephantidae

Distinguishing characters:	trunk; skull full of air pockets to reduce weight (pneumatization); graviportal (weight-bearing) limbs; well-developed occipital (lambdoidal) crest for muscle attachment; "conveyor belt" cheek teeth replacement; lophodont cheek teeth; upper incisors modified into tusks; dental formula 1/0, 0/0, 3/3, 3/3
Number of species:	3
Representative species:	Asian elephant, *Elephas maximus*
Geographic distribution:	sub-Saharan Africa, India, southeast Asia
Diet:	herbivorous – grass, leaves, bark (up to 400 kg/individual/day!)
Habitat:	grassland, forest
Behavior:	non-territorial; social – matriarchal groups led by oldest female; males may be solitary or live in bachelor herds; use tusks as tools (digging, accessing vegetation) and weapons; use trunks for feeding, drinking, bathing, vocalizing
Size:	up to 3 m tall at shoulder, 6000 kg
Reproduction:	gestation 18-22 months; single offspring
Lifespan:	60-80 years
Other notes:	thick pad in heel helps cushion steps and spread weight; typically walk, but can charge at >45 km/hr; generate low frequency soundwaves to communicate across long distances (~ 4 km)

Elephants are survivors of the ancient and diverse group that included mammoths and mastodons. Compare the tooth in the elephant jaw to those of the mammoth and mastodon. Which of the extinct relatives has teeth most like modern elephants? Naturally, the difference in tooth structure reflects a difference in feeding strategy. Mastodon teeth were ideal for browsing on woody stems and leaves, whereas mammoth teeth were most efficient at grinding grasses.

- Examine the elephant skull and identify the numerous pockets that make the skull strong and light.
- Examine the skeleton of an elephant's foot. Note the robust phalanges and the fact that they do not lie flat. In fact, elephants stand on their tip toes, almost as though they are wearing high-heeled shoes. In life, the space beneath the bones of the feet would be filled with a fibrous cushion.

Order Sirenia, Family Trichechidae

Distinguishing characters:	no incisors, but numerous cheek teeth; 6 cervical vertebrae; small premaxillae relative to dugong; rounded dorsoventrally flattened tail; keratinized plates on tongue, lower jaw, and upper palate; dense bones; paddle-like forelimbs and absent hind limbs
Number of species:	3
Representative species:	Amazonian manatee, *Trichechus inungus*
Geographic distribution:	tropical/subtropical North and South America and west Africa
Diet:	aquatic vegetation
Habitat:	entirely aquatic – rivers, estuaries, coastal waters (*T. inungus* restricted to freshwater)
Behavior:	solitary or in loose aggregations; active day and night
Size:	4 m long; 1000 kg
Reproduction:	gestation period 12-14 months; single offspring every 3-5 years
Lifespan:	unknown in wild; 12 years reported in captivity
Other notes:	cleft lips are used to grasp food; flippers have vestigial nails; good hearing facilitates communication between mother and offspring; skin sloughs off constantly, perhaps reducing algal buildup Historically, manatees were apparently often mistaken for mermaids. In fact the ordinal name Sirenia refers to the mythological sirens, beautiful mermaids who lured unwary sailors to their doom. One wonders how long a sailor would have to be at sea to mistake a manatee for a beautiful woman.

- Examine the manatee skull. Note how heavy and dense the bones are. Compare the skull to that of the dugong. Based on these skulls, what character can you use to distinguish between the families Trichechidae and Dugongidae? What important bone is clearly missing from this dugong skull (in a better preserved specimen it would be present)? Although we have a dungong skull for you to look at, we are not requiring you to be responsible for the Dugongidae in lab.

