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## **MAMMALOLOGY LAB 4**

### **LIMBS & LOCOMOTION**

Today's exercise focuses on the variation in limbs and lifestyles of mammals. You will be interpreting the lifestyles of a number of mammals based on various aspects of their body "design" as well as measuring and comparing the limbs of a wide variety of mammal skeletons. For some of the questions it will be helpful to consult **Chapter 5** of your lecture text.

1) Examine the limbs of the **human, cat, and horse**.

- ◆ Compare them with respect to the relative length and width of major forelimb bones (humerus, radius, & ulna) and major hindlimb bones (femur, tibia & fibula). Be sure to give the measurements for each as well as your rankings.

- ◆ Compare the bones found in the foot, as well as the number of digits.

2) How do you explain the seasonal differences in external morphology of the foot of the **arctic lemming** (*Dicrostonyx spp.*) in the diagram on display.

3) How are the feet of the **arctic fox** (*Alopex lagopus*) in the photograph on display modified for life in the snow?

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4) Examine the claws of the **mountain lion** (*Felis concolor*), **black bear** (*Ursus americanus*), and **polar bear** on display.

- ◆ How does the curvature of the polar bear's claw differ from those of the mountain lion and black bear?

- ◆ What are two possible reasons for this difference? (Hint: see fig. 5.17 in the lecture text for part of the answer)

5) Examine the photographs of the **badger** (*Taxidea taxus*).

- ◆ What adaptations to a semi-fossorial lifestyle are evident?

6) Examine the photographs of the **beaver** (*Castor canadensis*) and **South American river otter** (*Lutra lutra*).

- ◆ What adaptations to a semi-aquatic lifestyle are apparent in these two species?

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7) Examine the photograph of the **beluga whale** (*Delphinapterus leucas*).  
◆ How do its adaptations to an aquatic lifestyle differ from those of a semi-aquatic mammal such as the **California sea lion** (*Zalophus californicus*)?

8) What adaptations to a semi-aquatic lifestyle are seen in the photographs of the **platypus** (*Ornithorhynchus anatinus*) provided?

9) What adaptations to a semi-aquatic lifestyle are seen in the picture of a **harp seal** (*Pagophilus groenlandicus*) provided?

10) How do you explain the unusual pelage seen in the photograph of the **naked mole rat** (*Heterocephalus glaber*)?

11) What adaptations for a fossorial lifestyle are evident in the mole (*Scalopus aquaticus*)?

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### Adaptations for Flight

12) How does the skeletal structure of the bat wing differ from the wing of a bird?

13) How do the facial structures of **microchiropteran** and **megachiropteran** bats differ?

◆ How do these differences relate to differences in feeding ecology?

### Jumping vs. Ricocheting

14) The locomotory patterns of **hares** (*Lepus* spp.) and **kangaroos** (e.g. *Macropus giganteus*) are both described as *saltatorial*, yet their modes of locomotion are very dissimilar.

◆ How do they differ?

◆ What anatomical differences account for this?



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### Lab 4 - Limbs & Locomotion Take Home Worksheet

Fill in the table below with measurements from skeletons or diagrams. Calculate the ratios listed and answer the questions at the end. Be sure to read the questions **carefully**.

BE SURE TO SPECIFY THE **UNITS** IN WHICH YOU MEASURE!!! (Failure to do so will = lost points!)

<b>Skeleton</b>	Rabbit	Frog	Human	Cat	Bat	Chimpanzee	Horse	Mole
		mm						mm
<b>Forelimb</b>								
(1) humerus		41.4						13.7
(2) radius/ulna		23.8						13.5
(3) carpals		6.5						3.2
(4) metacarpals		12.8						2.3
(5) phalanges		12.4						5.2

<b>Hindlimb</b>								
(6) femur		68.1						17.0
(7) tibia/fibula		69.0						18.2
(8) tarsals		36.5						4.3
(9) metatarsals		27.3						4.5
(10) phalanges		32.2						5.0

**Forelimb Ratios relative to humerus (1)**

humerus [(1)/(1)]	1	1	1	1	1	1	1	1
radius/ulna [(2)/(1)]								
c+m+p [(3+4+5)/(1)]								

**Hindlimb ratios (relative to femur)**

femur [(6)/(6)]	1	1	1	1	1	1	1	1
tibia/fibula [(7)/(6)]								
t+m+p [(8+9+10)/(6)]								

**Forelimb to Hindlimb ratio**

(1+2+3+4+5)/(6+7+8+9+10)								
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1) The chimpanzee and human are both primates with somewhat similar hindlimb ratios, but very different forelimb ratios, why?

2) Compare the forelimb ratios of the frog and the rabbit. Why are the forelimb ratios so different? How similar are the other ratios?

3) How does the bat's mode of locomotion affect the values of its forelimb ratios? Does it have the same effect on its hindlimb ratios?

4) Why is the **forelimb to hindlimb** ratio different for a *leaper* versus a *runner/walker*?

5) Why is the **forelimb to hindlimb** ratio different for a *flyer* versus a *brachiator*?