

## Feeding Adaptations – Examination of Mammalian Skulls

Your TA will assign you skulls to examine and to use for some measurements.

1. Look at your skulls. Using the figure in this lab, determine the area of origin and insertion of the temporalis and masseter for these organisms. Compare the relative size of the areas of attachment for the temporalis and masseter muscles in the two organisms. What does this indicate about the feeding behavior of each animal?

2. Compare the position of the jaw joint in relation to the tooth row. How does this affect tooth occlusion during jaw closure? Try to explain these observations in terms of diet and dental function.

### Lever system of the mammalian jaw joint

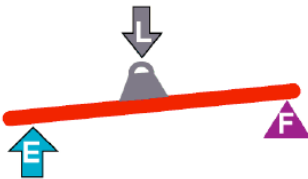
When load is placed on a joint and work is done on the load by the muscles around the joint, this can be modeled as a lever system (see Figure). Lever systems include a lever (the bone), a fulcrum (the joint), power input (the muscle), and some type of load. There are three types of lever systems:

#### First-class lever



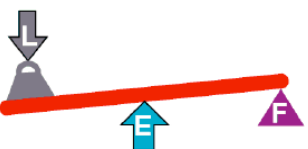
A. First-class levers. Seesaws and scissors are this type of lever. The fulcrum lies between the effort and the force.

#### Second-class lever



B. Second-class levers. These levers are primarily for strength. A wheelbarrow is an example of this type of lever. The load is between the force and the fulcrum.

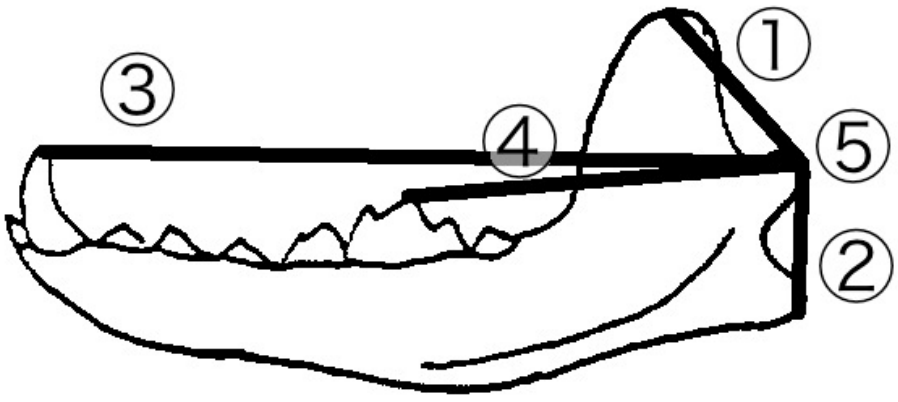
#### Third-class lever



C. Third-class levers. These levers produce large fast movements and require little effort. Spoons and golf clubs represent this type of lever. The effort is between the load and the fulcrum.

When you chew a bit of food in the back of your mouth with the molars, your lower jaw is a second-class lever. When you bite something at the front of your mouth with your incisors, your lower jaw is a third class lever.

**Determination of Force**



1. MAT – moment arm of the temporalis (in lever)
2. MAM – moment arm of the masseter (in lever)
3. OL – out lever of canines. Length depends on the region of lower jaw of interest.
4. OL – out lever of molars.
5. Jaw joint – (mandibular fossa + mandibular condyle)

Using a ruler or calipers measure the moment arms (in lever) of the temporalis and the masseter with the jaw closed. Then, measure the length of the out lever for two situations: 1) when food is placed at the canines and 2) when food is placed at the molars. Fill in your values below:

Organism	OL (molars)	OL (canines)	IL (masseter)	IL (temporalis)

Organism	Muscle	Mechanical advantage at canines (IL/OL)	Mechanical advantage at molars (IL/OL)
	masseter		
	temporalis		
	masseter		
	temporalis		

Are the ratios of Li/Lo the same in all cases? If not, how do they differ and what does this mean in terms of bite force at different tooth positions and between the two organisms?