Phylum Echinodermata: Class Asteroidea - Sea Stars (starfish)

Draw the external and internal anatomy as indicated:

External Anatomy

1. The body is composed of calcified endoskeleton plates. The radial symmetry is a secondary development from the larval stage. On the upper or aboral surface note the central disk and arms or rays that project outwards from the center. They have a water vascular system, which uses seawater, unique to this phylum. Locate the madreporite, or sieve plate, a beadlike structure along the upper central disk. This functions as a water intake structure.

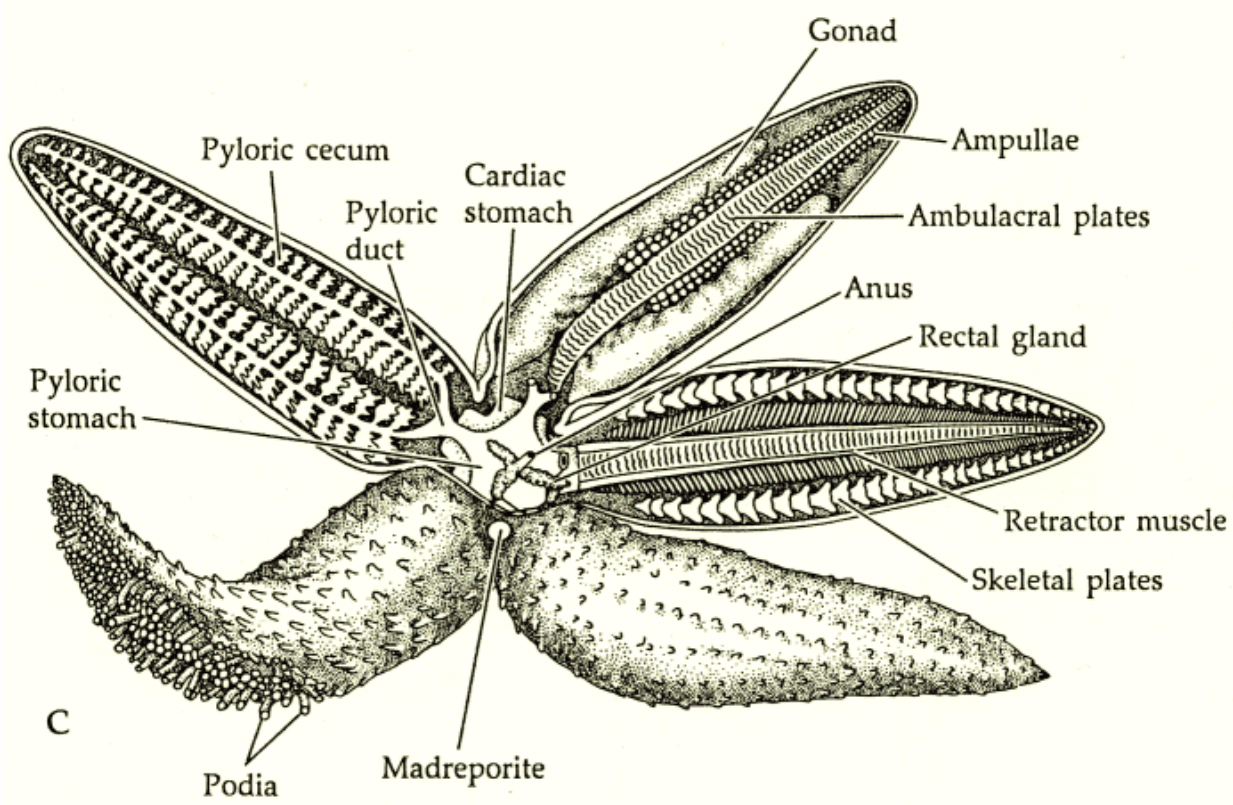
2. Take a small sample of endoskeletal plate from one arm (cut with scissors) and examine it under the dissecting scope. Look for the spines and pedicellaria – tiny manipulative pincers – and gill extensions (thin strands of tissue) in the small grooves. Look for the tiny eyes at the end of each arm.

3. On the oral (bottom) surface note the tube feet, mouth and ambulacral groove that travels from the mouth to each arm. What is the function of the tube feet?

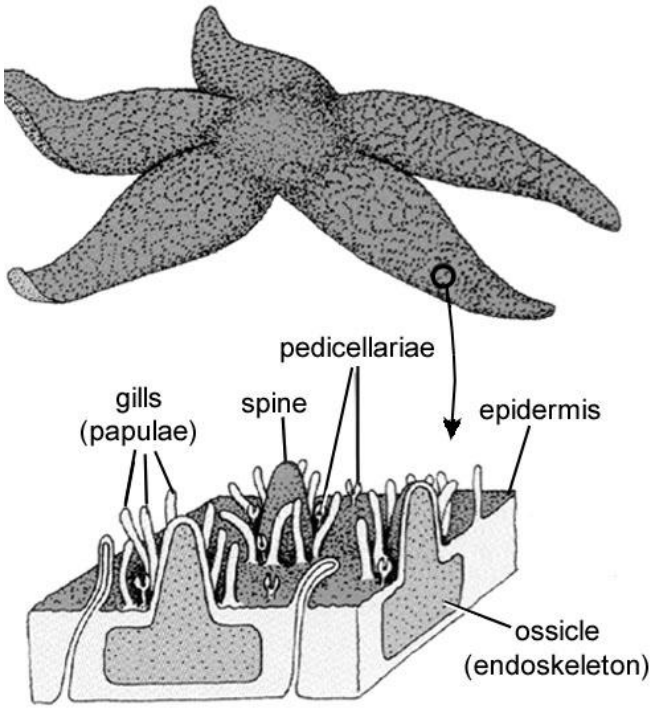
Internal Anatomy

1. Along one of the arms or rays make a cross section. Note the internal structures: twin digestive glands along the dorsal sides of the arm. Ampulla (small bulb like structures) attached to the top of the tube feet. What is the function of the ampulla? Note the coelomic cavity (space). Gonads (if any) will be on the ventral or oral side of the arm. Make a thin cross section of one arm and examine the tube feet, ampulla and other structures under the dissectin microscope,

2. Cut along the aboral sides of two arms (opposite the madreporite) and remove the calcareous plates up to the central disk. Try and remove half the calcareous plates on the central disk leaving the madreporite side intact. Look for the mouth (oral side) stomach and anal opening (difficult to locate) in the central disk cavity. From the madreporite see if you can locate a radial canal that connects to this and then out to the arms. Finally, remove the madreporite and view and draw it under the dissecting microscope. Why does it contain small grooves or pores?



From: http://teacher.ocps.net/keila.mena/seastardissection.htm



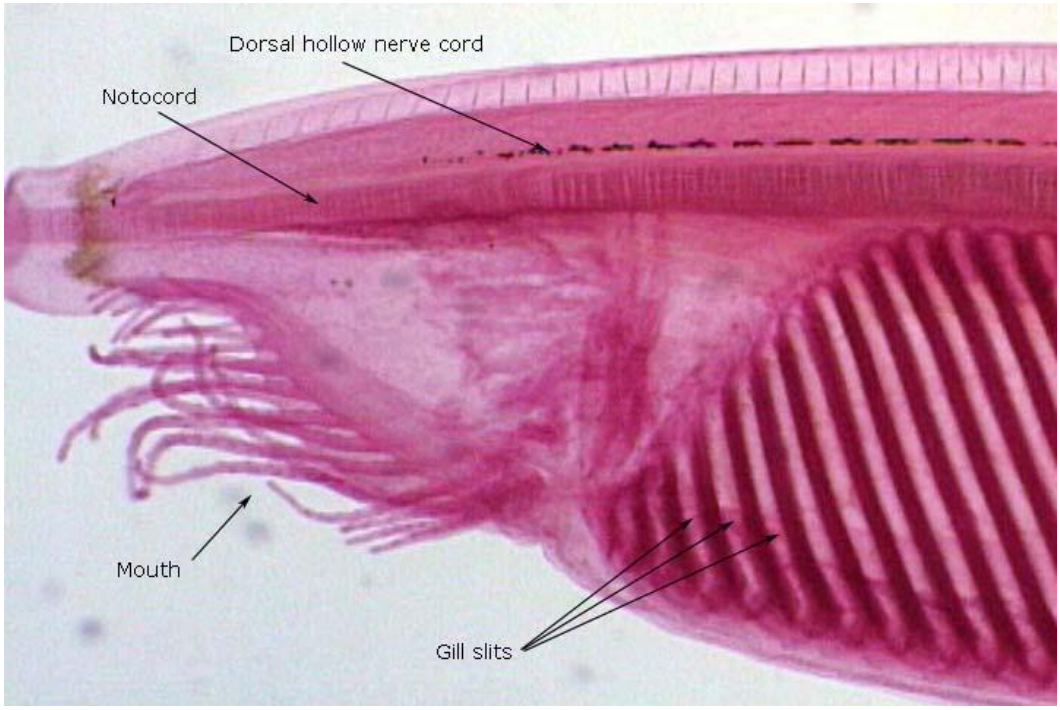
From: http://www.cals.ncsu.edu/course/zo150/mozley/fall/Asterskin.jpg

Phylum Chordata – subphylum Cephalochordata

Amphioxis observations
Draw and label the slide of *Amphioxis* a chordate in the subphylum Cephalochordata.

Label the following structures on from your drawing:
Mouth
Anal opening
And the following traits that are characteristic of all chordates:

1. Segmental muscles (myomeres)
2. post anal tail
3. notochord (see photo)
4. dorsal hollow nerve chord (just dorsal to the notochord)
5. pharyngeal arches/gill slits



From: http://phobos.ramapo.edu/~spetro/Slides/amphioxus_closeup.jpeg

Phylum Chordata, Subphylum Vertebrata, Class Osteichthyes (bony fishes)

Fish Dissection

Examine and sketch the external and internal anatomy:

External Anatomy

1.Look at the fish's skin, including under the dissecting scope. Draw the shape of the scales.

2. Locate the various fins: anterior dorsal, posterior dorsal, caudal (tail), anal, pelvic, and pectoral fins. Determine the range of motion possible for each fin. Note the bony rays of the fins, and the lack of external muscles.

3. Find the lateral line. What is its function?

4. Open the mouth and examine the teeth. What sort of teeth are they? What are they used for? Go back farther into the fish's mouth and find the gill arches. Describe their shape and arrangement.

5. Locate the operculum (gill covers) and look inside. Cut away the operculum and examine the gills more closely. How does their structure relate to their function? Note how the gills, gill arches, and the tongue are related.

Internal Anatomy

1. Insert scalpel or scissors into the anus, and cut forward to the bottom of the jaw. Do not insert the blade too far, or you will damage the internal anatomy.

2. Using either the scalpel or scissors, cut upwards around the gills toward the dorsal side of the animal. Cut around the body cavity so as to expose the internal organs. Take your time, as hurrying too much increases the risk of damaging the organs, and also increases the likelihood of a slipping blade. Note how much of the body is skeletal muscle.

3. Locate the swim bladder at the top of the body cavity. Note that it is a large, balloon-like structure. What is the function of the swim bladder?

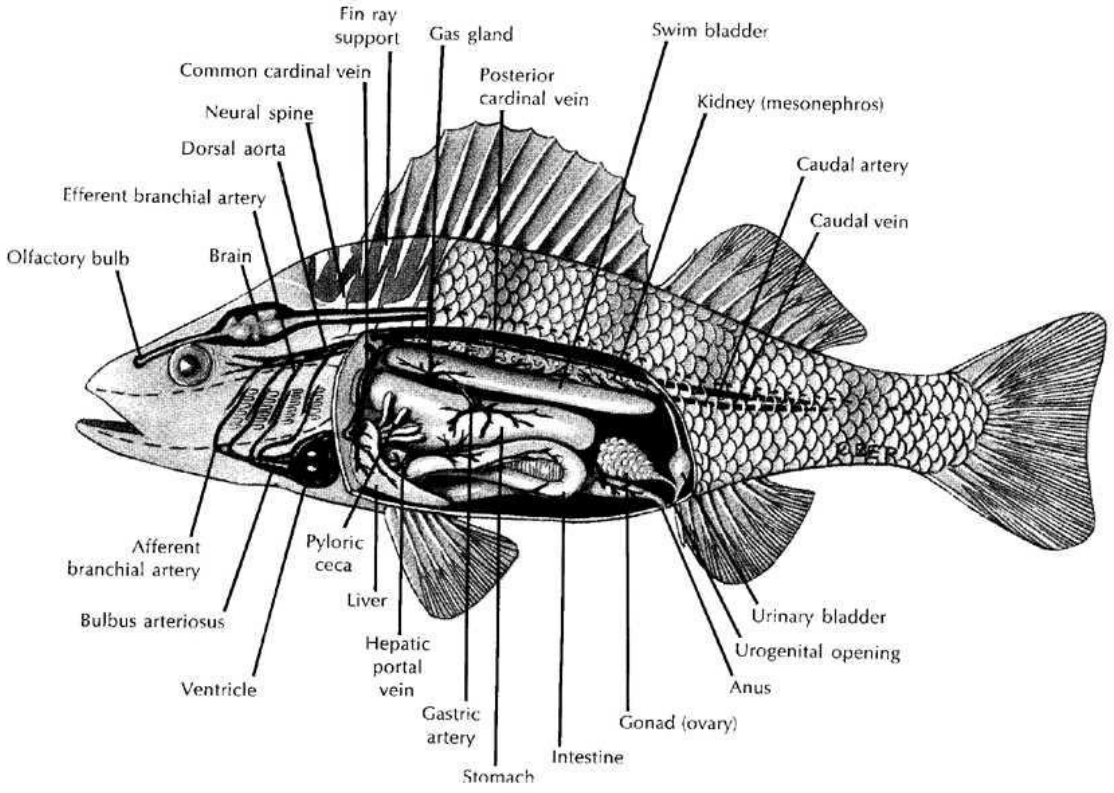
4. Above the swim bladder, **against the wall of the body cavity**, locate the kidneys. These are small and thin, and often hard to see.

5. Find the digestive system by following the intestine up from the anus. Note that it coils (mildly) just before reaching the stomach. There are two stomach regions in the fish, the posterior pyloric stomach (with pyloric ceca wrapped around it). What is the function of the pyloric ceca?

6. Just anterior from the pyloric stomach, find the cardiac stomach, where digesting begins. Anterior from the stomach, you will be able to see the liver.

7. Just posterior from the mouth, find the heart. Note that the heart is very close to the gills. Why is that?

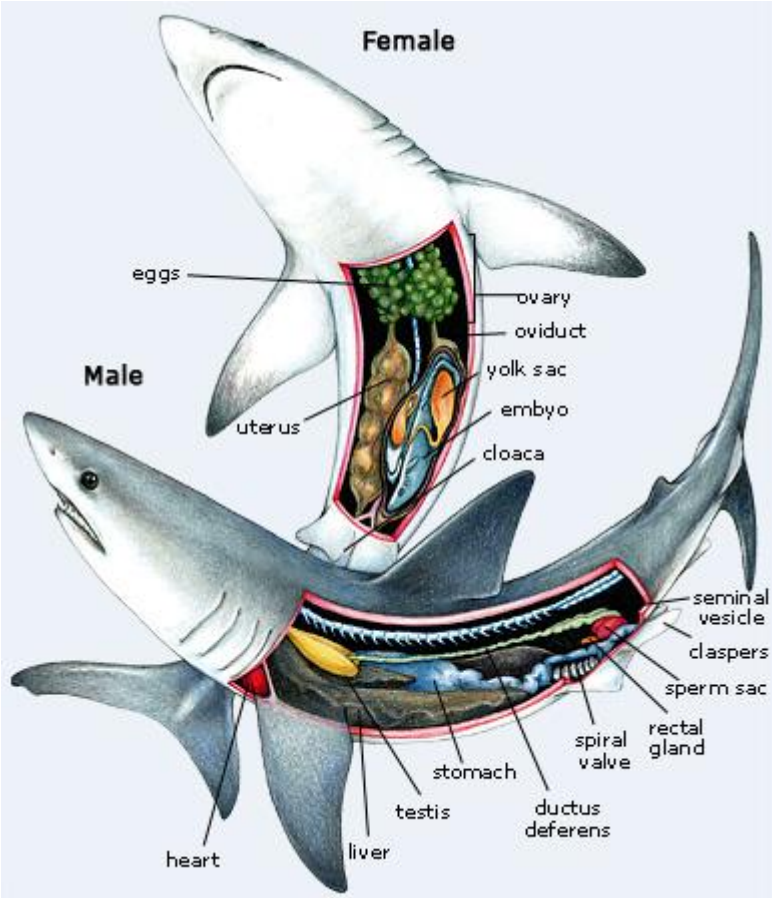
8. Examine the demonstration shark (Class Chondricthyes – cartilaginous fishes) and describe a comparison of external and internal anatomy between this and the bony fish. Make a list to note the major differences? Make a list to note the major similarities?



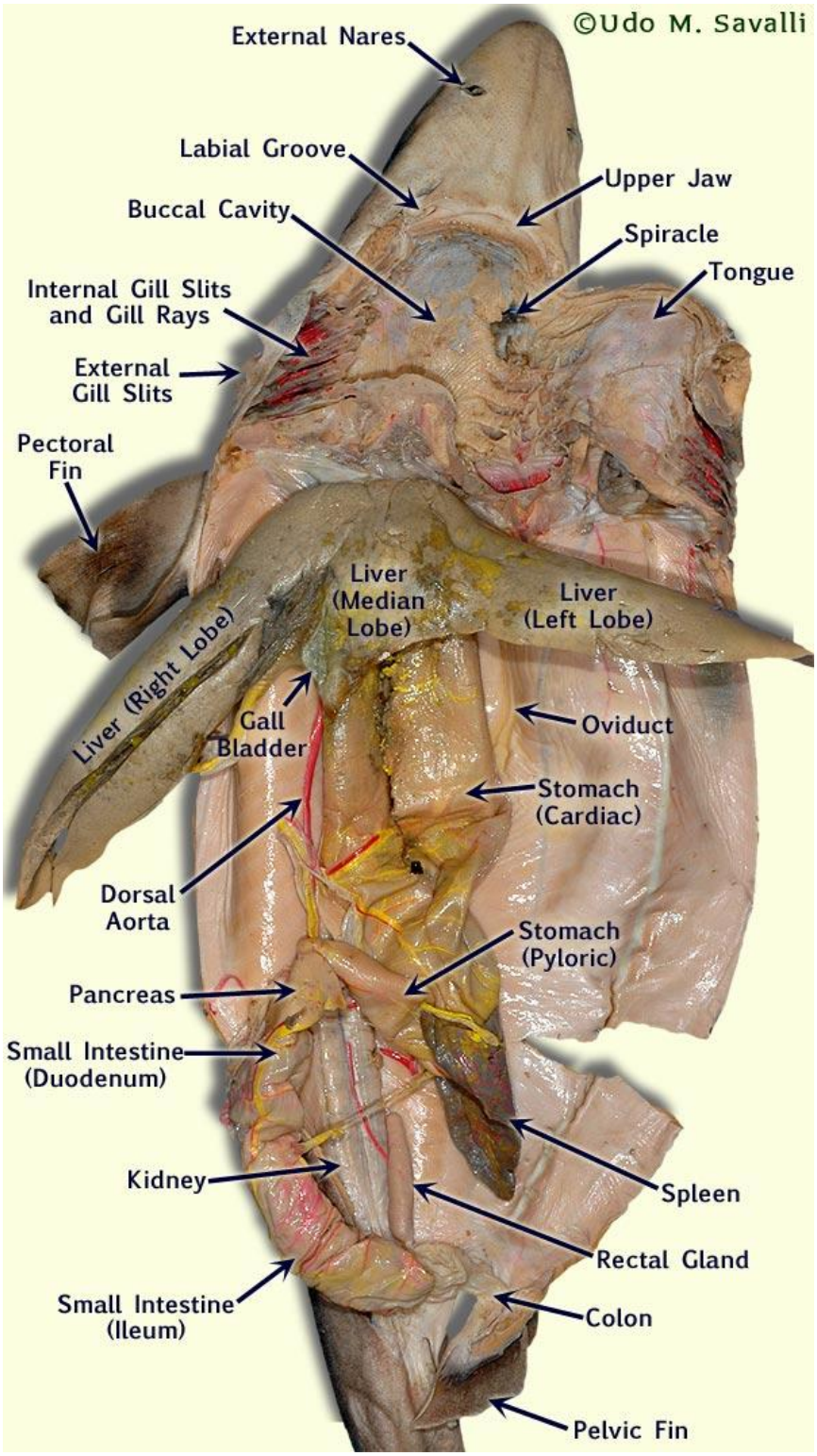
From: http://www.hedley.ca/anatomy_internal.html

Phylum Chordata: Class Chondricthyes, the cartilagionous fishes

Labeled dissection of a shark (*Squalus*)



From: http://www.seaworld.org/animal-info/info-books/sharks-&-rays/anatomy.htm



From: http://www.savalli.us/BIO370/Anatomy/2.SharkLabel.html