

The Structure of a Starfish

Complete the following tasks using this handout, your textbook and the colouring worksheet (provided).

Water Vascular System:

1. Colour the water vascular system (i.e. the madreporite, the ring canal, the radial canals, the tube feet, and the ampullae) one colour.
2. Complete the following table, describing the functions of the components of the water-vascular system. Use the colouring worksheet as well as your textbook as references.

Water Vascular System Structures	Functions
madreporite	
ring canal	
radial canal	
tube feet	
ampullae	

Digestive System:

1. Colour the digestive system (i.e. the stomach, the digestive glands, and the anus) a second colour.
2. Complete the following table, describing the functions of the components of the digestive system. Use the colouring worksheet as well as your textbook as references.

Digestive System Structures	Functions
mouth	
stomach	
digestive glands	
anus	

Reproductive System:

1. Colour the reproductive system (i.e. the gonads) a third colour.
2. Complete the following table, describing the function of the component of the reproductive system. Use the colouring worksheet as well as your textbook as references.

Reproductive System Structure	Function
gonads	

Chapter 8-8: Phylum Echinodermata

Animals of the phylum Echinodermata have spiny skins that are made up of hard, calcified plates that form a type of skeleton just under their epidermis. They include the starfishes, sea cucumbers, and other familiar sea shore animals. A unique feature of the group is that they possess a derivative of the coelom, known as the water vascular system.

This plate contains a diagram of a representative echinoderm, the starfish. The anatomy of this animal is typical of the rest of the group. We will also highlight its water vascular system and show various representatives of the phylum. You should begin your work by focusing on the anatomy of the starfish.

Echinoderms are exclusively marine and brackish water animals and many species are found in the shallow sections of bodies of water. They are radially symmetrical animals, as the view of the starfish shows; the starfish may be cut equally in five different directions, beginning at its midpoint. This type of symmetry is also found in the phylum Cnidaria, but it is different from the bilateral symmetry found in most other phyla thus far discussed. Echinoderms have no segmentation in their bodies and no head region.

The prefix "echino-" means spiny, and all echinoderms have **skin with spines (A)**, which you should color a light color.

Another unique feature is the water vascular system, which can be seen in the starfish and is extracted in the diagram below it. At the surface of the starfish, the entry to the water vascular system is called the **madreporite (B)**. This structure is sometimes called the sieve plate. Through minute openings in the madreporite, water enters a tube that leads to a **ring canal (C)** that circles this opening. Water then enters any of five **radial canals (D)**, which can be seen in both the starfish and the lower left diagram. Each radial canal carries water to a pair of **tube feet (E)** at the surface of the echinoderm, and above each tube foot is a rounded muscular sac called an **ampulla (F)**. As the ampulla contracts, the water within it is forced into the tube foot, and the tube foot extends and attaches to an object with its sucker. The suckers permit the echinoderms to cling tightly to rocks and prevent them from being swept away by strong waves. They also allow the starfish to grip tightly to the shells of mollusks upon which they feed.

We will now concentrate on the other anatomical features of the typical echinoderm. Light colors should be used for this section. Continue your reading in the paragraphs below.

When an echinoderm feeds, its gut extends out of its body. The **stomach (G)** is located close to the opening of the starfish and it is extended to contact food. The food is digested and stored in five pairs of **digestive glands (H)**, located in the five arms of the starfish, and waste is eliminated through the **anus (I)**, which opens to the exterior near to the madreporite.

Echinoderms are either male or female. Sperm cells and egg cells are produced within the testes or ovaries, which are located in each arm, and released into the water through openings in the arms. The reproductive organs are called **gonads (J)** and can be seen in the arm of the starfish. Echinoderms have no centralized nervous system, but nerves are concentrated near the mouth and branches extend into the arm.

We will close the plate with a brief examination of three other representative echinoderms. Light yellows and grays should be used to avoid obscuring the details of these animals. Notice that they are radially symmetric like the starfish.

The phylum Echinodermata consists of five classes, one of which contains the **sea urchins (K)**. These are flattened organisms without arms that are covered by solid shells bearing jointed, movable spines. Other representative echinoderms are the **brittle stars (L)**, which are similar to starfishes, but have long arms set off from the central disk. The skeleton of the arms is highly specialized, jointed, and extremely flexible, and allows the animal to move with great speed and agility.

A final representative is the **sea cucumber (M)**. Sea cucumbers are soft-bodied creatures that burrow in the ocean bottom. Their tube feet are very small and their skeleton consists of isolated plates and spicules inside their leathery body wall.

Starfish Anatomy

- Skin with Spines....A
- MadreporiteB
- Ring Canal.....C
- Radial Canal.....D

Phylum Echinodermata

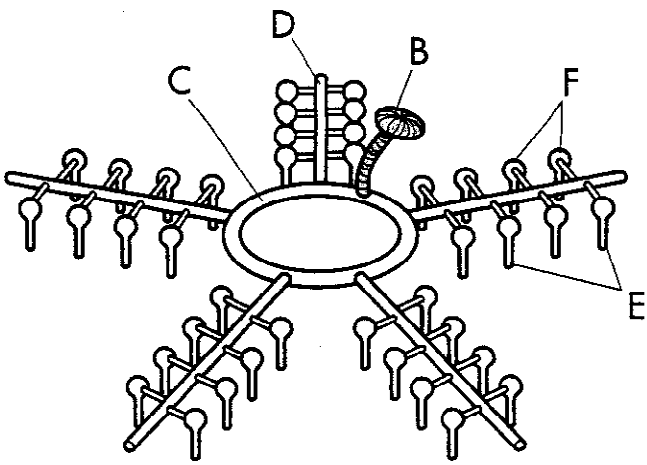
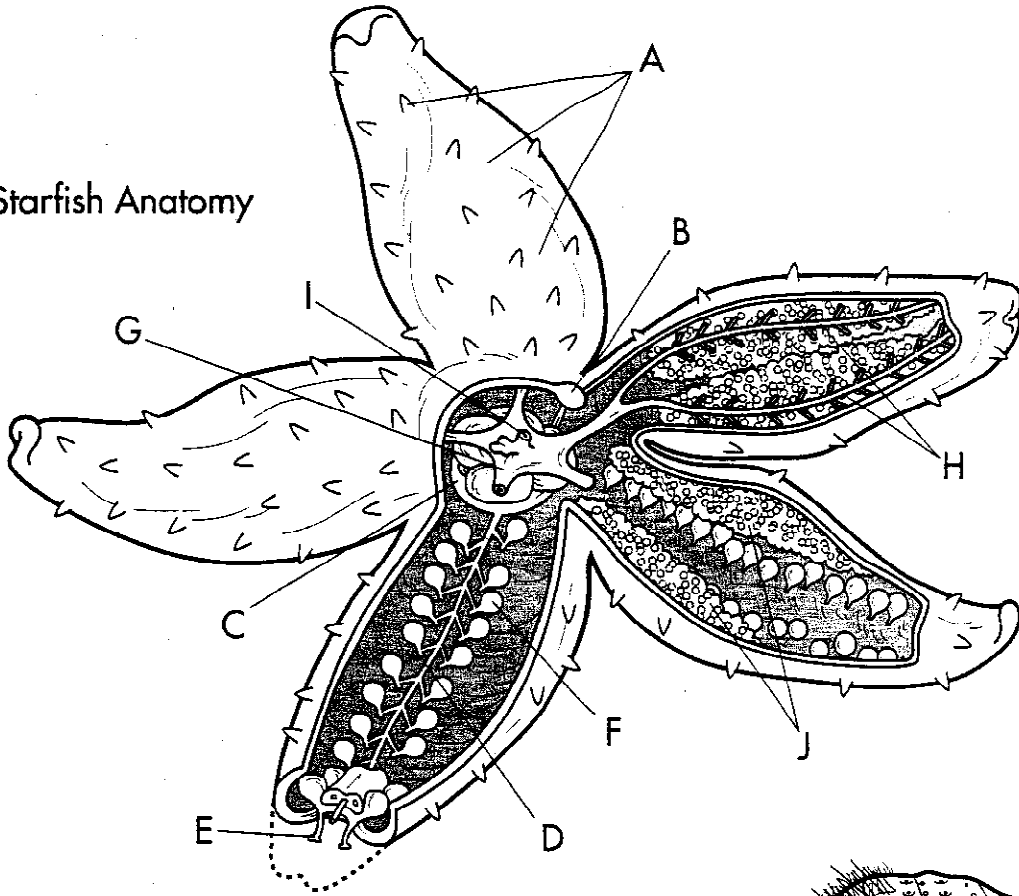
- Tube FeetE
- AmpullaF
- StomachG
- Digestive Glands....H
- Anus.....I

- GonadJ

Representative Echinoderms

- Sea Urchin.....K
- Brittle Star.....L
- Sea Cucumber.....M

Starfish Anatomy



Water Vascular System

Representative Echinoderms

