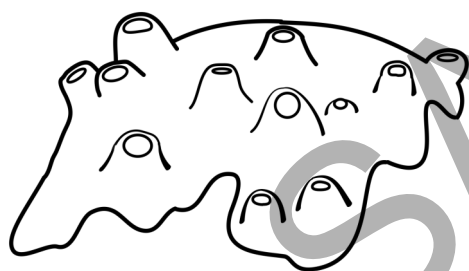
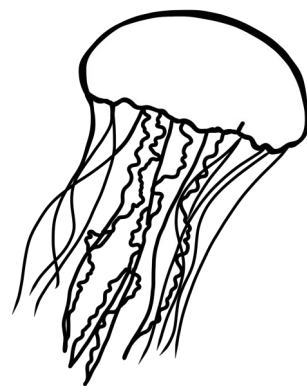


Invertebrates

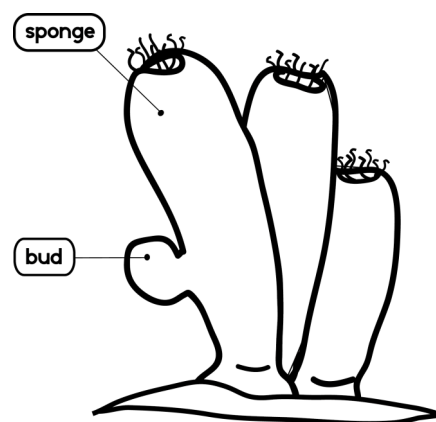
When scientists classify animals, the level beneath Kingdom Animalia is phylum. There are more than thirty different phyla (plural of phylum) scientists group animals into. One is *Chordata*. This is the phylum that all **vertebrates**, animals with backbones, are classified in. This includes animals such as mammals, fish, birds, and reptiles. All the other phyla are reserved for **invertebrates**, animals without a backbone. When you look at it that way, you might think there are a lot more invertebrates than there vertebrates. And, you'd be right! Of all the different species of animals in the world, invertebrates make up around 95%. That means if you had a room with 100 different species of animals in it, 5 of them could be types of dogs, elephants, fish, and birds. The other 95 would be things like jellyfish, sponges, corals, earthworms, starfish, snails, squids, clams, shrimp, crabs, centipedes, butterflies, beetles, spiders, scorpions, honeybees, ladybugs, crickets, and all sorts of other animals. That's a lot of different types of animals! At first glance, they don't have much in common. After all, how could you group a honeybee and a jellyfish together? Thankfully, scientists break the invertebrates into different phylum, and then classes, orders, and families to study animals that are similar, so that's what we're going to do. We'll look at some of the many different groups of animals that make up the world of invertebrates.

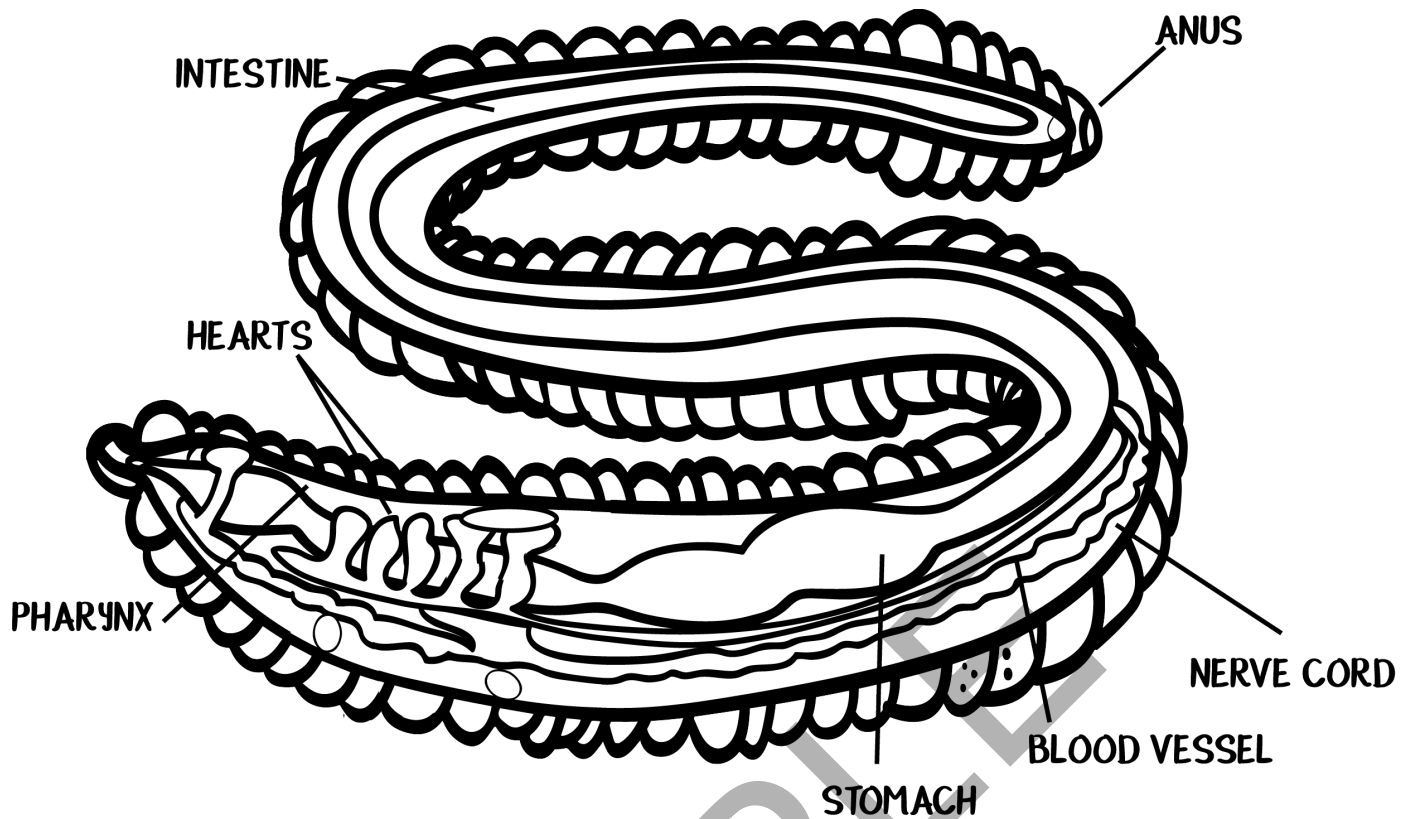


Phylum *Porifera* is made of pore-bearing animals called sponges. Most sponges live in the sea, but a few kinds live in fresh water. Sponges are unlike most other animals. They don't have heads, arms, or internal organs. The adults cannot move but stay anchored to one spot. A living sponge has two types of openings on its body. Ostia are small pores that

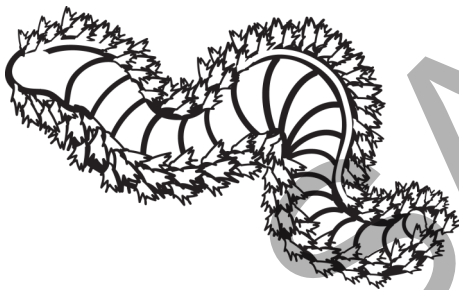
allow water into the sponge, and the osculum is a large pore that allows water to leave the body.

Sponges reproduce in several different ways. Like most animals, they can reproduce sexually when a male and female cell join. They can also reproduce asexually. One way they do that is by a process called budding. In budding, sponges grow a bud or branch filled with special cells called archaeocytes. These cells have the ability to grow into whatever types of cells the sponge needs. The bud can then break off or stay attached to the parent sponge and develop into a new sponge.





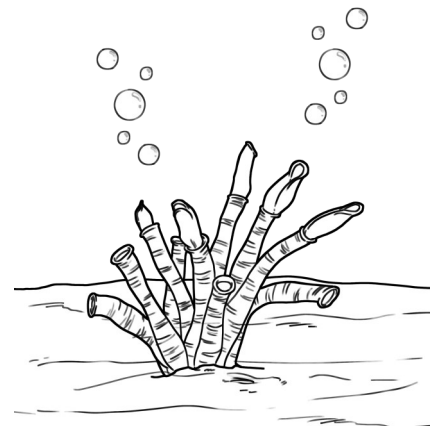
While earthworms might be the most recognizable **annelid**, they are not the only type of worm in this phylum. Bristle worms, pile worms, and tubeworms are also annelids.



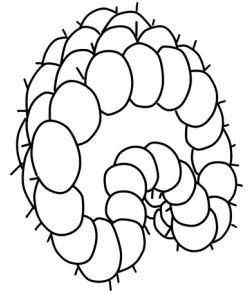
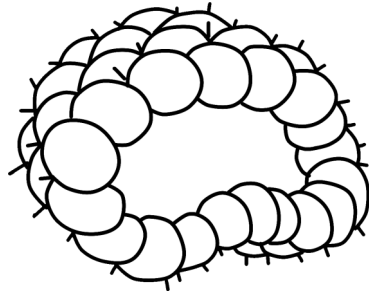
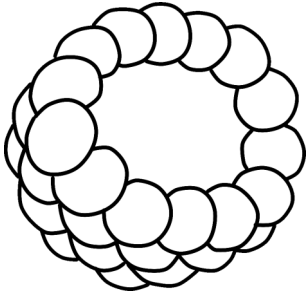
Bristle worms (also called pile worms or sand worms) can be 1 inch (2.5 cm) to 3 feet (90 cm) long. They have sharp jaws that they can retract, two tentacles, and tiny bristles they use for moving. A bristle worm can have more than two hundred segments, with almost every segment holding its own pair of bristles.

Tubeworms live on the ocean floor. Once a tubeworm has chosen its spot to grow, it stays there the rest of its life. The outside tube can be made of mucus strengthened with mud, sand, and shell fragments. The tube can also be made of calcium carbonate. Some tubes are long while others are coiled.

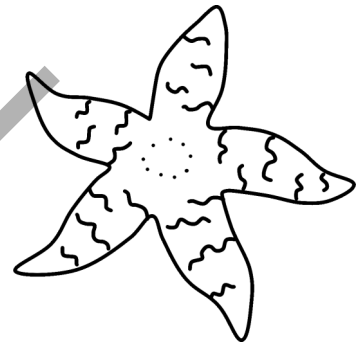
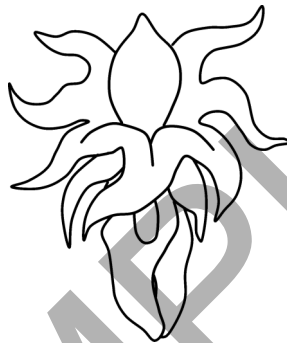
Tubeworms have feathery radioles, which are like arms they use to trap food from the water. Whenever a tubeworm is alarmed, it pulls itself safely back inside its tube. Some tubeworms even have a special piece they use to block the "door" to the tube to help protect themselves.



The young starfish continues dividing, growing larger and larger.

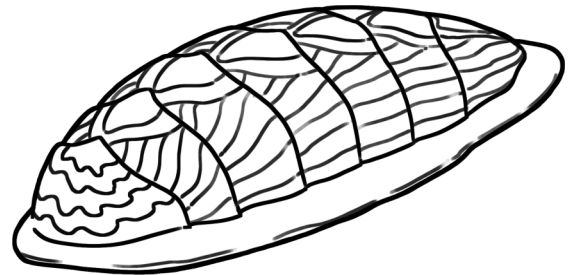


In time, the starfish will grow into larvae. Each larva will find a place on the bottom of the sea to finish growing into a young starfish.

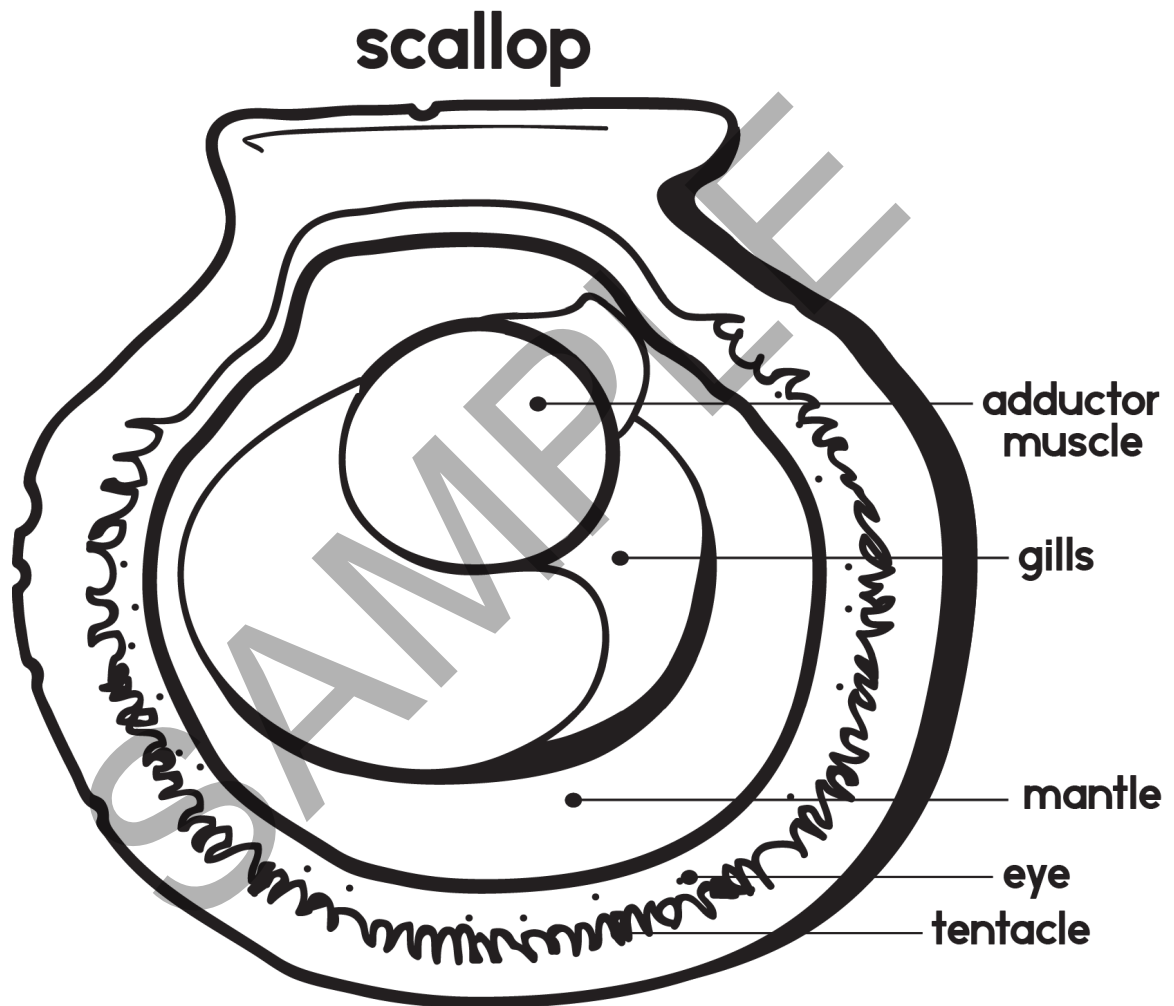


The next group of animals we're going to look more closely at is phylum *Mollusca*. There are more than 100,000 different species of mollusks in the world, and they include a very large variety of creatures, from tiny snails to giant squid. Many mollusks are protected by a hard outer shell, but some like squids, just have a special layer called a mantle to keep them safe. Remember that when scientists classify animals, the level beneath phylum is class. We're going to look at four different classes of mollusks. We'll start with class Polyplacophora.

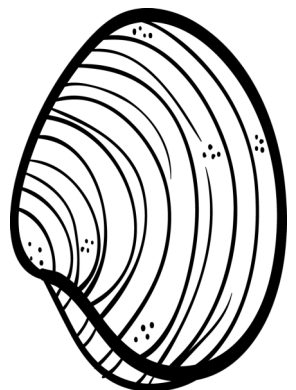
Polyplacophora is the class of chitons. There are hundreds of types of chitons, and they live in many places all around the world. Most of the chitons that live in warmer waters live fairly close to the surface, but chitons that live in colder waters live much deeper, even as far as 13,000-23,000 feet (4,000-7,000 meters) beneath the surface. They have a row of eight overlapping plates on their top and move by using one large foot.



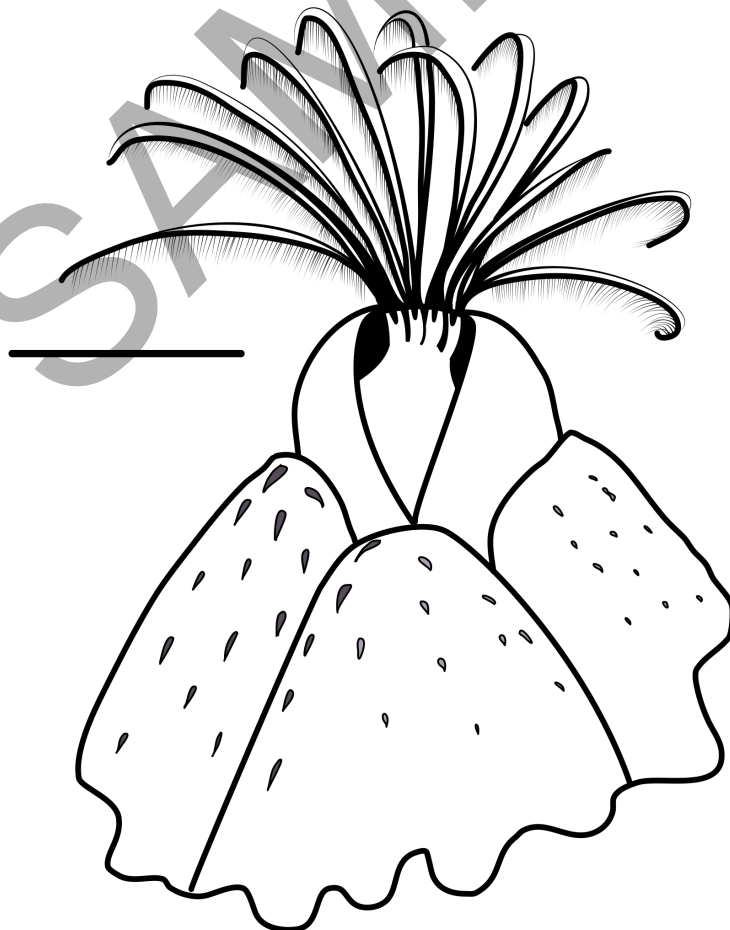
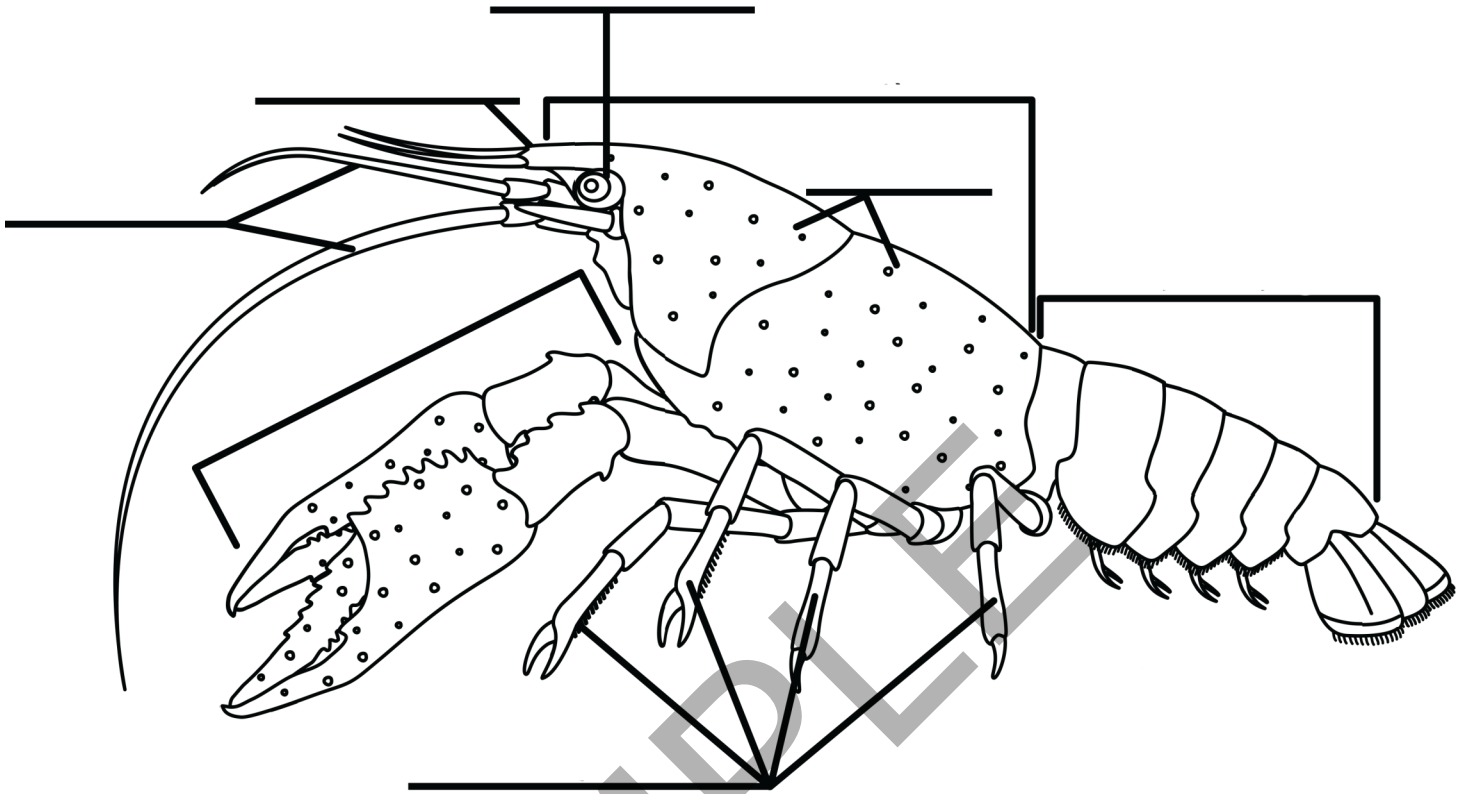
Scallops are able to do something different than the other bivalves we've looked at, though. They can swim by opening and closing their shells quickly. This forces water out of the mantle area, pushing the scallop through the water. It doesn't move all the time like people usually do, but it's an option when it feels threatened by a predator, such as a starfish. We don't think of starfish as particularly frightening, but they can be deadly to scallops. The starfish wraps its arms around the scallop and uses the suction of its tube feet to pull the scallop open. Then it sticks its stomach in between the valves and eats the inside of the scallop!

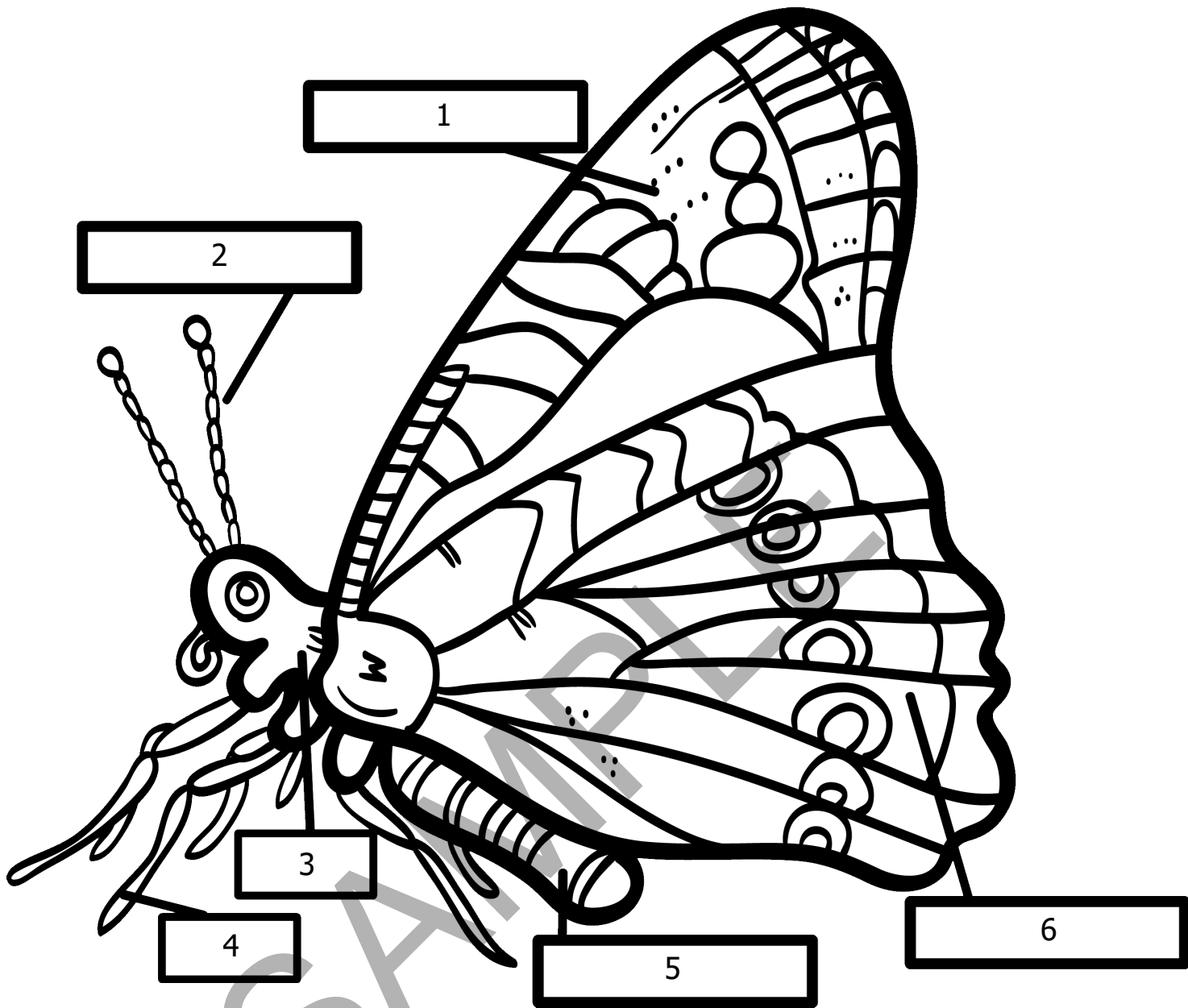


The last bivalve we're going to look at is the clam. The clam has two valves, a ligament, and an adductor muscle like the other bivalves we've looked at. Clams live all over the world, in both fresh water and marine environments. There are hard-shell clams and soft-shell clams. Some types of clams have a layer of mother-of-pearl beneath their mantle, just like mussels.



Let's review for a minute and label the diagrams of the crayfish and barnacle.





1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

Terminology

Using what you learned, define these words in the best way you can. Use the back of the page if you need more room.

Vertebrates: _____

Invertebrates: _____

Nematocysts: _____

Radially symmetrical: _____

Cnidarians (*Cnidaria*): _____

Setae: _____

Annelid (*Annelida*): _____

Echinoderms: _____

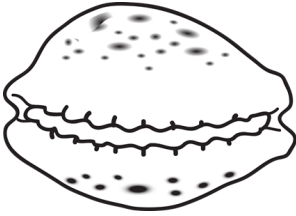
Bivalve (*Bivalvia*): _____

Cilia: _____

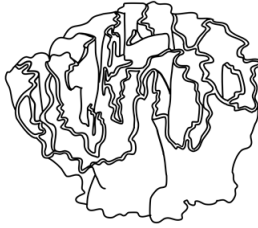
Byssus threads: _____

Cephalopods (*Cephalopoda*): _____

Which of the following animals is not a cnidarian? Draw an X through it.



Cowrie



Coral

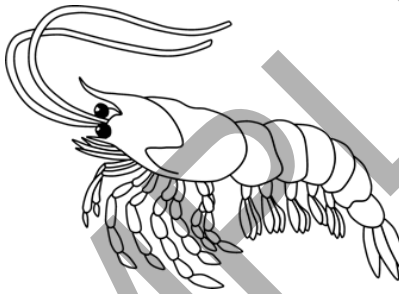


Jellyfish

Which of the following animals is not a gastropod? Draw an X through it.



Conch



Shrimp

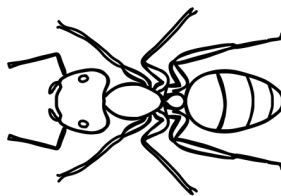


Limpet

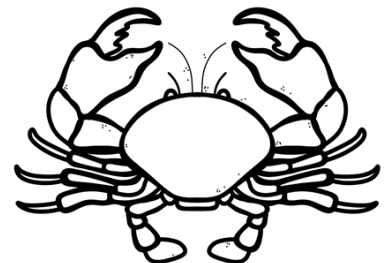
Which of the following animals is a crustacean? Draw a circle around it.



Octopus



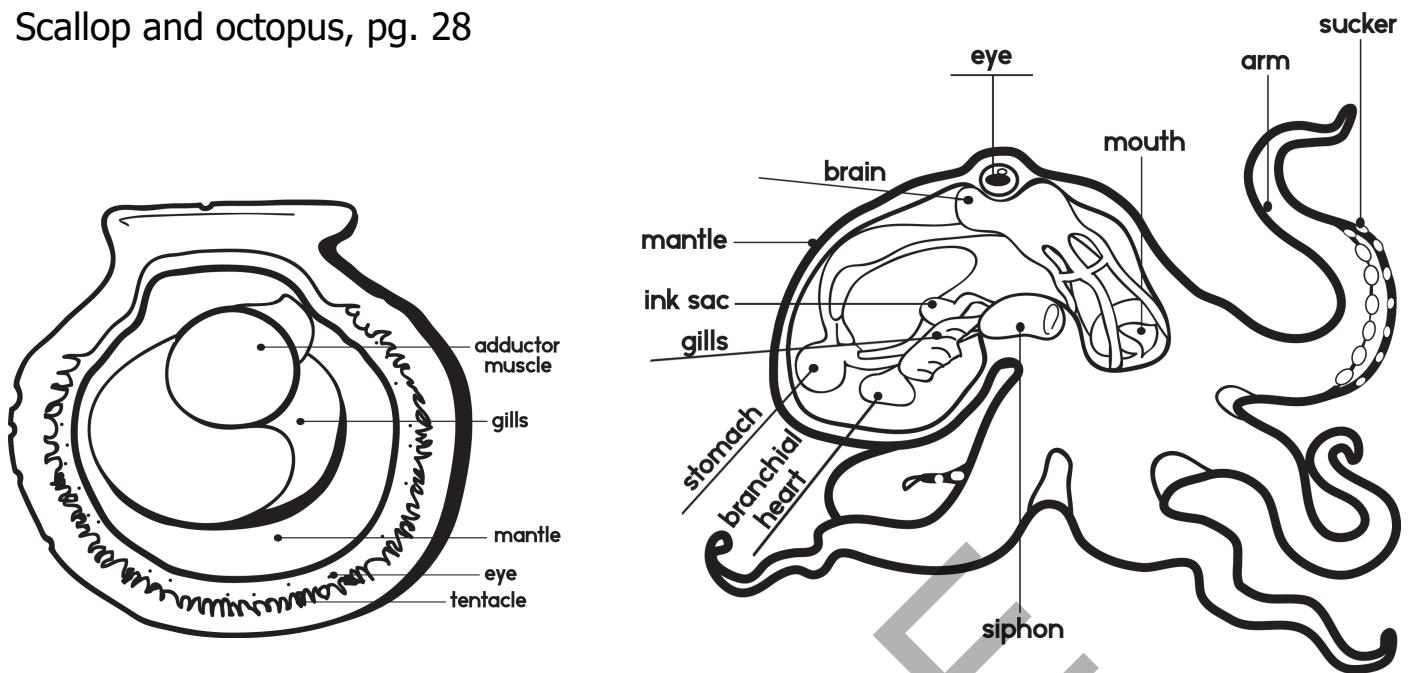
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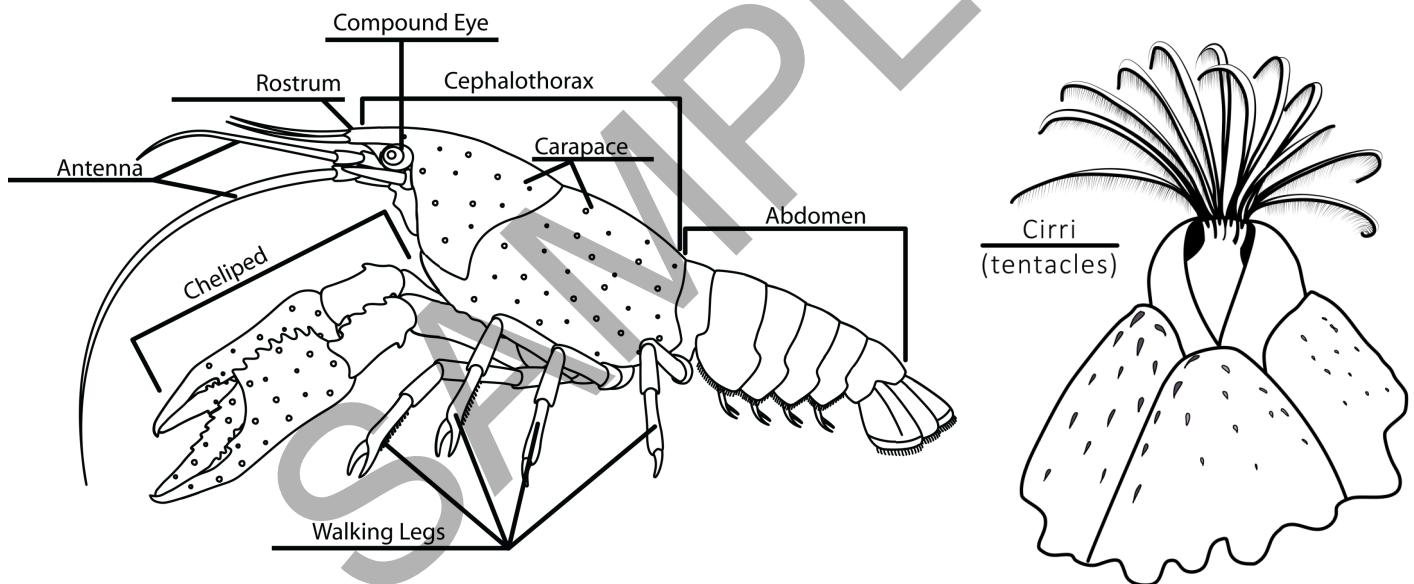
Crab

Can you name two differences between moths and butterflies?

Scallop and octopus, pg. 28



Crayfish and barnacle, pg. 37



Spider, pg. 65

