Cleaner Shrimp & Their Customers

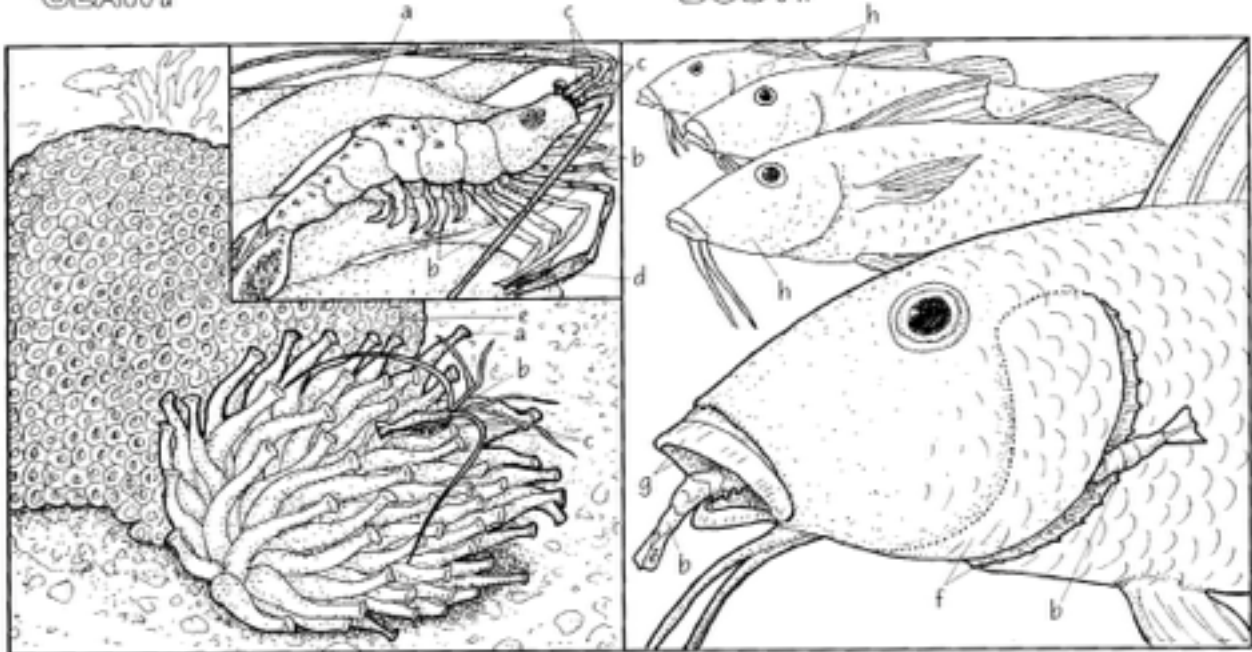Name:

Period:

SEA ANEMONE a
CLEANER SHRIMP ☆
  BODY b
  ANTENNA c
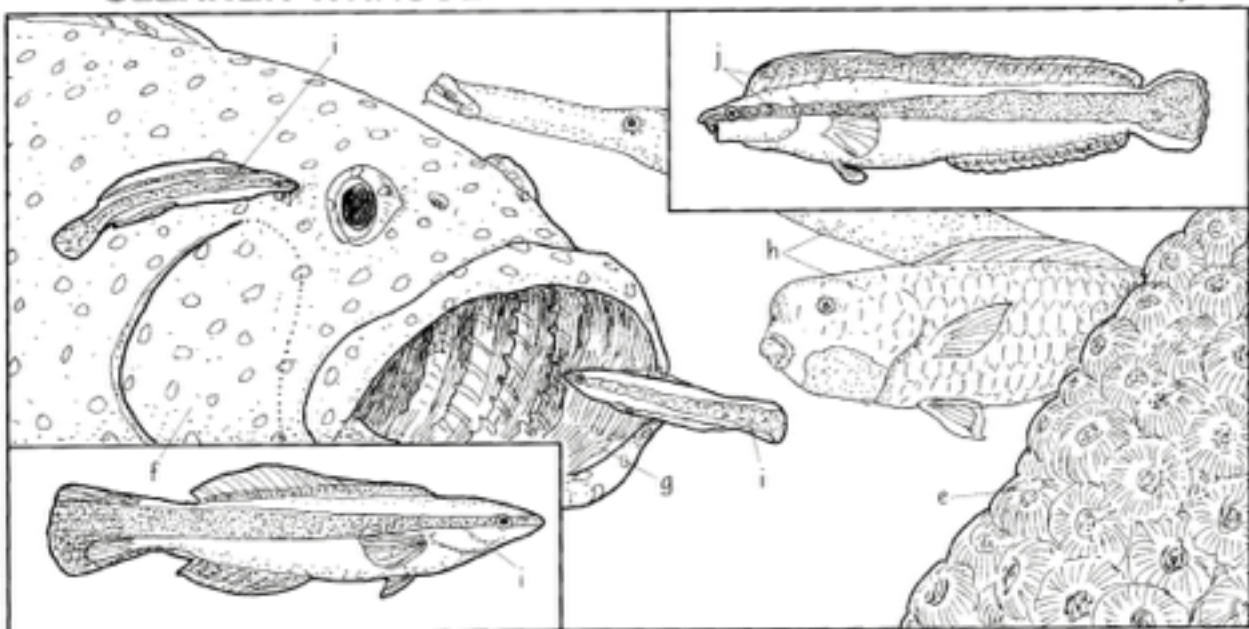 CLAW d

CLEANING STATION e
CUSTOMERS ☆
  OPERCULUM f
  MOUTH g
  BODY h

CLEANER WRASSE i

FALSE CLEANER BLENNY j

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Follow the directions below to color-code the diagram and to answer the questions. Use colored pencils, and check off each box ☑ as you finish that part of the instructions.

For this exercise, you will be analyzing how certain body parts and behaviors of some organisms help them to specialize in removing parasites from on (and inside!) much larger organisms.

Take a look at the diagram. The drawings show various marine fish that have been infected with parasites, which are little organisms that damage their host (animals that they live on). These parasites, such as certain worms, bacteria, and small crustaceans (things with lots of legs and a shell) hurt the fish. The fish want the parasites removed so badly that they are willing to NOT eat the bite-sized animals that volunteer to clean them. Some small fish and shrimp have evolved to get their food by plucking parasites off of the body, out of the mouth, and off of the gills of larger fish. Both organisms benefit: the cleaners get a free meal of yummy parasites, and the hosts no longer have something itching or burrowing into their flesh. [Are you scratching yourself yet?]

1. Begin by looking at the diagram in the upper left. It shows a cleaner shrimp hiding inside a protective sea anemone that is attached to a coral reef. Color the tips of the sea anemone's tentacles (*a*) purple □ and the rest of the tentacles with white □ . For the title SEA ANEMONE, color every other letter the same purple as the tentacle tips □ . In the close-up picture of the shrimp, color the shaded parts of its body with the same purple you used for the sea anemone tentacle tips □ . The rest of the shrimp is transparent (you could see inside of it). Color the rest of the shrimp body with light gray □ . For the title CLEANER SHRIMP, color every other letter purple □, and the remaining letters light gray □ .

What are two ways that the cleaner shrimp is protected by living in the sea anemone? [hint: think of the colors and how the anemone gets food].

        1—

        2—

2. You can see behind the sea anemone a big lump of star coral (*e*). Color this coral gray □ . In the bottom right picture, you will see star coral there, too. Color that coral gray as well □ . Such coral lumps are used by the cleaner shrimp to attract "customers". Color the label CLEANING STATION using the same gray as the coral □ . Fish in the area are used to being cleaned near certain pieces of coral, and will actually wait around them until the shrimp appear.

3. When the cleaner shrimp sees the waiting fish and gets hungry, it has developed a signal to get its customer fish closer. The shrimp leave the safety of their anemone, and crawl up to the top of the coral. When a fish wanting cleaning spots the shrimp, the fish moves even closer to the coral. The cleaner shrimp then starts rocking its body back and forth and waving its long antennae, sort of like ground crew at an airport signaling a plane slowly towards the terminal. When the fish gets close enough, the cleaner shrimp starts to work. The shrimp uses its claws to scrape off parasites from the skin, and may even make tiny cuts on the fish to remove more deeply-attached parasites. While it is working, the cleaner shrimp then eats the parasites that it removes. Crunchy! After scouring the outside of the fish, the shrimp then is allowed into the gills of the fish, under the operculum (*f*), a protective cover for the gills. Color the part of the shrimp (*b*) you can see sticking out of the operculum using purple □ and light gray □ . Finally, the shrimp goes into the open mouth (*g*) of the fish, and removes any parasites / snacks it finds there. Color this shrimp purple □ and gray □ , too.

How do the claws of the cleaner shrimp help it to get food?

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How do the reef fish benefit from their relationship with the cleaner shrimp?

Even before the fish get within eating distance of the shrimp, they have already identified the cleaner shrimp as something that they should not eat (because they want its help). What visual clues would the fish see?

4. Besides shrimp, there are also some fish that have evolved to do the same cleaner job. Like the brightly colored shrimp, cleaner wrasse have developed striking coloring that makes them easy for their customers to spot. In the bottom left of the diagram, color the large horizontal stripe down the center of the cleaner wrasse using black □ . Use yellow to color the stripe along the top of its body □ , and use blue on the bottom part of the body, underneath the main black stripe □ . Color the background of the rectangle with the cleaner wrasse light blue-green for seawater □ .

How do fish know not to eat the cleaner wrasse if they see it swimming around?

5. The customers of the cleaner wrasse look for a cleaning station (just like for the cleaner shrimp) and wait for the wrasse's wiggling signal that it is OK to get close. The customer swims up next to the cleaning station get very still and open their mouths (just like at the dentist) as well as exposing their gills (not like at the dentist). Color the two cleaner wrasses working on their customer using the same color scheme as in step 4: black □ , yellow □ , and blue □ .

Why do fish open their mouths and expose their gills around the cleaner wrasse?

6. The process of natural selection has resulted in some mimics (copiers). Because large fish don't usually eat cleaner wrasse, other fish that have the same coloring have been protected from eating as well. And they *really* take advantage of this. In the upper right of the cleaner wrasse drawing, you will see another fish that looks really similar, the false cleaner blenny. Color this fish *the same way* you colored the cleaner wrasse (black □ , yellow □ , and blue □). This sneaky fish is allowed to get close by the bigger fish, who are expecting a cleaning. Instead, the false cleaner blenny bites a chunk of flesh out of the customer and darts away. Evil!

How does the coloring of the false cleaner blenny help it to survive?

If lots of false cleaner blenny fish moved into a coral reef, how might this affect the population of cleaner wrasse?