Student answers will vary. We have provided suggestions for student responses and tips for leading this activity.

Open Ocean Survival Activity Sheet

Name: Teacher Guide **Date:** _____

Instructions:

You can prepare the creature cards ahead of time (laminate them to use in future activities). If you do this, you can ignore #1-4 in the procedure.

1. Gather your materials to survive in the open ocean!
   a. Creature ID cards, hole punch, string or yarn for wearing creature cards, Colorful paper (yellow, blue, and red), long pieces of tape, rope, or string to mark off ocean zones in the classroom, glue or tape to stick the two sides of the creature cards together, *Optional*: coloring materials (markers, pencils or crayons).
2. Each person will pretend to be a specific open ocean creature. Create your creature card to learn more about your new identity! You can assign creatures or let students choose.
   a. Cut out your creature card on the **cut line**.
   b. Fold on the **fold line**. You should have a creature image on one side and the description on the other.
   c. Glue (or tape) the two halves together.
   d. Hole punch the top corners.
   e. Cut out a piece of string or yarn about a foot long. Tie each end to the hole punched corners on the ID cards.
   f. *Optional:* Color in your creature picture to bring it to life!
   g. Drape it around your neck as your new ID.

Create your own Dr. Open Ocean identity! You can dress up as a scientist and make a name tag to match the students. Check out the template on the last page.

Note: The creature cards are grouped in sets of three (with one creature from each zone). Cards connected by the same number (e.g., 1A & 1B, 2A & 2B, 3A & 3B, 4A & 4B) have similar ecological roles in each zone. This means that creatures in sets 1A and 1B are similar, so we recommend selecting creature cards based on their numbers first (see example A), and then add additional sets based on the letter (see example B).

- Example A: For a small class, choose sets with different numbers. For example, a class of 12 students would have 4 groups of three, so you could use card sets 1A, 2A, 3A, and 4A.
- Example B: A larger class, of 24 students, would have 8 groups of 3, so you could use all of the cards.

3. Read the back of your card to learn about your creature.
   a. Record the words in **bold** on your worksheet. These clues will help you know what action to take during the game!

Look for students to record key elements from their creature ID cards. For example, the cockeyed squid (from set 1A):
- large eye looks up into dimly lit waters above
- small eye looks down to search for glowing animals that live in the darkness below
- it eats glowing (bioluminescent animals)

Students may also write down things that interest them, such as the cockeyed squid moves by squirting water through a siphon or that it is eaten by sharks and tunas.

4. Create your own animal dance that represents your creature! For example, if you are a shark, you could put your hand on top of head to represent a dorsal fin.
   a. Practice your dance!
   b. Describe your dance below:

Examples:

- **Squid**: Cup hands in circles around each eye to represent large eyes for life in the twilight zone.
- **Green Sea Turtle**: Hands on hips with elbows back to represent shell.
- **Humpback Whale:** Arms out to side to represent giant pectoral fins.
- **Yellowfin Tuna**: Hands to side close to form a torpedo-shaped body.
- **Tiger Shark**: Hand on top of head to represent dorsal fin.

Establish the ocean zones!

You may want to prepare the ocean zones ahead of time.

5. Now that you have created your creature card, you will establish your ocean zones in the classroom. Make sure you have plenty of space!
6. Create the ocean zone labels. Use a black marker and write in big letters (decorate if you want!):
    a. "Sunlight Zone" on yellow paper.
    b. "Twilight Zone" on blue paper.
    c. "Midnight Zone" on red paper.
7. Use tape, rope, or string to create zones by marking lines across the classroom.
    a. Label the zones with your paper labels.
    b. There should be enough room so that all students can stand in each zone.
    c. Tape the sunlight zone on one side, the twilight zone in the middle, and the midnight zone on the other side.
    d. *Optional:* You can use the tape, rope, or string to create a border around each zone.

Descend through the ocean zones!

This activity highlights the Hawai'i Underwater Research Laboratory (HURL). Check out **http://www.soest.hawaii.edu/HURL/** for photos, illustrations, and information on their submersibles, research projects, and technologies.

8. Your teacher is the narrator. Listen as they read the introduction:

"Close your eyes and imagine that you are standing at the edge of the beach looking out to sea—beyond the horizon. You can see past the shoreline, past the coastal waters to the open ocean. The open ocean covers more than half our planet Earth and is home to a variety of plants and animals that have adapted to survive from the surface to the very deep sea.

You have been given a new identity on your creature ID card and I have a new identity also! I am Dr. Open Ocean. I study life in the open sea and I am about to head out on my underwater submersible, the Pisces IV. I am going to journey through the open ocean zones in my submersible to explore some of the adaptations that help different organisms survive in their part of the ocean. Are you ready to come with me on this journey? Let's go investigate how well your organism might do if you were forced to live somewhere else!

Additional teacher narration (not on student worksheet): As I begin my descent into the first zone, I will share my observations with you. Listen for clues about how life exists in this region and use the information on your card to figure out how well you survive. If the description sounds like your ideal environment, do your creature dance and stand up! If the description sounds like you might do okay (but not great), do your creature dance and sit down! If the description sounds like you will not do well at all (and might even die), do your creature dance and lay down!

Now, if you haven't already, take a few minutes to read the back of your card to learn about your creature. Write a few things down on your worksheet about how your creature survives. Pay close attention to the words in bold, they will help you know what action to take later on!"

9. As Dr. Open Ocean begins their descent into the first zone, they will share their observations with you. You will listen for clues about how life exists in this region and use the information on your card to figure out how well you survive:
    a. If the description sounds like your ideal environment, do your creature dance and stand up!
    b. If the description sounds like you might do okay (but not great), do your creature dance kneel down!
    c. If the description sounds like you will not do well at all (and might even die), do your creature dance and sit down!
10. Gather in the area labeled the "Sunlight Zone" and listen to the next part of the adventure in the open ocean - **The Sunlight Zone:** As you read, there are notes to suggest when to show photos. You can print these photos or project them from a computer so students can see.

"Prepping for a trip like this takes a lot of effort! My team and I have been hard at work organizing the journey, gathering supplies, and planning for our research goals. After a long journey on a transport boat, The Pisces IV is ready to be lowered into the sea. I get into the 20 foot long submersible, settle on the cushions, and peer out the small bubble-like windows in anticipation [show photo 1].

As the sub begins to sink below the surface, the water line divides my window and I glance at the sky above. The sun warms the water and can even shine through to about 600ft in tropical waters! With so much sunlight, organisms like phytoplankton and algae that use the sun's energy to photosynthesize thrive in this zone. In fact, I see an algae drifting by, kept afloat with it's own packets of air!

With so many photosynthesizers around, there is also an abundance of herbivores, like zooplankton, who thrive by feeding on plant matter. Animals that feed on zooplankton and other surface swimmers also do well in this sunlight zone. With my sub still just at the surface, I look across the sea and I see a jelly [show photo 2]! Like the algae, it has a bubble of air to help it float at the surface while the rest of it, the long dangling tentacles, drift below and catch food.

Because there is so much light in this region, it is much easier to see what is around. Creatures have adapted to have colors or patterns, like counter shading, that help them blend in survive well here. They can hide from predators more easily or go unnoticed when catching prey!"

Additional teacher narration (not on student worksheet): Look at your card and determine if you will do well in the sunlight zone. Remember, If you will do well here, stand up. If you will do okay, but you might do better deeper in the water, kneel down. If the sunlight zone is just not for you, lay down."

The Sunlight Zone Photos

The Pisces IV will take you on your journey in the deep sea.

Photo 1. The pisces IV submersible
Image courtesy of the Hawaii Undersea Research Laboratory (HURL)

This jelly floats on the surface!

Photo 2. Portuguese Man-O-War
Image courtesy of Wikimedia

11. Look at your card and determine if you will do well in the sunlight zone.
    Remember, if you will do well here, stand up. If you will do okay, but you might do better deeper in the water, kneel down. If the sunlight zone is just not for you, sit down. Don't forget to do your creature dance!

12. Move to the area labeled "Twilight Zone" and continue listening to the next part of the adventure in the open ocean - **The Twilight Zone**:

"Now that we've explored a little bit of the surface waters, it's time to dive deeper into the twilight zone! Brace yourselves as we descend from about 600 feet up to 2,000 feet deep. Here, there is very little light and the water is cold without the sun to warm it. There is also less oxygen. In order to see the creatures around me, I have to turn on all of my lights! [show photo 3].

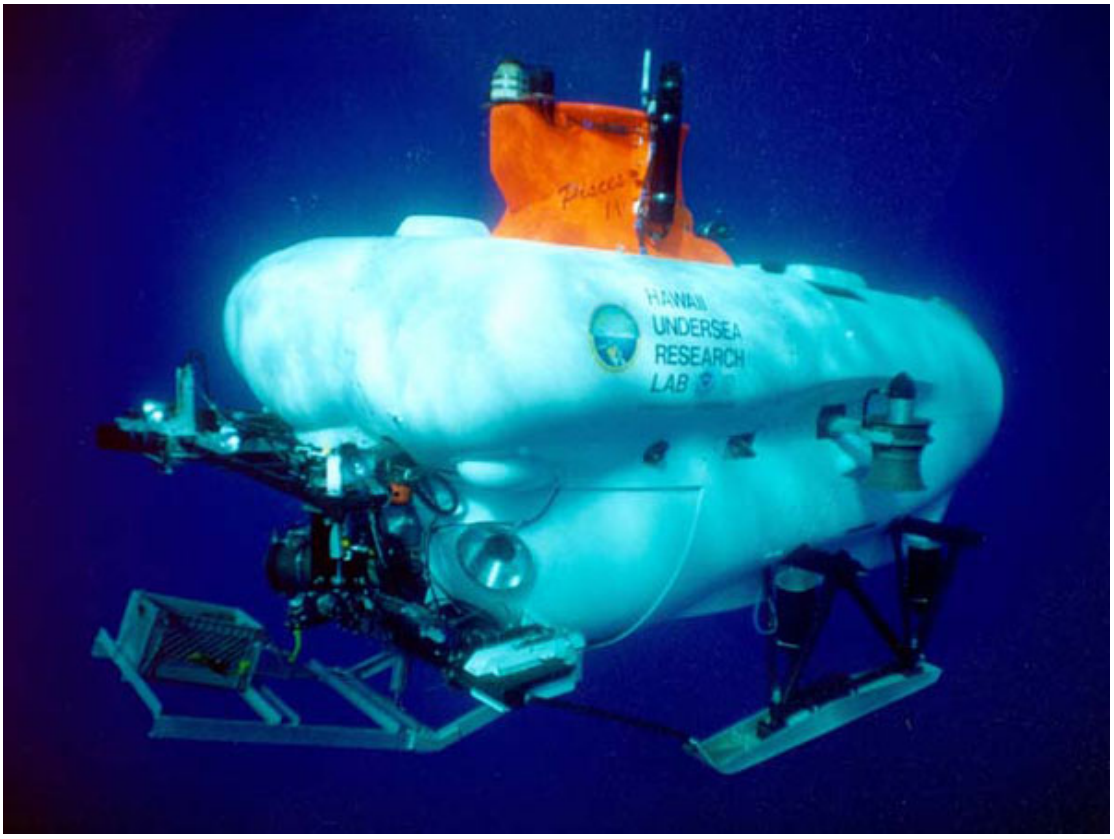
Many animals here are adapted to living in low light conditions. There are a lot of animals who make their own light, a feature called bioluminescence. They can use this either as camouflage from predators below or as lures to attract prey. Some have even adapted to have specialized eyes. One such squid has two different sized eyes [show photo 4]. The larger one is thought to be used to look upward, taking in the limited light that may come through the surface waters. The other smaller eye then, peers downward, catching glimpses of any bioluminescent animals.

The ocean twilight zone is also an important source of food for many marine animals. Some zooplankton and fishes use the twilight zone to hide during the day and then they swim shallower at night to feed. Some animals, like the sperm whale, have to come to the surface to breathe but feed on giant squid that live in the twilight region. This pattern of movement is called vertical migration.

Additional teacher narration (not on student worksheet): Look at your card and determine if you will do well in the twilight zone. Remember, if you will do well here, stand up. If you will do okay, but you might do better deeper or shallower in the water, sit down. If the twilight zone is just not for you, lay down. Don't forget to do your creature dance!"

13. Look at your card and determine if you will do well in the twilight zone.
    Remember, if you will do well here, stand up. If you will do okay, but you might do better deeper in the water, kneel down. If the twilight zone is just not for you, sit down. Don't forget to do your creature dance!

Twilight zone photos:



The Picses IV!

Photo 3. The Pisces IV descends.
Image courtesy of NOAA

The cockeye squid!

Photo 4. The eyes of this squid help it to survive in the darkness of the twilight zone.
Image courtesy of Wikimedia Commons

14. Move to the area labeled "Midnight Zone" and continue listening to the next part of the adventure in the open ocean - **The Midnight Zone**:

"Our next and last stop is the midnight zone, where we are engulfed in complete darkness! The depth in this zone can range from about 2,000 feet to over 10,000 feet in some parts of the ocean! The Pisces IV can carry us to 6,500 feet - just what we need for this trip to reach the bottom at our given location. [Show photo 5]. As we near the final stage of our study, we have to pay close attention to our timing since the submersible can only support us for about 7-9 hours. So let's get to it!

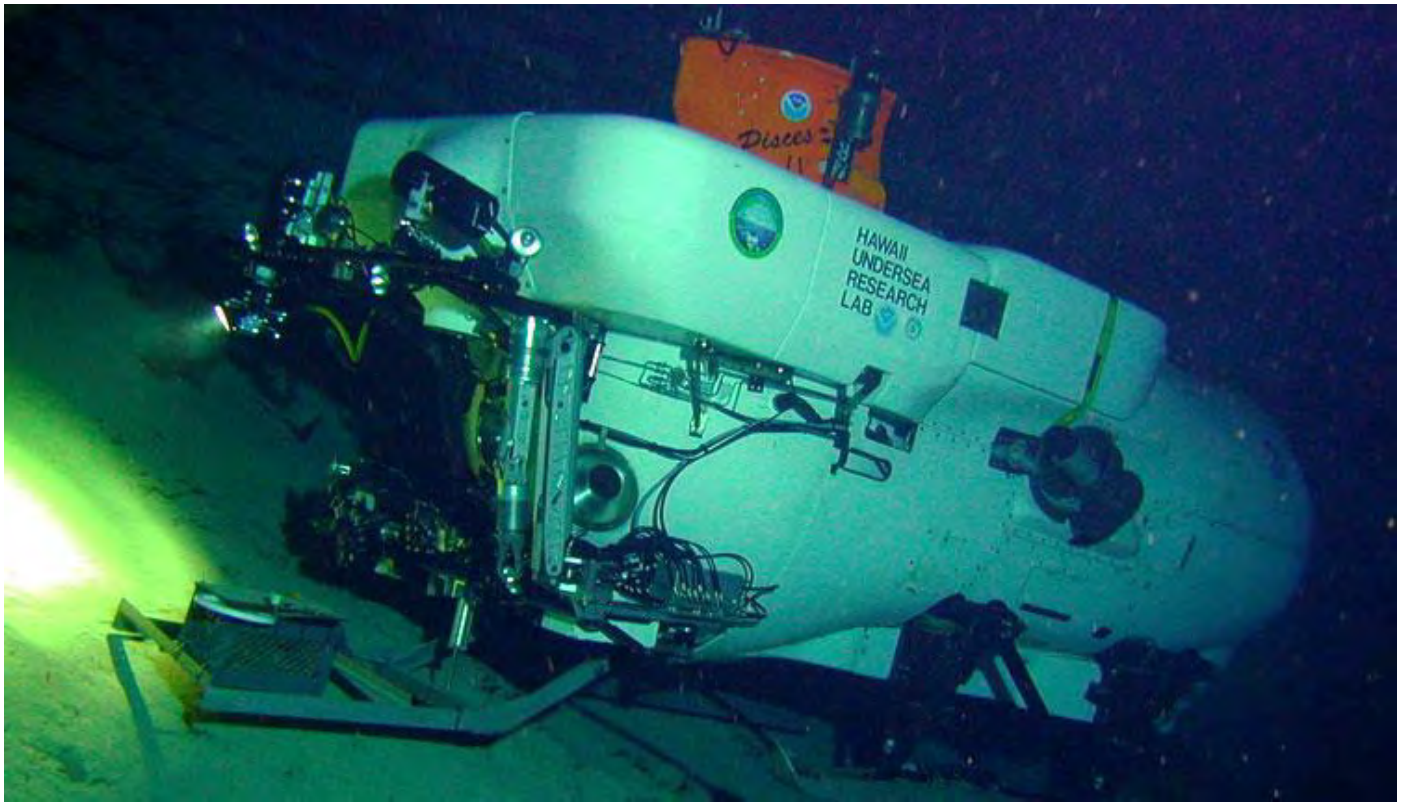
The water here is near freezing (usually about 39 degrees F) and dark. There is no light for photosynthesis so no phytoplankton or algae can grow here. Without the ability to see in the darkness, some organisms have even evolved without eyes! Water pressure is also very great here because of all the thousands of feet of water pushing down from above. A lot of the animals tend to be blobby, watery, and pale in order to survive the high pressure.

There is very little food in the deep ocean, so many predators also have large heads, mouths, and teeth to be able to eat whatever comes their way (otherwise, they might not get a chance to eat for a long time!) [Show photos 6]. Others rely on matter that falls from the zones above, known as marine snow. This debris seemingly sprinkles down (like snow!), eventually reaching the seafloor. Some animals can filter the food scraps from the water with specialized feeding appendages. Others live in the mud on the seafloor and constantly sift through the sand for food.

Additional teacher narration (not on student worksheet): Look at your card and determine if you will do well in the midnight zone. Remember, if you will do well here, stand up. If you will do okay, but you might do better shallower in the water, kneel down. If the midnight zone is just not for you, sit down. Don't forget to do your creature dance!"

15. Look at your card and determine if you will do well in the midnight zone.
    Remember, if you will do well here, stand up. If you will do okay, but you might do better shallower in the water, kneel down. If the midnight zone is just not for you, sit down. Don't forget to do your creature dance!

Midnight zone photos:



It's too dark to see without lights in the twilight zone!

Photo 5. The Pisces IV underwater.
Image courtesy of NOAA, via the Smithsonian

Deep sea fish with large teeth!

Photo 6. This deep sea fish has large teeth.
Image courtesy of Wikimedia Commons

16. Now that you've made it to the deepest part of the ocean, it's time to go back up! Listen as your teacher tells the final story of your journey back up to the surface. Your teacher will indicate what zone you are in. When you get to the zone that you do best in, stay in that habitat.

"We are approaching the limit of our dive time and need to head back up to the surface. Before our submarine leaves the midnight zone, let's say goodbye to the creatures who are adapted to living in the deepest part of the ocean. Creatures that are standing, do your creature dance and then tell us about the adaptations that help you thrive in the midnight zone. [Allow students in the midnight zone to share about their creature. Instruct them to remain in this area.]

All other creatures — come with me as our Pices IV rises up to twilight zone [Move to the twilight area] . If this is your ideal habitat, do your creature dance and then tell us about the adaptations that help you thrive in the twilight zone. [Allow students in the twilight zone to share about their creature. Instruct them to remain in this area.]

All remaining creatures — come with me as our Pices IV continues rising to the surface zone [Move to the sunlight area]. If this is your ideal habitat, do your creature dance and then tell us about the adaptations that help you thrive in the surface zone." [Allow students in the sunlight zone to share about their creature.]

17. *Optional concluding activity*: Depending on how much time you have, continue to explore what the students have learned using the prompts below:

    a. Group Habitat Discussions: Talk with the other organisms adapted to your zone and discuss what sorts of adaptations help the creatures survive well in your zone. (Each group can also write their key ideas on the board for the whole class to discuss and compare.)

    b. Record Your Creature Zone: Create a model of the ocean zones on the board. Write the name of your creature in the zone where it was best adapted.

Activity Questions:

Look for students to provide information about their creature's adaptations. We have provided suggestions based on the creature ID cockeyed squid in set 1A.

1. My creature was Cockeyed squid. I survived best in the twilight zone. The things that helped me to survive well were bioluminescence and eyes that look different directions. I didn't survive well in the sunlight zone because I am easily seen there and make an easy prey. I am not as good of a predator in the surface waters because my eyes are adapted for low light conditions.
2. Look at your card and find the number and letter combination in the corner. Find the two other students with the same number/letter combination and learn about the other creatures in your group.
    a. Share your creature description with the other students in your group. Listen as they share about their creature.
    b. Which creature survived best in each of the habitats?
        i. Sunlight Zone:

        Sargassum (Limu kala)- a primary producer that needs sunlight to photosynthesize and has floats to keep it near the surface.

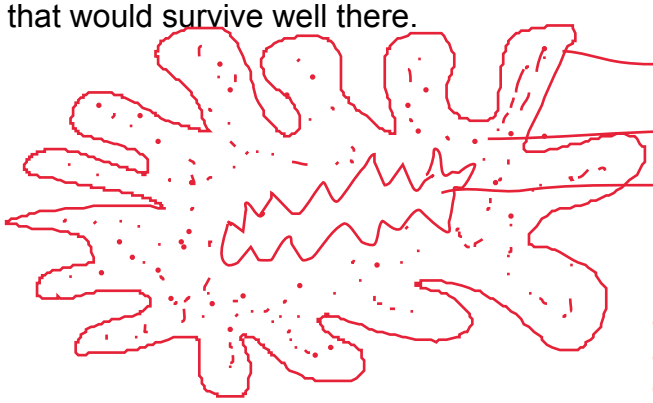
        ii. Twilight Zone:

        Cockeyed squid - a predator adapted to hunting in low light conditions.

        iii. Midnight Zone:

        Glass sponge -- a fitler feeder that lives in deep water attached to the bottom.

3. Pick one of the three ocean zones that you have explored. Design, draw, and label a creature that would survive well there.



Deep-sea mouth eater

My deep-sea mouth eater lives in the darkest, deepest part of the ocean. It has no eyes. It has a blobby body and a very large mouth so that it can eat whatever it finds. It also has stinging tentacles that stick up to catch prey. It crawls along the ocean floor looking for dead things.

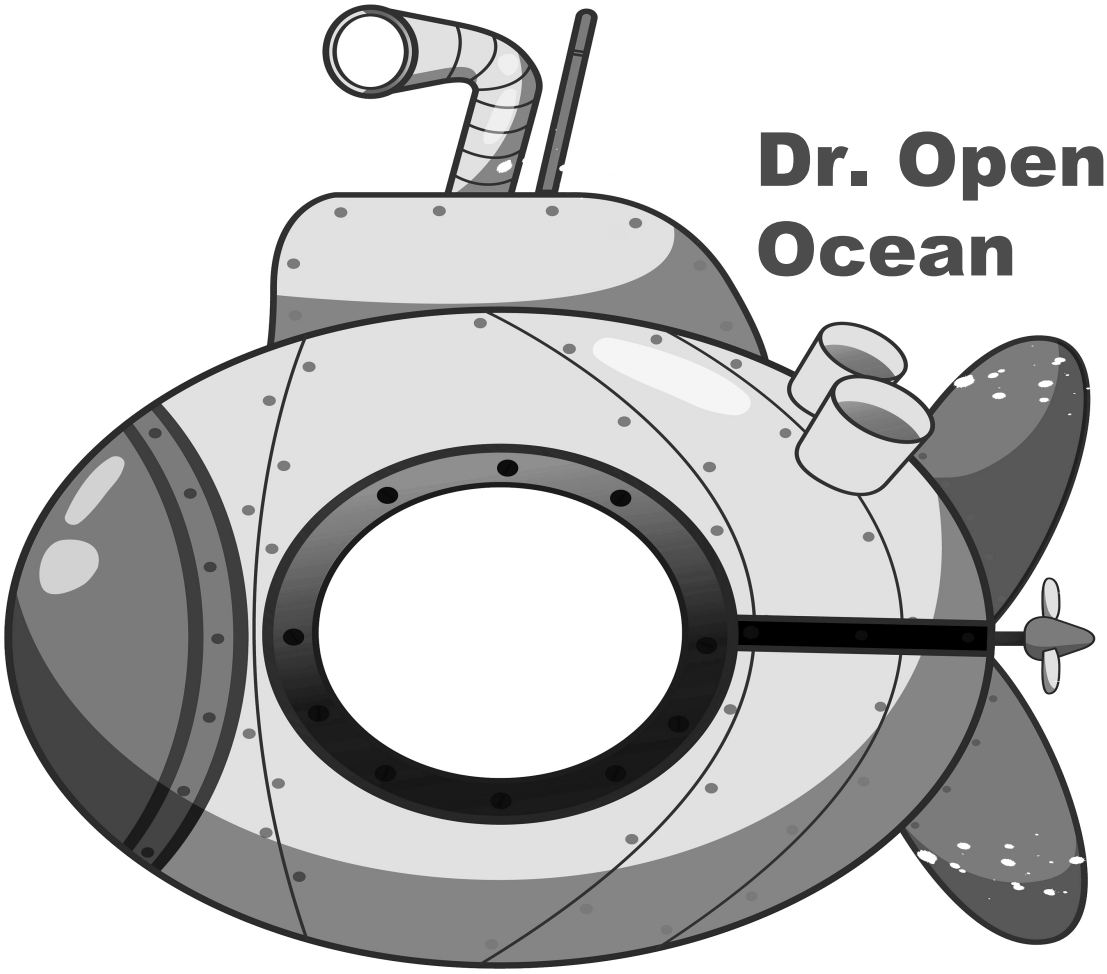
4. Pick an organism that you are very familiar with, such as a pet, and describe its habitat:

I have a beta fish that lives in fresh water. It lives in a tank with rocks and places to hide. It used to have a bubbler and a filter, but I have discovered that it can survive without those as long as I feed it regularly and change its water sometimes.

    a. If you put this creature in a different habitat, how would it do? Describe the habitat.

Some organisms are more flexible in their habitat than others. For example, my beta fish can survive in a variety of water conditions (it can even gulp air if the water quality is really bad). If I put my beta fish in a muddy puddle, it would probably be fine (it certainly does okay in a very dirty tank, and I know of one that survived days in a water bottle). However, my beta fish would not do well in salt water or on land! ... Other types of fishes need very specific water conditions to do well (such as stream fishes that need clear running water.

Dr. Open Ocean



Hole punch on the circles. Tie each end of a peice of yarn through the holes to create a name badge.

Draw your face in the window of the submersible!

Fold along this line

DESCRIPTION:

If you want, you can add details about you to establish your profile as Dr. Open Ocean! Otherwise, you can cut off this side of the page.