

## Birch Aquarium at Scripps Institution Oceanography

**Introduction:** The purpose of this ocean lab field trip is to observe and study live marine life, their habitats, and the major environmental concerns that they face. This worksheet is divided into three parts: **Part I** covers the three major exhibits: Global Warming, Research Vessels, Sharks, and Seahorses (Exhibit Hall is to your left – south end ; sharks outside). **Part II** address the Hall of Fish aquarium tank exhibits (to your right – north end ). Both the Exhibit Hall and the Hall of Fish question sets are ordered according to a counterclockwise circuit of the hallway loop. **Part III** covers the outdoor tide pool exhibits (straight ahead, behind the building – west end). This is designed as a self-guided tour - do it solo, or work as a student group. Can't find info? Track down the professor or an aquarium docent.

### Part I - The Exhibit Hall

#### A. Global Warming Exhibit (west side of exhibit hall)

1. Climatologists collect the samples of **polar ice** to learn about paleo-climates (climates of the past).

Polar ice samples contain tiny, trapped bubbles of ancient, which record ancient levels of atmospheric \_\_\_\_\_, a powerful greenhouse gas..

2. Scientists have collected ancient **atmospheric CO<sub>2</sub>** and **surface temperature data** that continuously covers the last 650,000 years. Note how the two data sets (CO<sub>2</sub> and temperature) move up and down together in close, lock-step fashion over the last 150 years. What does this tell us about how one factor relates to the other over time? For example, if CO<sub>2</sub> continues to go up dramatically, then what would you expect temperature to do?
- \_\_\_\_\_

3. Over the last 650,000 years, up to the start of industrial revolution, atmospheric CO<sub>2</sub> concentration has never risen over what level? \_\_\_\_\_ppm

4. What was the atmospheric CO<sub>2</sub> level back in late 1950's? \_\_\_\_\_ppm

5. What is the current (2017) level of CO<sub>2</sub> concentration in our atmosphere? \_\_\_\_\_ppm

6. How much has atmospheric CO<sub>2</sub> gas risen over the last 60 years \_\_\_\_\_ ppm; a \_\_\_\_% increase

7. What are the predicted levels of CO<sub>2</sub> in our atmosphere 50 years from now if we continue to burn fossil fuels at present rates? \_\_\_\_\_ppm

#### Evidence for Global Warming and Climate Change

8. List four visible changes occurring today that are considered solid physical evidence for global warming?

#1) \_\_\_\_\_ #2) \_\_\_\_\_ #3) \_\_\_\_\_ #4) \_\_\_\_\_

#### Ocean Acidification

9. Ocean acidity has increased by how much in the last 250 years? Increased by \_\_\_\_\_ %

10. What is being added to the ocean that is causing seawater to become increasingly acidic? \_\_\_\_\_

11. How much CO<sub>2</sub> that we pump into the atmosphere gets absorbed into the ocean every year? \_\_\_\_\_%

12. How will increases of CO<sub>2</sub> in our ocean affect carbonate shell and coral reef production?

13. List three ways that you can reduce your carbon footprint.

#1) \_\_\_\_\_ #2) \_\_\_\_\_ #3) \_\_\_\_\_

**B. Sally Ride Research Ship Exhibit** (back end of exhibit hall)

1. Briefly describe the new Sally Ride research vessel (size, length, capabilities, owned and operated, etc.)
2. List (at least 4) various types of oceanographic sample/data collecting activities carried out on this vessel?  
#1) \_\_\_\_\_ #2) \_\_\_\_\_ #3) \_\_\_\_\_ #4) \_\_\_\_\_
3. Which of the above listed oceanographic research activities do you find most interesting and why?
4. Where is the Sally Ride doing research today? What type of research is it currently doing?
5. As the leading research scientist on board, what would you propose for an oceanographic study? Why?

**C. Outdoor Shark Exhibit** (outside: via the south door exit of exhibit hall)

1. Name two different types of sharks in the tank. #1. \_\_\_\_\_ #2. \_\_\_\_\_
2. Name two different types of rays in the tank. #1. \_\_\_\_\_ #2. \_\_\_\_\_
3. How do sharks differ from their cousins, the rays, in terms of anatomy and lifestyle?
4. What do you think is a shark's role in a marine community? Do they have an important job to fulfill?
5. Do you like sharks?                      Are you afraid of sharks?                      Are sharks in trouble worldwide?  
Should we take more steps to protect sharks, and what might those steps be?

**D. Seahorse Exhibit** (east side of exhibit hall)

1. What are seahorses exactly and what/how do they eat?
2. What are the three major types of marine habitats where seahorses call home?  
#1. \_\_\_\_\_ #2. \_\_\_\_\_ #3. \_\_\_\_\_
3. What makes seahorses so unique in the animal world, in terms of their reproduction practices?

4. What are the seahorse's natural enemies, and how do they protect themselves from them?
5. How many seahorses are harvested every year? \_\_\_\_\_ What are they harvested (used) for?
6. Why are seahorse species in danger of collapse? What some solutions to improve seahorse numbers?

**The Plastic Vortex** – (Central Hall near west exit to outdoor tidepools)

1. What is the "Plastic Vortex"? Where is it?
2. Where does the plastic come from and how/why does it get into the vortex?
3. Why do the vortex plastics pose a threat to sea life? List some the negative effects.

**PART II - THE HALL of FISHES** - North side of Building

**A. The Sardine Tank** – Front entrance (Tank #1)

1. Sardines often swim in schools with their mouths wide open. What are two reasons for this?  
(Hint: They use their gills for two important life-supporting purposes.)  
#1 \_\_\_\_\_ #2 \_\_\_\_\_
2. The California sardine fishery collapsed back in the 1950's. Reason(s) why it happened?

**B. The California Current and Adjacent West Coast Marine Ecosystems**

1. What is the most important physical factor that determines the distribution and variety of marine life in west coast coastal waters? Hint: Water.
2. What are some other important factors that influence offshore habitat conditions? List three.  
#1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_
3. Classify/Describe the California Current within the North Pacific Gyre. Circle the one correct choice in each of the pairs of choices below (circle a total of three answers).  
*Boundary or Transverse?      Eastern or Western?      Cold or Warm?*

4. The California Current and adjacent coastal waters are a particularly rich marine ecosystem. Why? (Hint: think about the limiting factors and water movement that promote primary productivity)
5. How does upwelling influence water temperature and nutrient levels in the surface waters?

6. List the four marine geographic provinces found along our west coast from Canada to Mexico.

#1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_ #4 \_\_\_\_\_

7. List the major types of marine habitats displayed in the various tanks. Note: there are 7 listed on wall.

#1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_ #4 \_\_\_\_\_

#5 \_\_\_\_\_ #6 \_\_\_\_\_ #7 \_\_\_\_\_

**Northwest Coast Marine Habitats** – (Tanks 2 through 7)

8. List **three** of the most common types of marine life that you observed in the Northwest Coast tanks?

#1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_

9. Take a close look at Tank #5. What is so special about tank #5? Describe what you see (hopefully, it's not hiding). What is the average lifespan of this amazing cephalopod?

**Southern California Marine Habitats** – (Tanks 10 through 19)

10. List **three** of the most common types of marine life that you observe in the So Cal tanks

#1. \_\_\_\_\_ #2. \_\_\_\_\_ #3. \_\_\_\_\_

11. How do Northwest Coast marine communities differ from those on the Southern California coast, in terms of physical factors, and the variety and size of organisms?

**Giant Kelp Forest Tank** (Tank #19)

12. Spend some time studying the abundant marine life in the very large kelp forest tank. Identify and count as many species of sea life as possible. How many species did you count?

13. Name and describe (in some detail) one species in the kelp tank that you find most interesting.

14. List two ways that you think that a kelp forest promotes and sustains abundant and diverse sea life.

#1 \_\_\_\_\_ #2 \_\_\_\_\_

C. **Troubled Tropical Coral Reefs Ecosystems** – (Tanks 20 through 33). Find the Tropical Seas coral reef tanks/exhibits. Read and study the information listed on the wall.

1. List **three** of the most common types of marine life that you observe in the tropical marine habitats.

#1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_

2. How do warm-water marine communities differ from the previously-observed cold-water communities, in terms of variety and anatomy?

3. What are signs of an unhealthy coral reef system?

4. What are some threats or causes for the collapse of the coral reef systems worldwide?

5. What are some of the ways that humans are providing relief to troubled coral reef systems?

6. Why are coral reef ecosystems worldwide important and worth saving?

### OUTDOOR TIDEPOOL EXHIBITS

1. How many plant and animal phyla do you recognize in the tide pools? List at least four.

#1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_ #4 \_\_\_\_\_

2. Do the tide pools have a dominant plant phylum? \_\_\_\_\_ If so, which one? \_\_\_\_\_

3. Do the tide pools have a dominant animal phylum? \_\_\_\_\_ If so, which one? \_\_\_\_\_

4. What types of challenging physical conditions must tide pool organisms deal with that are not commonly found in most other marine ecosystems? Think about things like tides and waves.

5. What principle characteristics do these organisms possess that makes them so well suited to the tide pool habitat? Think about the above challenging physical conditions of a tidepool that you listed.

6. What animal species, that are no longer abundant in wild tide pools along our shoreline, do you recognize in these artificial tide pool habitats? Why have they vanished? How can they make a comeback?

## **PART IV - POST FIELD LAB REFLECTION**

Write a two-point reflection of your field trip experience at the Birch Aquarium (about 150 words).

**1. What did you learn on this trip? How does that relate with what you are learning in this course?**

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**2. What did you find most interesting or important? What did you find difficult or challenging?**

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