TEACHER GUIDE: GRADES 6-8

THANK YOU FOR CHOOSING BIRCH AQUARIUM FOR YOUR FIELD TRIP!

We hope these resources will help you and your students make the most of your time at the aquarium. Each activity sheet aligns with a different exhibit in the aquarium, and all the answers can be found within that exhibit. You can find the answer key and more exhibit information below.

TIPS & TRICKS

- Print these activity sheets for your students before you arrive. They are not available for printing or pick up at the aquarium.
- Bring your own clipboards and writing instruments for each student. Exhibit windows **cannot** be used as writing surfaces.
- Give a copy of this guide to each chaperone so that they can best support their group of students.

There is no activity sheet for Tide Pool Plaza, as your students can touch local animals here! Be sure to put away all materials that could fall into the open water. Follow directions of aquarium staff and volunteers at all times.

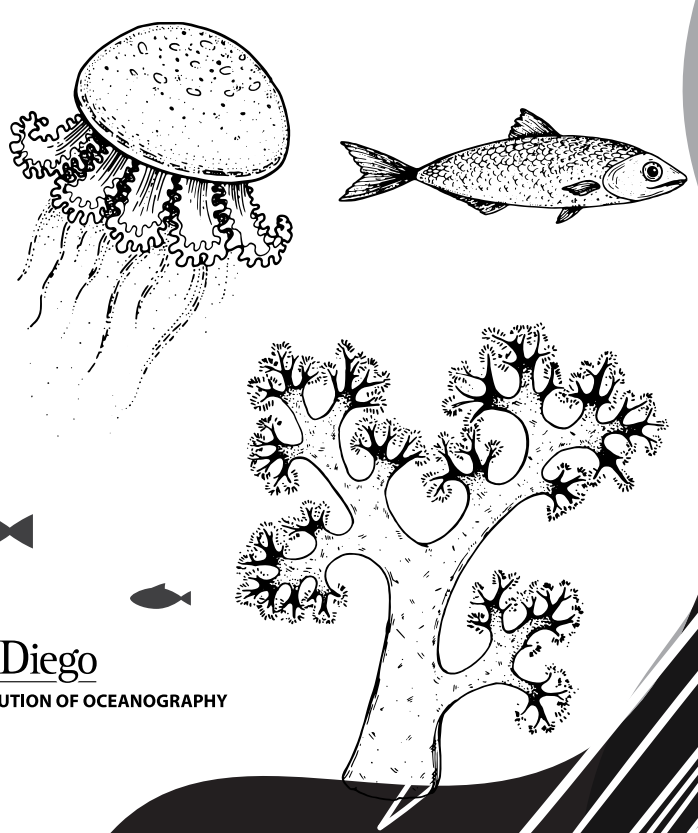
QUESTIONS YOU CAN ASK YOUR STUDENTS:

- Have you ever seen this animal before?
- What body parts help it survive in our local environment?
- What do you think the animal will feel like? What does it actually feel like?

HAVE YOU BEEN ON YOUR FREE PRE-VISIT YET?

Teachers receive a **FREE** pre-visit prior to your program to help you in the planning process.

Call (858) 534-7336 to make a reservation in advance.



BIRCH AQUARIUM | UC San Diego SCRIPPS INSTITUTION OF OCEANOGRAPHY

Birch Aquarium at Scripps

EXHIBIT INFORMATION

SHELIA MARIE DAVIS GALLERIA

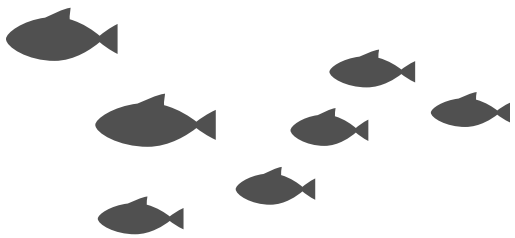
- Don't forget to look up when you walk through the aquarium doors!
- Check out life size models of local shark species.

LIVING SEAS: PACIFIC NORTHWEST & COASTAL CALIFORNIA

- The *Adam R. Scripps Living Seas Gallery* takes you on a journey through the vibrant ecosystems of the Pacific. Begin with the cold waters of the Pacific Northwest to the beauty of Coastal California and on to the colorful reefs of the Tropical Pacific! Ask students what similarities and differences they notice between the animals as they work their way through the different ecosystems.
- Sea anemones can be found in many exhibits throughout the *Living Seas*. Their stinging tentacles stun small prey that swims, crawls, or drifts by.
- The sting of moon jellies is mild to humans.
- Garibaldi can be found in many exhibits, including the Kelp Forest. Juveniles are smaller and covered in bright blue spots, which signals to territorial adults that they are still young.

LIVING SEAS: GIANT KELP FOREST

- Our Kelp Forest holds 70,000 gallons of water!
- Fresh seawater for our exhibits is pumped up the hill from La Jolla Shores thanks to equipment on Scripps Pier.
- The giant kelp that makes up our Kelp Forest Exhibit provides a home for many animals. It can grow up to 150 feet tall at a rate of up to 18 inches per day!



LIVING SEAS: TROPICAL PACIFIC

- Our loggerhead sea turtle was rescued near a power plant in New Jersey. She has paralysis in her back flippers, meaning they cannot move.
- Scientists 3-D printed a brace to fill a gap in her shell to keep her healthy as she grows!
- Activity Sheet Tip: Help the students stay on time during their ethogram by starting a timer.

HEALTHY VS. BLEACHED REEF

- Coral reefs are home to more species than any other ocean ecosystem.
- Warming waters caused by climate change cause the algae that live within coral tissues to leave, resulting in coral bleaching. This impacts all the species that depend on the coral as their habitat or food source.
- Scripps scientists are always researching new ways to reduce the impact of climate change on our planet.

SHARK SHORES

- Sharks don't actually want to bite humans. Shark bites are really shark accidents- a lot of sharks like to eat seals and sea lions.
- In the water, where it can be hard to see, sharks can get confused and think humans are seals or sea lions. There are also many species of sharks, and they all eat a variety of things.
- The biggest shark on the planet, the whale shark, actually eats tiny plankton!

SEADRAGONS & SEAHORSES

- Some relatives of seahorses and Seadragons are the Seamoth, Cornetfish, Trumpetfish, Pipefish, Shrimpfish and Snipefish. Some of these relatives can also be found in the exhibit!

BEYSTER FAMILY LITTLE BLUE PENGUINS

- Little Blue Penguins are native to Southern Australia, New Zealand, and Tasmania.
- Their climate is actually very similar to our own here in San Diego!
- There is always an education naturalist in the Research Station who can answer any questions you or your students may have.

ANSWER KEY

LIVING SEAS: PACIFIC NORTHWEST & CALIFORNIA COAST

- Northwest Coast: Sunflower Star, Giant Pacific Octopus, Bat Star, Pacific Spiny Lumpsucker
- San Diego Bay: California Spiny Lobster, Bat Star
- Southern California Rocky Reef: Garibaldi, California Spiny Lobster, California Moray Eel

LIVING SEAS: GIANT KELP FOREST

- Food webs should be drawn with the arrow pointing where the flow of energy is going.
- Decomposers connect all the animals to the producers, as dead animals are broken down into nutrients that the producers use.
- As temperatures warm, some animals may shift their range north if the water becomes too hot for their prey or for themselves. Some species may adapt to warmer water over time and others may not survive.

HEALTHY VS. BLEACHED REEF

- Algae in the bleached reef was expelled due to warmer water temperatures.
- If the coral is left unhealthy and may eventually die.
- This also impacts all the species that depend on the coral as their habitat or food source.

SHARK SHORES

- Seal and sea lion populations would increase because there is no predator to keep their populations in check.
- Fish populations would then decrease as a result of more seals and sea lions needing to eat.
- Removing sharks upsets the natural balance of the ecosystem.

SEADRAGONS & SEAHORSES

1. The MALE seahorses get pregnant, which differs from most of the animal kingdom.
2. Female seahorses transfer their eggs to the male's POUCH after an elaborate mating ritual.
3. Female seadragons transfer their eggs to the male's TAIL after an elaborate mating ritual.
4. DAILY greetings help seahorses form long-lasting bonds.
5. Male seahorses remain pregnant for up to 4 WEEKS.

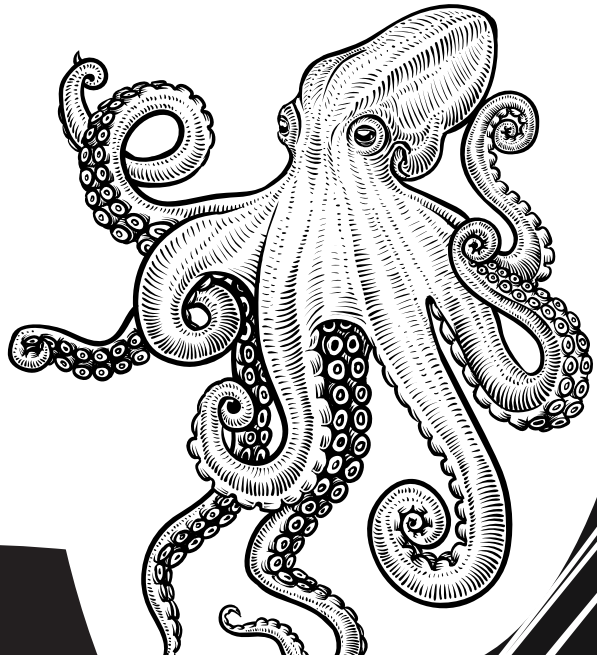
- Seahorses have a PREHENSILE tail, which is adapted to grasp and hold onto objects, similar to a monkey!

BEYSTER FAMILY LITTLE BLUE PENGUINS

There are many different behaviors penguins may do that relate to their life cycle. For example, students may observe a penguin holding pieces of plants in their beaks, which they use to build their nest. Encourage students to think about the why behind each behavior.

What are the ways that a warming planet affects penguins?

1. Fewer fish to eat
2. Flooding of nesting areas
3. Decreased odds of breeding



LIVING SEAS:
PACIFIC NORTHWEST + COASTAL CALIFORNIA

The most important factor that determines where marine organisms live is water temperature. Each organism has a temperature range that they can live in. Traveling through the beginning of *Living Seas* is like swimming down the West Coast. See how the types of animals change from the Pacific Northwest to Coastal California as the water warms.

DRAW A LINE TO MATCH THE ANIMAL WITH THE HABITAT THEY LIVE IN. SOME MAY LIVE IN MORE THAN ONE PLACE!

HABITAT	ANIMAL
Northwest Coast (Oregon & Washington)	Sunflower Star
	Giant Pacific Octopus
San Diego Bay	California Spiny Lobster
	Garibaldi
	California Moray Eel
Southern California: Rocky Reef	Bat Star
	Pacific Spiny Lumpsucker

WHAT DO YOU THINK WILL HAPPEN TO THE ANIMALS THAT LIVE THERE AS OCEAN TEMPERATURES RISE DUE TO CLIMATE CHANGE?

See the chart below for the average water temperature in each location.

	AVERAGE WATER TEMPERATURE	
	January	July
Washington	45°F	54°F
Oregon	49°F	55°F
Northern California	51°F	56°F
Southern California	57°F	67°F

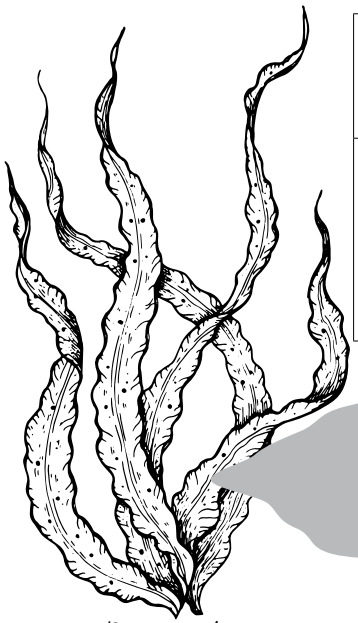
GIANT KELP FOREST

The kelp forest is an important habitat in Southern California for many animals. At Birch Aquarium, our team of aquarists feed each animal exactly what they need. In the wild, they must depend on what is around them. Using the information about each animal, build a food web that shows how energy flows through this ecosystem. Then, see if you can find any of these animals in the exhibit!

TIP:
Draw your food web arrows pointing towards the organisms getting the energy.

For example, this human gets energy from eating the hamburger, so the arrow points towards the human.

Remember, an animal might get energy from more than one thing!



PRODUCERS Create their own energy via photosynthesis	HERBIVORES Eat producers	OMNIVORES Eat both animals and producers	CARNIVORES Only eat other animals
Giant Kelp	Sea Urchin Opaleye Kelp Crab	Bat Star Eats kelp, sea urchins	Garibaldi Eats crabs, sea stars Sheephead Eats sea urchins, crabs Giant Sea Bass Eats sheephead

DID YOU KNOW?

Decomposers like fungi, bacteria, and certain invertebrates are an important part of a food web as well. Decomposers break down organic matter from dead organisms into nutrients that producers need to make their energy. Think about where you would add decomposers into your food web.

LIVING SEAS:
TROPICAL PACIFIC

Your journey through *Living Seas* continues as you explore the wildlife found in the Tropical Pacific. Ethograms are a way to study an animal's behavior by collecting data on what they are doing. Use this ethogram to observe how the organisms are interacting with the other living and nonliving things in their environment.

INSTRUCTIONS:

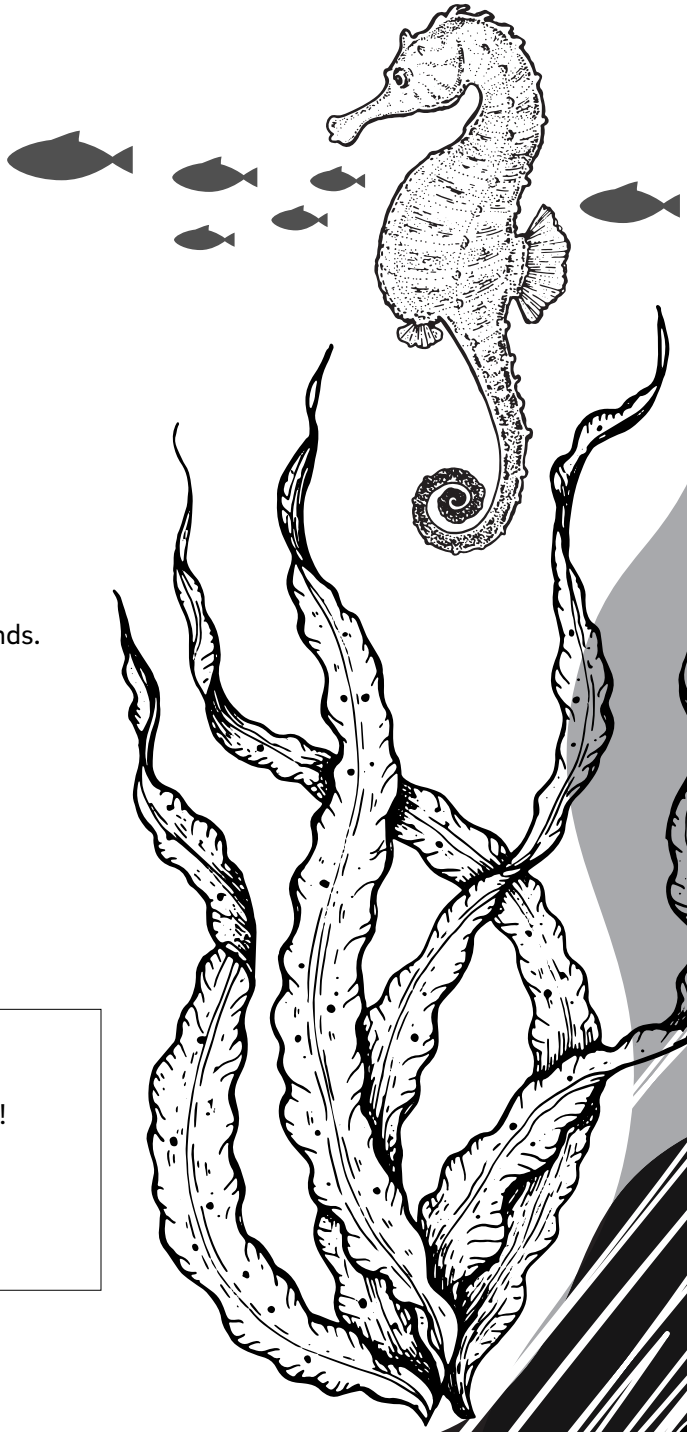
- Pick an animal to study in one of the Tropical Pacific exhibits. Write its name on the line below.
- When you are ready to begin, count to ten. Then, place a checkmark next to the behavior the animal is doing at that moment. Then, count to ten again and repeat.
- Do this 12 times (for a total of 2 minutes) to fill out the whole chart. Total each behavior to see what they were doing the most.

ANIMAL: _____

TIME	FEEDING	ACTIVE Moving around, not interacting	INACTIVE Not moving around	SOCIAL Interacting with another animal	NOT VISIBLE	OTHER
0:10						
0:20						
0:30						
0:40						
0:50						
1:00						
1:10						
1:20						
1:30						
1:40						
1:50						
2:00						
TOTAL						

SEADRAGONS + SEAHORSES

Seadragons and seahorses have unique characteristics that help them reproduce
Find the answers to the questions below around the exhibit to reveal a fun fact.



1. The ___ seahorses get pregnant, which differs from most of the animal kingdom.
   P. Male Q. Female

2. Female seahorses transfer their eggs to the male's ____after an elaborate mating ritual.
   D. Tail E. Pouch
   F. Fins G. Gills

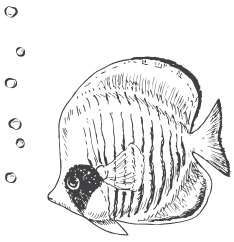
3. Female seadragons transfer their eggs to the male's ____ after an elaborate mating ritual.
   E. Tail F. Pouch
   G. Fins H. Gills

4. ___ greetings help seahorses form long-lasting bonds.
   P. Weekly Q. Monthly
   R. Yearly S. Daily

5. Male seahorses remain pregnant for up to ____.
   L. 4 Weeks M. 2 Weeks
   N. 10 Weeks O. 4 Days

Seahorses have this kind of tail, which is adapted to grasp and hold onto objects, similar to a monkey!

_ R _ H _ N _ I _ E
1 2 3 4 5



HEALTHY VS. BLEACHED REEFS

Look closely at the difference between the healthy and bleached reef. What do you notice?
The healthy coral gets its vibrant colors from a type of algae called zooxanthellae. The zooxanthellae lives inside the coral which creates a mutualistic relationship: the coral provides the algae with protection and nutrients for photosynthesis, and the algae provide coral with food from photosynthesis. However, warming waters caused by climate change will cause the coral to be come stressed and expel the algae.

WHAT DO YOU THINK HAPPENED TO THE ALGAE IN THE BLEACHED REEF? WHAT DOES THAT MEAN FOR THE CORAL?

DID YOU KNOW?

Corals have the potential to recover! According to research by the Scripps Institution of Oceanography at UC San Diego, corals can recover and grow normally within two to three years when surrounded by relatively healthy waters and reefs.

This recovery process involves the return of essential algae, known as zooxanthellae, which are vital for coral survival. However, coral recovery is complex and can vary depending on the specific location and ecosystem.

Ongoing research aims to uncover the dynamics of coral recovery and develop effective conservation strategies to support these efforts.

SHARK SHORES

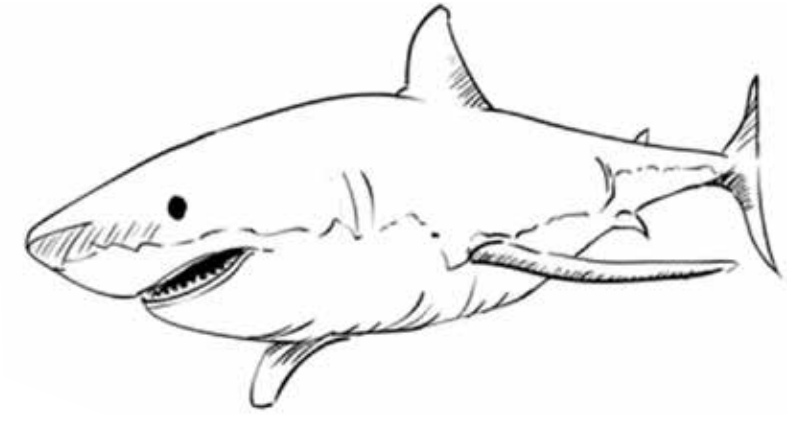
What emotions do you feel when you see these sharks? People often feel nervous around sharks because they are often portrayed as scary or dangerous in movies or media. In reality, shark attacks are incredibly rare, and sharks are actually very important to the ocean! They keep the ocean food web balanced and their health indicates the overall health of the ecosystem.

IMAGINE THAT WHITE SHARKS WERE REMOVED FROM THE OCEAN FOOD WEB.

What would happen to their prey (seals and sea lions)?

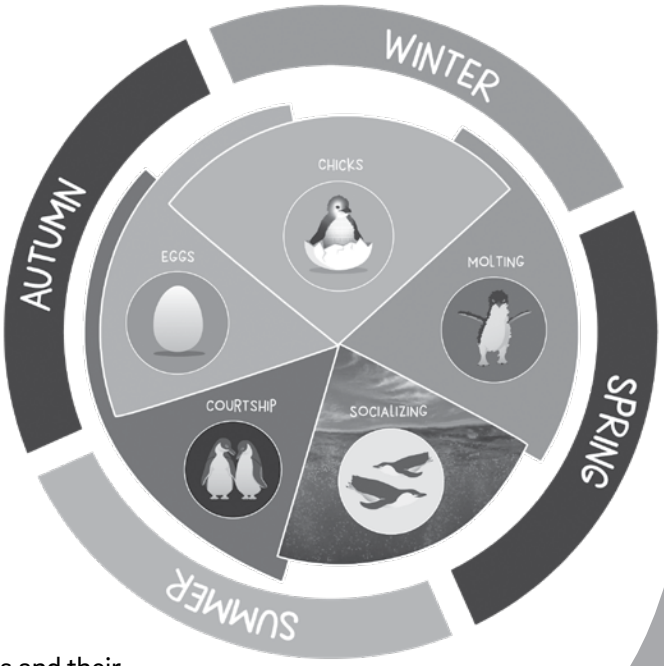
What would then happen to the fish that seals and sea lions eat?

How would these changes affect the ocean ecosystem as a whole?



BEYSTER FAMILY LITTLE BLUE PENGUINS

Look at the life cycle chart to the right to see how penguins tend to spend their time over the course of a year. Then, observe the penguins for a few minutes.



WHAT BEHAVIORS DO YOU OBSERVE? (Circle all that apply)

SOCIALIZING:
Penguins spend their time swimming and feeding together.

MOLTING:
Once a year, penguins molt all of their feathers and grow back new ones.

EGGS:
Eggs are laid, both penguins take turns sitting on the eggs to incubate them.

CHICKS:
Parents will care for and feed their young chick.

COURTSHIP:
Male penguins will do courtship displays to attract females and start building nests.

The effects of climate change can negatively impact the penguins and their habitat. Use exhibit signage to answer the following questions.

WHAT WAYS DOES OUR WARMING PLANET AFFECT PENGUINS?

1. _____

2. _____

3. _____

Read how the community came together in New Zealand to protect penguins from the effects of climate change, like flooding. What effects of climate change have you felt in your own community?

CIRCLE ANY OF THE EFFECTS BELOW THAT YOU HAVE NOTICED:

Extreme temperatures	Flooding	Drought
Increased fires	Warming oceans	Sea level rise
Extreme weather	Other: _____	

What climate action can you take to help your community? Choose an action from the exhibit or come up with your own!

I CAN HELP MY COMMUNITY FIGHT CLIMATE CHANGE BY:

_____

_____

_____

_____