

Slide Number	Text to go with Slide
1.	Opening slide-no text
2.	<p>NOAA's National Marine Sanctuaries protect more than just water. They protect cultural resources, coastlines, reefs, benthic (bottom) environments etc. Along the west coast of North America lay 5 sanctuaries that are in some of the most productive waters in the world. This is due to the Eastern Boundary Current called the CA current. It provides loads of nutrients for the marine web. The bottom environment is valuable habitat both at the intertidal zone and subtidal zone.</p>
3	<p>The Rocky Intertidal and Subtidal habitats on the west coast are packed with life. Students like you up and down the coast are helping the National Marine Sanctuaries protect these marine habitats by monitoring the life in these zones.</p> <p>Today you will learn how and why we monitor the rocky intertidal and subtidal habitats. (Photo from J. Pearse)</p>
4	<p>Gulf of the Farallones National Marine Sanctuary protects the waters surrounding the Point Reyes and the Farallon Islands and the near shore waters of Bolinas Lagoon and Tomales Bay. Here is Duxbury Reef which is the area you are going to help monitor. (Photo by J. Saltzman)</p>
5	<p>Students in the field use a few different pieces of equipment. The first is the transect tape. At Duxbury Reef there are two permanently marked transects as you saw in the last map. A long tape is used to mark the transect.</p> <p>The quadrat is a plastic square that is a half meter by a half meter which means it covers an area of a quarter of a square meter (0.25 m²).</p> <p>When in the field we have kneepads in order to get close to the ground to see what wonderful creatures are living there! (Photo from J. Pearse)</p>
6.	<p>Before you go to the field, you will first need to know what algae and animals you are looking for and how to identify them. There are a few activities to help you learn. The first is part of this slide show where you will see the different species and will fill in your personal identification notes sheet. The second is a practice session with life size photos and quadrats. You will learn to</p>

	<p>identify species while practicing the data collection method. (Photo from J. Pearse)</p>
7.	<p>Now to the animals which are probably more familiar. There are many groups that we will be collecting data about. They are sea anemones, several mollusks, barnacles and sea stars. (Photos by K. Soave)</p>
8.	<p>The Giant Green Anemone is hard to miss. Its huge! Sometimes you will see them all curled up with sand and small rocks attached to their body to prevent drying out.</p>
9.	<p>There are three species of anemones that we find at Duxbury Reef. The most abundant one is the aggregating anemone, about an inch in diameter. The top picture shows them open, when under water. And the photo below shows them when exposed to the air. They are the green little blobs. This species will be pointed out to you on the reef so that you can see what they really look like when exposed to the air and not underwater. They often cover themselves with small rocks and sand to help keep the moisture in during the low tide period.</p> <p>The giant green anemones are much larger than the aggregating anemones. They are often solitary while the aggregating ones are found in groups, actually in cloned groups. The giant greens live in the mid to low zone and are not that abundant where we will be monitoring.</p> <p>The brooding anemone is a small brownish anemone that is rare. It gets its name from the way it reproduces. New anemones bud off from the adult and are seen on the base of the animal. (The identification card has a nice picture of this.) (Photos by K. Soave)</p>
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11.	<p>There are two species of snails at Duxbury that we will monitor. The abundant turban snail lives in the high to mid zone. It has a very round shell and often brown to black on color. The turban snail is an herbivore and grazes on the algae. The whelks are predatory and have an elongated shell. They are gray in color.</p> <p>Hermit crabs live in snail shells. You will have to check each shell to see if it is a snail or a crab. Be sure to be gentle while picking up the snails and return them back where you found them, especially if they are under the algae. (Photos by K. Soave and A. Devitt)</p>
12.	<p>Sea stars are the most well know and easily identified species in the rocky intertidal habitat. The most abundant species is the ochre (o-ker) sea star. It grows up to 10 inches in diameter and has a few color morphs – orange, brown and purple. Sea stars are predators and are very important in the dynamics of the rocky intertidal zone.</p> <p>On the smaller side are six armed stars. They grow only to an inch in diameter.</p> <p>Very rare at Duxbury, yet much more abundant at other rocky intertidal zones, are bat stars. They are very colorful and grow to about 5 inches in diameter. The name comes from the webbing between the arms of the bat star. (Photos by K. Soave)</p>
13.	<p>Limpets are another interesting group of mollusks. They only have one shell that covers their muscular foot. The limpets that we monitor at Duxbury are small in size - a quarter to a half an inch in diameter. Some people think they look like little volcanoes. Another species that is found on the outer reefs in the high wave action area are owl limpets. They grow much larger, up to 2 inches</p>

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15.	<p>Barnacles are not in the mollusk group although you may have thought that at first. Yes, they do have a shell, but not the muscular foot. Barnacles are actually closely related to shrimp. A fun way to think about barnacles is that they are shrimp that have glued their heads to the rock, built a strong home around themselves, with doors that shut when the tide is out. They open the doors, called plates, under the water so they can kick their legs to filter food out of the water. The barnacles here are small - less than the width of your pinky finger (less than 1 cm in diameter). They are abundant in the high zone of the rocky intertidal habitat. You will not have to count all the barnacles in your quadrat, just how many squares are they present in. (Photo by K. Soave)</p>
16.	<p>The reason we are doing all this monitoring is find out how our intertidal life changes over time. How is it affected by climate changes, pollution, coastal development, and human trampling and harvesting. We need to monitor specific sites to follow these changes over time. If we discover that changes are occurring, studies can be focused on the causes and whether action should be taken to counter the changes. But first it is necessary to have some good rigorous data.</p>
17.	<p>Another impact on the rocky intertidal species is people walking and investigating and having fun looking around the rocky intertidal zone. In the future, the Gulf of the Farallones National Marine Sanctuary will study the impact that people have on Duxbury Reef (Photo from J. Pearse)</p>
18.	<p>Students and researchers can easily study the rocky intertidal habitat because its accessible from shore. But how about under the water in the subtidal zone? In the shallower depths, researchers</p>

	use quadrats when diving on SCUBA, but how about at deeper depths, where scuba is really not a safe or efficient option? At Cordell Bank NMS, scientists use a submersible and remotely operated vehicles to get below the surface and use video and photos to estimate the abundance of fishes and invertebrates.
19.	The pictures you will be looking at today come from Cordell Bank, an underwater island/rocky reef about 20 miles west of Point Reyes and Bodega Head. Most of the Bank sits on the continental shelf at 400 feet, while some of it rises to peaks of 115 feet below the surface of the water.
20.	Orange Cup Coral is a stony coral, its tentacle tips are hard. It filter feeds for plankton, and is typically solitary, although, they can be abundant in certain areas. You will count these as individuals in the photos.
21.	Hydrocoral is another stony coral that that can be pink or purple. It is very fragile and slow growing. It can take 25 years to grow 1.5 inches! They filter feed for plankton as well and are solitary, but like orange cup coral, can be abundant in areas. This will be counted individually.
22.	Strawberry anemones are bright pink and sometimes orange. They stand by themselves, but are very abundant. They use their stinging tentacle tips to catch plankton in the currents. They thrive in strong current areas. These would be too hard to count individually, so this species you will count and record the number of squares they appear in.
23.	Sponge comes in a variety of shapes and sizes and is very difficult to identify to species. There are over 5000 species in the world's ocean and fresh water areas. They eat plankton by filter feeding. The small holes in sponge intake the water, this body part is known as Ostia. The water goes through the sponge and is exported out the large holes known as Oscula. The plankton, bacteria, detritus, is left behind in the sponge! Since there are so many species, just look for spongy like organism and record as sponge!
24.	One of the categories on the data sheet is bare rock. You'll discover that the depths of the bank determine the type of marine life that live there and their abundance. The bottom habitat of Cordell Bank is mostly granite. It provides a place offshore for species to live on. Hundreds of different invertebrates use this habitat as a home.

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25.	Crinoids are also known as Feather Stars. They are related to seastars and sea cucumbers. Crinoids can live as deep as 3300 ft! They feed on plankton, detritus, and bacteria. They can detach and fly in the currents to land in a new home.
26.	There are numerous species of seastars at Cordell Bank. They are radially symmetrical and are cousins to crinoids, sea urchins, and sea cucumbers.
27.	<p>Heres a quick test? What species do you see?</p> <p>There are strawberry anemones (lighter pink and fluorescent pink), sponge, hydrocoral.</p> <p>(on click, arrows point to the strawberry anemones, sponge, and hydrocoral)</p>
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29.	Here you should see sponge, orange cup corals, strawberry anemones, and a seastar (upper right), as well as some bits of hydrocoral.
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