

# ODFW Marine Reserves Program

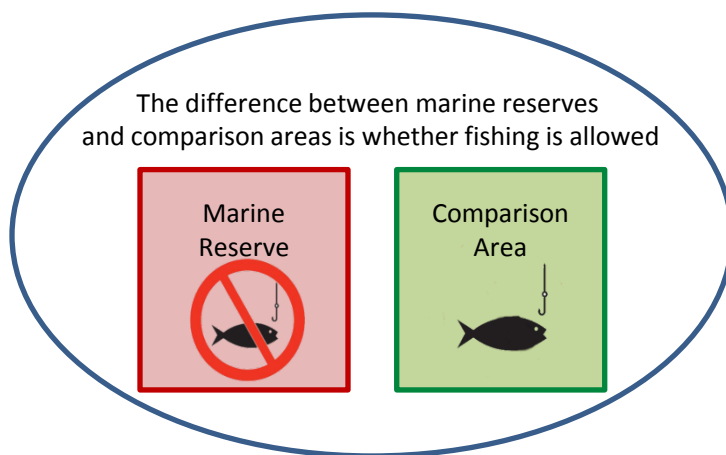
## Comparison Areas – tools for understanding changes over time



In 2012, Oregon completed designation of five marine reserve sites within its state waters to advance scientific research and conserve habitats and biodiversity. Oregon Department of Fish & Wildlife is responsible for overseeing the management and monitoring of Oregon's marine reserves.

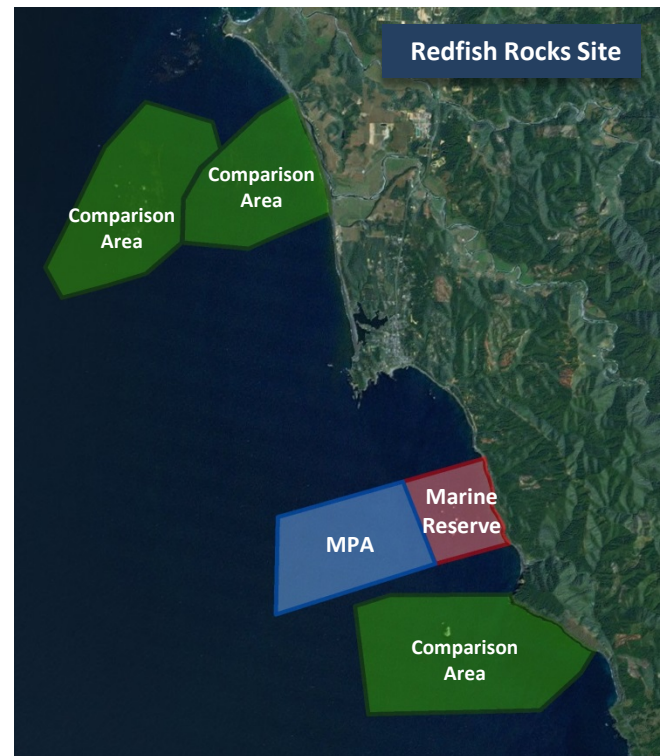
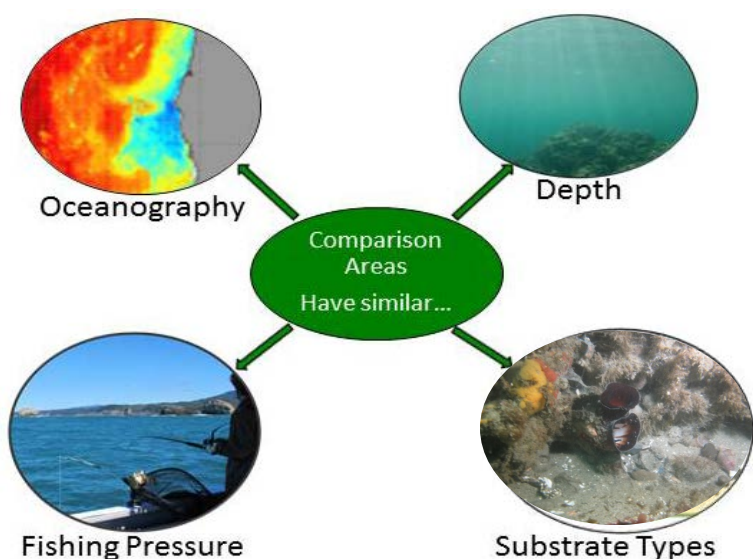
### What are Comparison Areas?

Comparison areas are monitoring sites, in close proximity to the marine reserve, that remain open to fishing. Long-term monitoring will be conducted identically in both the reserve and comparison areas so that we can understand whether the changes we are seeing in the marine community (fish and invertebrate species) are from environmental variation or from the marine reserve protections.



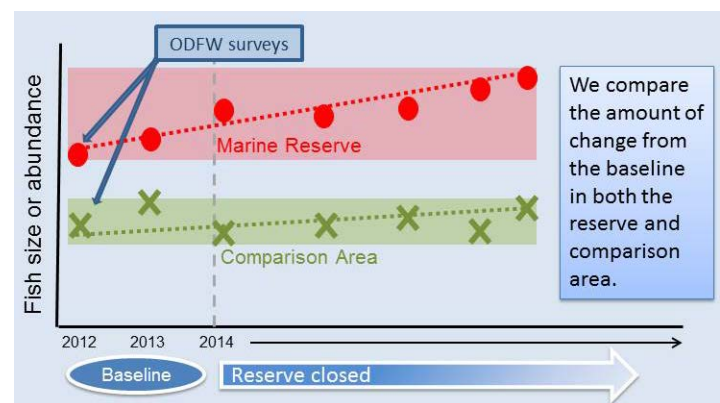
### How do we choose Comparison Areas?

Ideally, a comparison area would be identical to the marine reserve in all ways except that it remains open to fishing. In reality, it is impossible to find two areas that are perfectly identical. Instead, we find areas as similar as possible and select more than one comparison area per reserve. We look to find comparison areas that have similar ocean conditions, habitats, and fishing pressure as the marine reserve.



### Where do we start? Baseline ...

Prior to the prohibition of fishing, we sample in the reserve (red) and the comparison areas (green) to quantify the initial conditions of these areas. This allows us to identify differences that already exist between the areas.



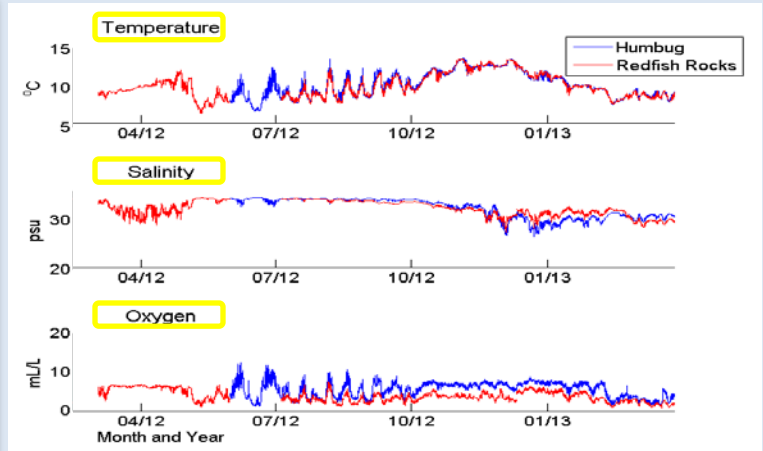
### What's next? Understanding changes over time ...

From our baseline, we are now tracking the changes occurring in the reserve and in the comparison areas over time. This allows us to isolate reserve effects from natural variations. We are looking for changes in species composition, size, and abundance.

## Do the comparison areas have similar ocean conditions as the marine reserve?



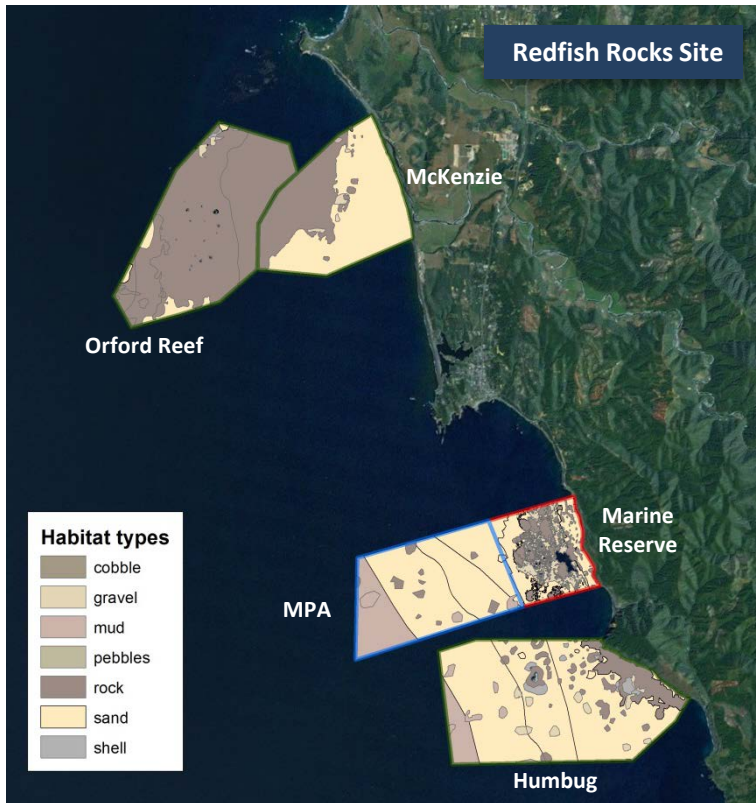
Oceanographic instrument (CTD) bolted to the ocean floor collecting data at Redfish Rocks.



Temperature, salinity, and oxygen measured April 2012 - January 2013. Marine reserve in red; comparison area in blue.

Ocean conditions were very similar between the marine reserve and the comparison area suggesting that Humbug is a good comparison area to the reserve.

## Do the comparison areas have similar habitat and fishing pressure as the Redfish Rocks marine reserve?



During our baseline assessments, we found Humbug Comparison Area to have very similar ocean conditions, proportions of habitats, and fishing pressure to the marine reserve. Also, we found similar habitats at Orford Reef and McKenzie Comparison Areas to the marine reserve. However, these two areas have more fishing pressure than the reserve experienced prior to protection. We therefore are using Humbug as our primary comparison area and Orford Reef and McKenzie as secondary comparison areas.

### Comparison Areas: Facts and Myths

**✗ MYTH:** Comparison areas are meant to catch fish that swim out of the reserve

**Actually,** comparison areas are meant only to be a scientific control to detect change over time.

**✓ FACT:** A reserve can have more than one comparison area

**Yes,** since no area is a perfect match to the marine reserve, more than one comparison area is usually selected.

**✗ MYTH:** Comparison areas are meant to catch larval fish that originated from the reserve

**Actually,** comparison areas are meant only to be a scientific control to detect change over time.

**✓ FACT:** Fishing is allowed in comparison areas

**Yes,** be sure to consult all current fishing regulations before fishing in a comparison area.



### For more information from ODFW

Website:

[www.oregonocean.info/marinereserves](http://www.oregonocean.info/marinereserves)

E-mail us:

[odfw.marinereserves@state.or.us](mailto:odfw.marinereserves@state.or.us)

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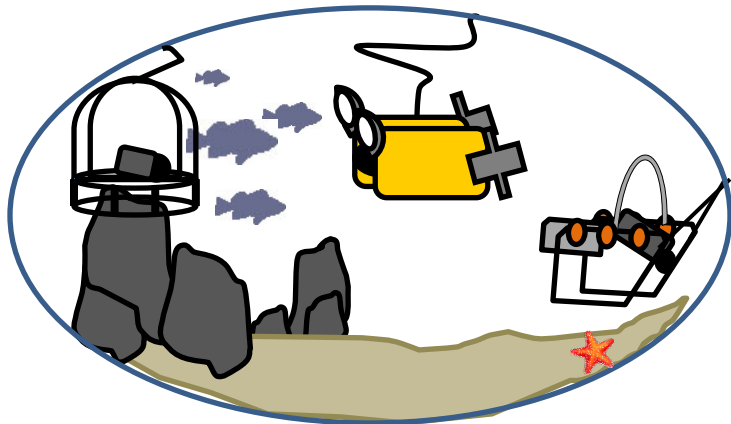
## Underwater Video Surveys – Ongoing in the Deep



In 2012, Oregon completed designation of five marine reserve sites within its state waters to advance scientific research and conserve habitats and biodiversity. Oregon Department of Fish & Wildlife is responsible for overseeing the management and monitoring of Oregon's marine reserves.

Marine reserves contain a variety of habitats and depth ranges. To assess the animals and their habitats at these sites, we need a variety of tools. Scuba divers can only survey areas in depths up to about 75 feet. We use underwater video as our eyes for getting into the vast remainder of places where divers can't go. Video survey tools can collect information on animal behaviors and life history stages unable to be captured by extractive methods, and allow us to watch animals in their native habitats. Video surveys are also non-lethal, an important consideration for monitoring marine reserves.

### Lander, Sled, and ROV: 3 types of tools – 3 places



#### Video Lander

The **video lander** is a camera that can be dropped anywhere. Typically used in rocky habitats, this high-definition camera and frame is built to withstand the abuse of being dropped into the unknown and survive the trip. Left on the bottom for up to 5 minutes, the lander gives us a “snapshot” of fish, algae, invertebrates, and the habitat in places too deep for divers and too shallow for the Remotely Operated Vehicle (ROV).



#### Video Sled

Our **video sled** lets us “skim the bottom” in broad areas of sand and mud habitat. This camera system uses a time-clock synced to the vessel's GPS to record where it is each second, allowing us to accurately determine the location of habitat changes, fish observations, and any other “events” seen on the video. From the video recorded by the sled, we count fish and invertebrates. We also compare our observations with habitat maps, created using high-resolution multibeam sonar, for accuracy.

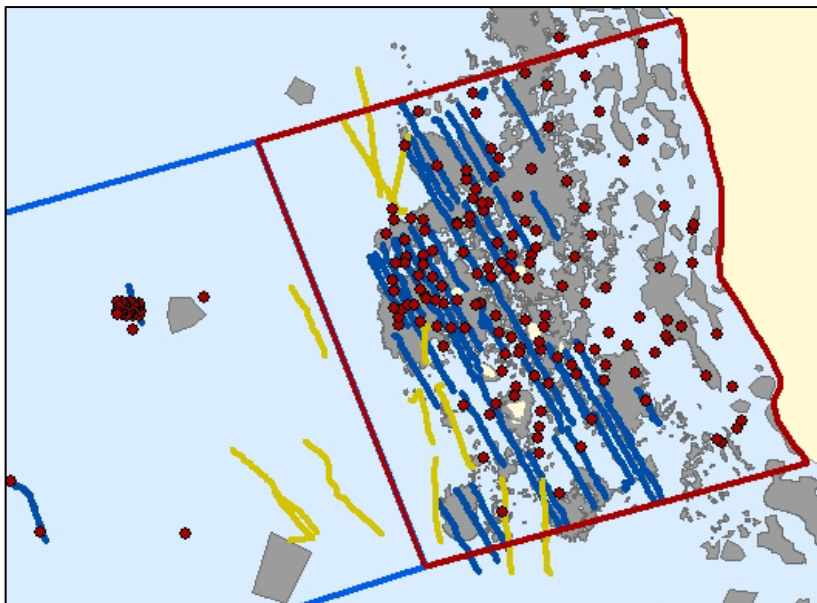


#### Remotely Operated Vehicle (ROV)

The **ROV** is our most complex video tool. It is “flown” by a person on the surface, controlled via an umbilical cable. The ROV can swim up, down, and around obstacles and follow along a transect line, like a SCUBA diver. The high-definition video is later analyzed for fish, invertebrates, and habitat. The ROV is perfect for surveying rocky habitats all the way out to the deepest parts of the reserves (and well beyond!).

## Where do we use video survey tools?

— Sled — ROV • Lander



Map of surveys conducted in 2010-11 at Redfish Rocks Marine Reserve. The shoreline is on the right. Red denotes the reserve boundary; blue, the MPA boundary. Rock habitat is in grey.

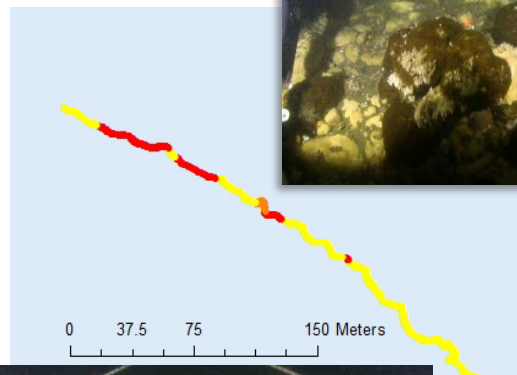
### What does the lander see?

Top, we see a school of black rockfish above hard, rocky bottom covered with sponges and algae. Bottom, canary rockfish hover over a soft sandy bottom. Lander video gives us data on the community of species and the type of habitat they live in.



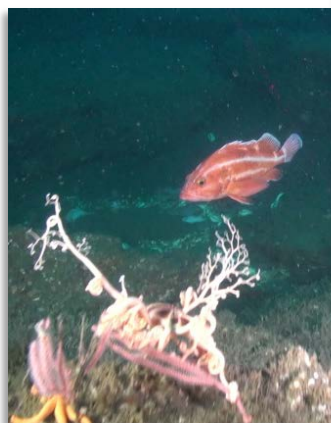
### Encountering different habitat types

Below is a track that was surveyed by the video sled. The colors change as the substrate changes from sand (yellow) to rock (red and orange). The sled can detect detailed changes in habitat, finding rock where sonar seafloor surveys did not.



### ROV Surveys

Unlike the sled or lander, the ROV has the ability to swim, stop, and look around. Investigations of a particular species or intensive surveys at a specific area too deep for divers becomes possible. Below is a yelloweye rockfish among slabs of bedrock, a species of particular management interest. On the right is a China rockfish, a species difficult to sample due to its cryptic nature.



For more information from ODFW

Website:

[www.oregonocean.info/marinereserves](http://www.oregonocean.info/marinereserves)

E-mail us:

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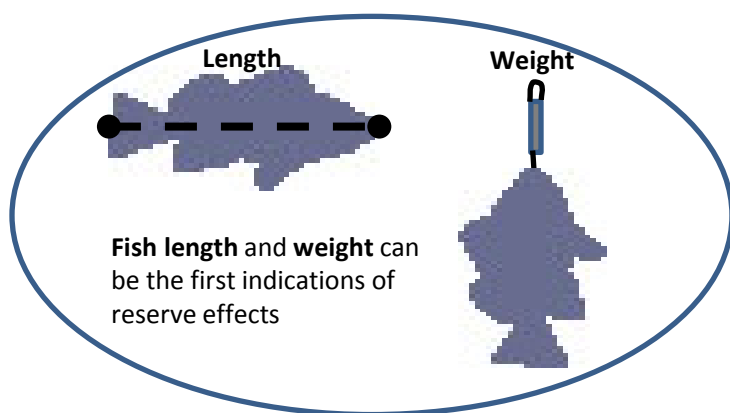
## Hook-and-Line Survey – Fishing for Science



In 2012, Oregon completed designation of five marine reserve sites within its state waters to advance scientific research and conserve habitats and biodiversity. Oregon Department of Fish & Wildlife is responsible for overseeing the management and monitoring of Oregon's marine reserves.

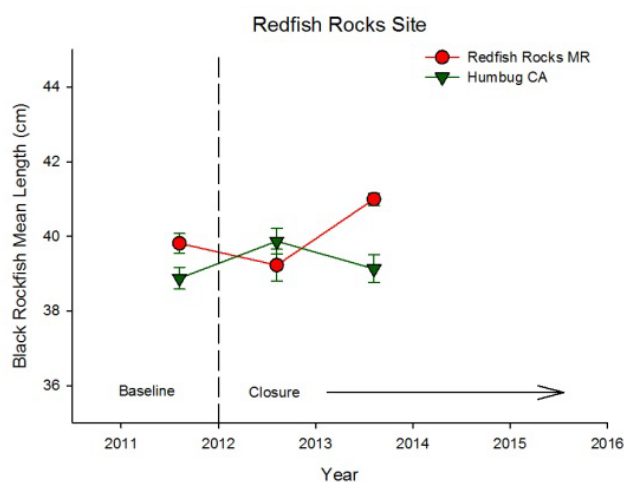
### What is the hook-and-line survey?

Fishing for Science: We collect data on fish by bringing citizen scientists (volunteer anglers) out on chartered fishing boats to **catch and release** fish. Hook-and-line surveys are a good way to get fish in hand in order to take accurate length and weight measurements. Changes in fish length and weight are one of the first early signs of potential effects from marine reserve protections.

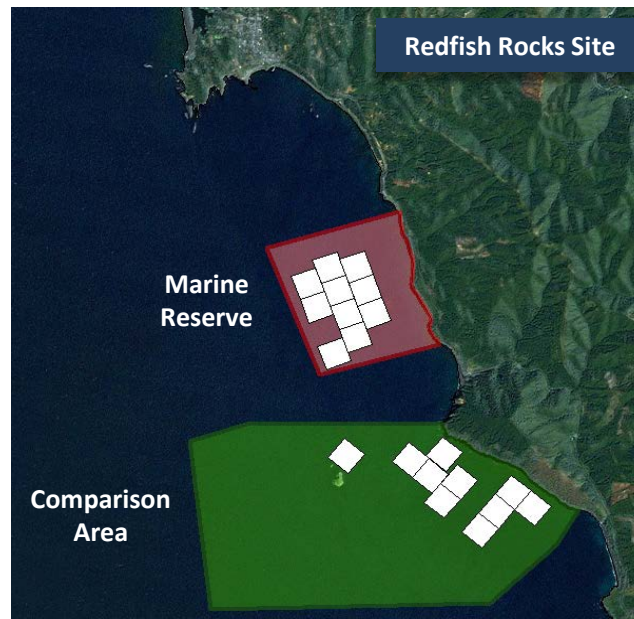


### Detecting changes in fish over time.

We look at differences in average fish length and weight **before** and **after** the reserve is closed to fishing. Also, we sample both **inside** the reserve and **outside** in the comparison areas (monitoring sites open to fishing). By sampling over time, we can determine whether fish sizes are changing due to cessation of fishing.



In this graph, we see the average (mean) length of black rockfish ( $\pm$  standard error) in the marine reserve (red) and comparison area (green) for our first three years of sampling. You can see the up and down caused by the natural variation of measurements from year to year. To tease out this natural variation from an actual effect of the reserve protections, we need long term monitoring. With time, we will determine if the **amount of change** in the average length of fishes inside the reserve is different than outside the reserve.



White squares indicate fishing grid cells.

### How do we sample?

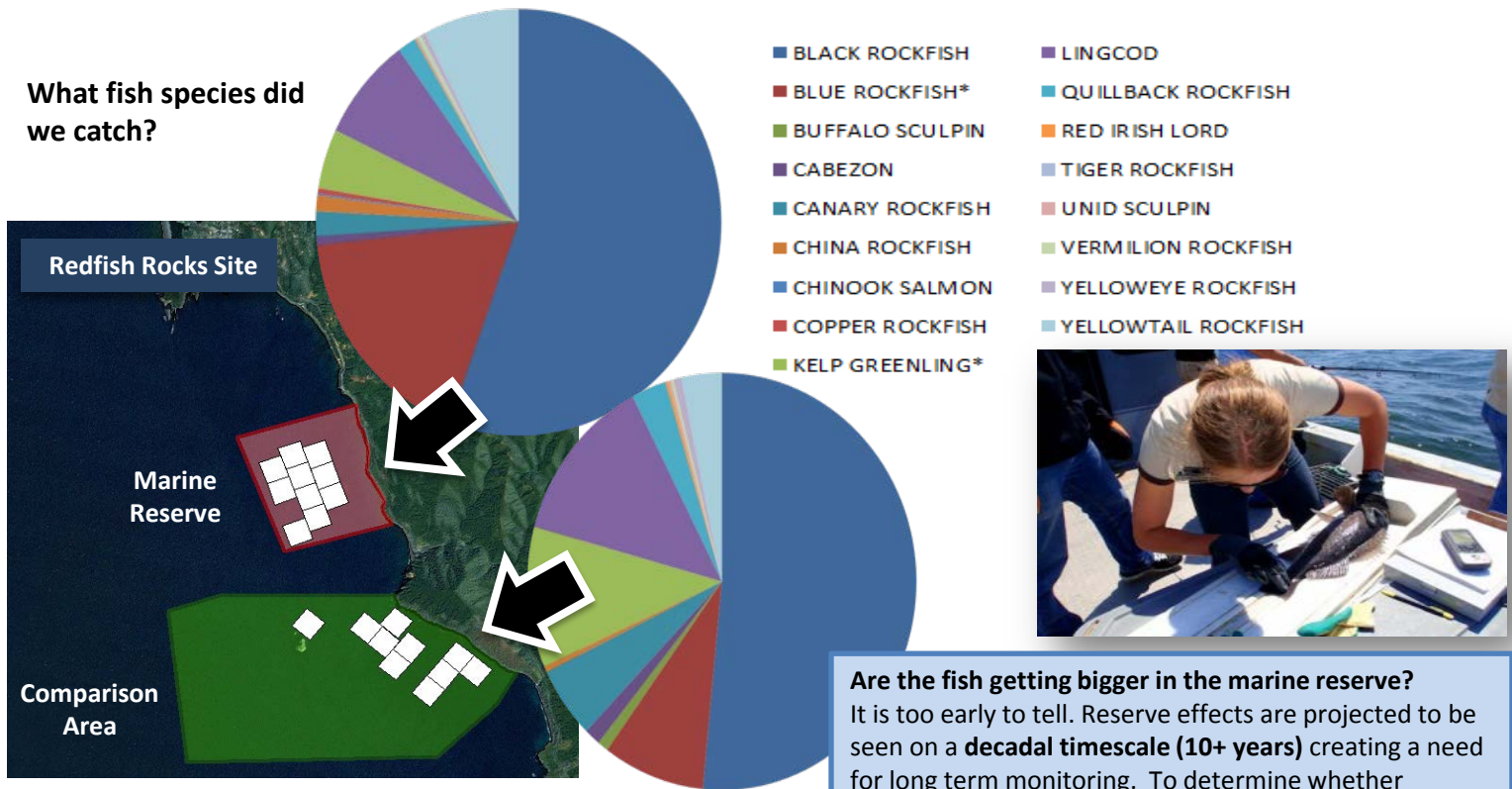
We place fishing grid cells (500m x 500m areas) in rocky reef habitats. Local fishing knowledge helps ensure cells are placed in locations where fish are commonly caught. On a survey day, five cells are randomly selected. Each cell is fished for approximately 45 minutes by 5 volunteer anglers. All caught fish are measured and then released.



### Sampling effort at Redfish Rocks site 2011-13.

- Surveys occurred once a month from July -October.
- One 8 hour day was spent fishing in the marine reserve followed by one day in the comparison area.
- We fished in five 500m x 500m cells per day, using 5 volunteer anglers to **catch and release** fish.
- Gear was standardized to a 6 ounce diamond jig for all anglers.

## What fish species did we catch?



These pie charts show the fish species caught (color) and their proportions (size of pie wedge) in the marine reserve and in the comparison area during our 2013 survey. Our monitoring is tracking changes in abundance, length, and weight of fishes over time. To do this we need comparison areas with similar species to the reserve in order to compare.

### Are the fish getting bigger in the marine reserve?

It is too early to tell. Reserve effects are projected to be seen on a **decadal timescale (10+ years)** creating a need for long term monitoring. To determine whether average fish sizes are getting bigger in the reserve, we need to continue hook-and-line surveys annually over the years to come.



### Fun facts from the 2013 survey at Redfish Rocks!

- We sampled a total of **1,197 fish** representing **17 different species** from the marine reserve and the comparison area.
- We had 24 volunteers join us for 8 days of fishing for science! Our average catch was 133 fish per day.
- The biggest fish caught was a 38 inch (20 lbs) lingcod and the smallest fish was a 1 inch sculpin (pictured above right).

### For more information from ODFW

Website:

[www.oregonocean.info/marinereserves](http://www.oregonocean.info/marinereserves)

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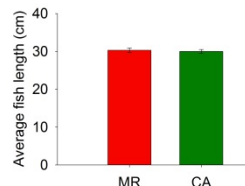
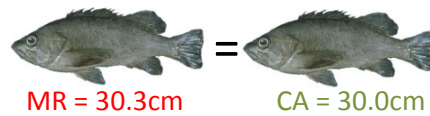
[odfw.marinereserves@state.or.us](mailto:odfw.marinereserves@state.or.us)



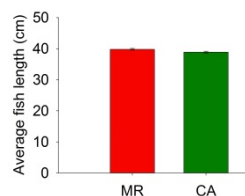
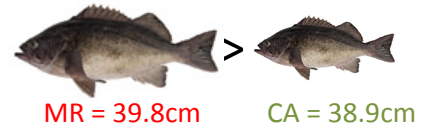
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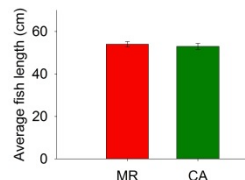
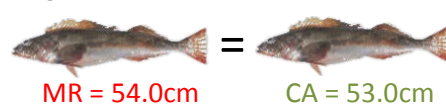
#### Blue Rockfish



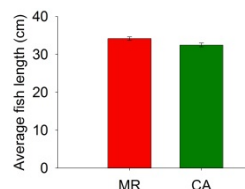
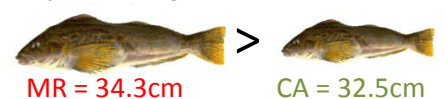
#### Black Rockfish



#### Lingcod



#### Kelp Greenling



Above are comparisons of fish length for the four most commonly caught species in Redfish Rocks. We see that for some species, we are starting with larger fish in the reserve. Knowing these initial baseline differences will help us determine the **amount of change** in fish sizes over time.