

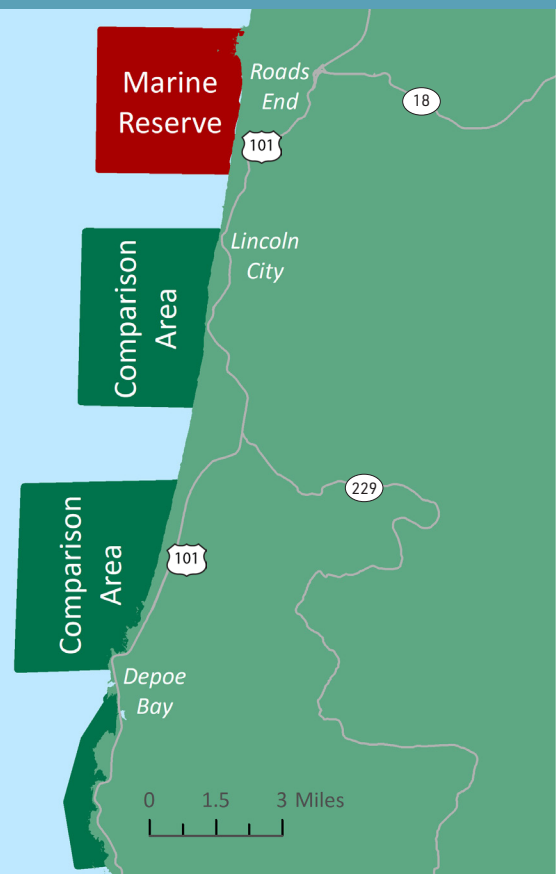


CASCADE HEAD MARINE RESERVE

What have we learned from 8 years of monitoring?



| | |
|------------------------|---|
| Restrictions Began | 2014 |
| Monitoring Began | 2012 |
| Size | Reserve: 9.7 square miles |
| Depth Range | Reserve: 0-190 ft |
| Habitats | Shallow (< 82 ft) and deep (> 82 ft) rocky habitats including large boulders and flat bedrock, as well as emergent rocks. Soft bottom habitats both shoreward and offshore of the rocky reef. Small stretch of rocky intertidal habitats around the Roads End headland. |
| Habitat Connectivity | Rocky reef habitats extend north and south, beyond the reserve. |
| Prior Fishing Pressure | High fishing pressure prior to closure, particularly for groundfish species associated with rock habitat. Moderate fishing pressure shoreside by recreational anglers. |



Core Tools



Video Lander



Hook and Line



SCUBA



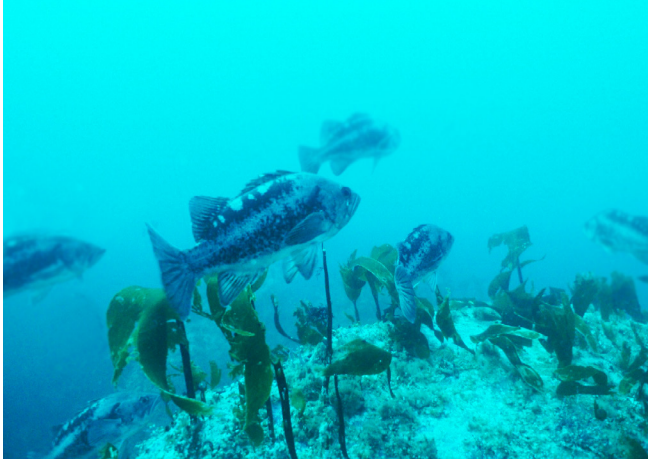
ROV

WE DOCUMENTED KEY CHANGES IN SPECIES AND ECOLOGICAL COMMUNITIES

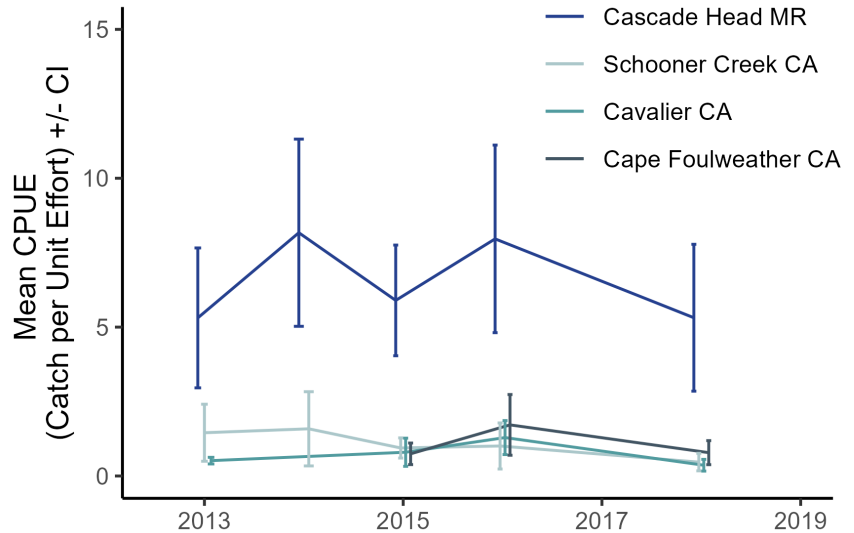
- We observed the impacts of Sea Star Wasting Disease at the marine reserve and its comparison areas.
- We documented natural, inter-annual variability in fish and invertebrate communities.
- It is too soon to attribute ecological changes to marine reserve protections.
- Our monitoring provides a foundation to evaluate future changes attributable to marine reserve protections.

BLACK ROCKFISH ABUNDANCE CONSISTENTLY GREATER IN RESERVE THROUGH TIME

- We measure relative abundance of fish with our hook-and-line surveys by tracking the catch per unit of effort (CPUE).
- For all years of monitoring, we observed consistently higher Black Rockfish CPUE in the marine reserve than in the comparison areas.
- Black Rockfish abundance drove the differences in the composition of species among study areas.
- Documenting these differences before and after reserve implementation is critical to understanding whether future ecological changes are attributable to marine reserve protections.



Left: Black Rockfish school at Cascade Head. Right: Mean CPUE of Black Rockfish with 95% confidence intervals (CI).



SEA STAR SPECIES RESPOND DIFFERENTLY TO DISEASE

- Sea star wasting disease (SSWD) appeared on the Oregon Coast in 2014.
- For sea stars that live subtidally (always underwater) the ODFW remotely operated vehicle (ROV) observed different responses by species after the outbreak.
- Some species, like the Blood Star, decreased in density.
- Others, like the False Ochre Star, increased in density at all sites.
- The Leather Star represents species with consistent density through time, neither increasing nor decreasing.
- Continued monitoring allows us to track species responses to these types of natural stressors.



Blood Star (*Henricia leviuscula*)

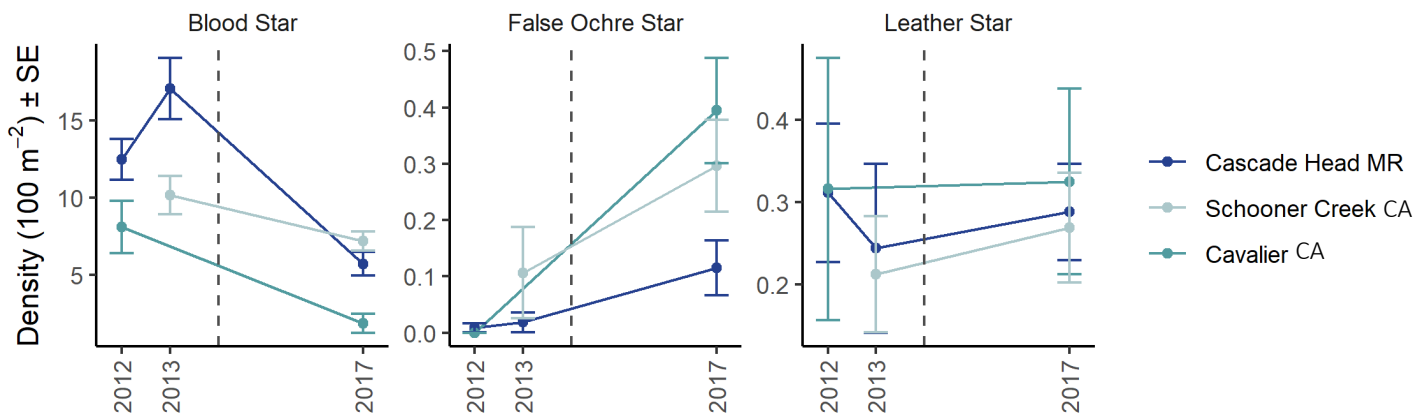


Figure: Trends in mean density by sea star species. Error bars indicate standard error (SE). Vertical dashed line indicates the onset of SSWD in 2014.