Olympic Coast National Marine Sanctuary

Status and Trends of Intertidal Resources

Management Issue

The rocky and sand intertidal habitats and associated species of the Olympic Coast National Marine Sanctuary (OCNMS or Sanctuary) are integral components of the Pacific northwest ecosystem. Baseline characterization and monitoring data that assess natural variation in abundance and distribution of marine invertebrates and macro-algae and detect potential anthropogenic impacts of climate change, invasive species and oil spills is critical to the protections and management of Sanctuary resources.

Description

The Sanctuary's rocky intertidal community is biologically rich with at least 300 documented species which includes an estimated 120 species of macro-algae (seaweeds), seagrass, and a myriad diversity of invertebrates and fish. Sandy intertidal areas host sand-dwelling invertebrates and several fish species including surf smelt which spawn at high tide on sand-gravel beaches where surf action bathes and aerates the eggs. Intertidal habitats challenge inhabitants with extreme temperature, salinity and oxygen fluctuations, along with powerful physical forces such as sand scouring and wave action.

Figure 1. Deploying green crab trap as part of long-term monitor for invasive species. Photo credit: OCNMS

Monitoring conducted by Olympic National Park since 1989 indicates that these habitats are healthy and do not appear to be changing substantially in response to human influences. Coastal ecologists have begun to design studies to better detect changes that may result from effects of global climate change, such as sea level rise, ocean acidification, increasing temperatures, and changes in storm frequency and magnitude. Oiling of intertidal areas can cause significant damage to invertebrates and algae, with negative impacts that can linger for many years. Popular intertidal areas often show signs of trampling in localized patches.

Invasive species often disrupt natural ecological communities by impacting biodiversity, trophic dynamics, nutrient availability, competition and predation patterns, and population structures. Relatively few exotic or non-indigenous species have been reported in the OCNMS and, of those, only a few are invasive and therefore threatening to community structure and function. Observations of the invasive brown algae *Sargassum muticum* and the ascidian tunicate *Didemnum* sp., along with the encroachment of the invasive European green crab *Carcinus maenas* all reflect the for potential deleterious impacts from invasive species.

Questions and Information Needs

1) What are the spatial and temporal distribution and abundance patterns of species, and how are they organized into ecological communities?

2) What is the natural variation of intertidal biota abundance and distribution? Will we be able to detect anthropogenic impacts on the same?

3) Will the biodiversity of intertidal habitats be impacted by global climate change, especially among echinoderms, mollusks, crustaceans and coralline algae which form protective structures such as shells from calcium carbonate?

4) What are the abundance, distribution and diversity of introduced species and how are these patterns affected by global climate change?

5) Can it be determined what means or pathways invasive species are introduced into the Sanctuary? What are their dispersal and recruitment mechanisms once exotic species become established?

Scientific Approach and Actions

- The intertidal monitoring program uses a standardized set of core protocols from the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) and Multi-Agency Rocky Intertidal Network (MARINe) which are used to monitor rocky intertidal habitat each fall. Sand beaches are monitored by protocols developed by Olympic National Park
- Review current rocky intertidal species inventory and identify introduced species and calcifying ($CaCO_3$) rocky intertidal species and continue to collect long-term monitoring data
- Continuously monitor physical and chemical oceanographic conditions (e.g. temperature, salinity, fluorescence, pCO_2, upwelling indices, etc.) in the nearshore waters
- Develop, partner and implement citizen science monitoring program to detect, track and eradicate invasive species when deemed necessary
- Conduct periodic rapid assessments in intertidal habitats with taxonomic experts and use data to update species list. Also deploy larval settling plates in nearshore habitats

Key Partners and Information Sources

Olympic National Park, Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO), The Multi-Agency Rocky Intertidal Network (MARINe), Washington Dept of Fish and Wildlife, coastal tribes, Smithsonian Environmental Research Center and taxonomists from a variety of institutions on the west coast.

Management Support Products

- Map native and invasive intertidal species abundance and distribution, as well as temporal patterns of expanding or contracting ranges of distribution
- Evaluation on the effects of climate change on the population dynamics of native and invasive species
- Analysis of organisms potentially disrupted by ocean acidification and increased pCO_2 in seawater

Planned Use of Products and Actions

- Maps showing spatial change of native and invasive species
- Develop adaptive management actions to adjust restoration or mitigation project as compensation for damages incurred by anthropogenic events, e.g. climate change, oil spills, etc.
- Assess ecological and human health impacts of introduced species in the Sanctuary and develop response plans specific to individual exotic or invasive species
- Education and outreach programs with agency partners on ocean acidification and intertidal organisms, and exotic and invasive species highlighting safe practices to reduce the introduction of new species
- Coordinate information with other west coast sanctuaries and other federal, state and tribal agencies to identify and track newly arriving exotic species of concern
- Organize an advisory panel of taxonomic and ecological experts to discuss and coordinate eradication or control efforts if aggressive invasive species are detected

Program References

OCNMS Management Plan

- Management Plan Review 2008 - *Priority Topics C & E*
- http://olympiccoast.noaa.gov/protection/mpr/mpr_prioritytopics.html

OCNMS Condition Report

- Questions 9, 11, 12, 13

ONMS Performance Measures

- By 2015, 100% of the sanctuary system is adequately characterized.
- Number of sites in which select living marine resource are being maintained or improved

Other Documents

- OCNMS Science Framework, 2003 (*http://olympiccoast.noaa.gov/research/interested/welcome.html*)