

RESOLUTION of the  
Greater Farallones National Marine Sanctuary Advisory Council

**To support staff recommendations within the Rocky Shores Topic Briefing**

At its meeting on December 15, 2023, the Greater Farallones National Marine Sanctuary Advisory Council suggested edits to the staff recommendations within the Rocky Shores Topic Briefing. The council passed a resolution to support the staff recommendations with the suggested edits.

Attachments: Rocky Shores Topic Briefing

*This resolution was passed with majority vote by a quorum of primary members (or alternate members serving in place of primary members) at a public meeting on December 15, 2023 held in Point Reyes Station, CA and via Google Meet. Council discussion regarding this resolution can be found in Meeting Highlights documentation at [https://farallones.noaa.gov/manage/sac\\_meetings.html](https://farallones.noaa.gov/manage/sac_meetings.html).*

***The council is an advisory body to the sanctuary superintendent. The opinions and findings of this letter/publication do not necessarily reflect the position of the sanctuary and the National Oceanic and Atmospheric Administration.***



## Topic Briefing on Rocky Shores in GFNMS

### State of the Resource

- Condition Report Data (in preparation)
  - Rocky intertidal habitat
    - Annual percent cover of acorn barnacles (*Chthamalus fissus*, *C. dalli*, *Balanus glandula*) and dwarf/golden rockweed (*Pelvetiopsis* spp.) was variable but generally stable since 2010, as measured at 4 sites.
    - Annual percent cover of turfweed algae (*Endocladia muricata*) was stable at Sea Ranch but declining at Bodega Marine Life Refuge.
    - Annual percent cover of northern rockweed (*Fucus* spp.) declined substantially at Bolinas Point and was very low in plots at Bodega Marine Life Refuge since 2010.
    - The percent cover of the foundation species surfgrass (*Phyllospadix* spp.) appears stable but was only monitored at one site (MARINe 2022).
  - Sea palm
    - Sea palm abundance declined from a high in 2008 to near zero during the 2014-2016 marine heatwave (MHW) at three locations (not specified because of “species of concern” status by the state). It appears to be slowly recovering since the MHW. In 2021, researchers recorded higher densities in Sonoma County and the state’s north-central marine protected areas within and adjacent to GFNMS as compared to areas that do not have stronger take regulations (Raimondi & Smith, 2022).
  - California mussels
    - Percent cover of mussels at three sites in the sanctuary, Bodega Marine Life Refuge, Sea Ranch, and Bolinas Point, varied between 80-100% over the past 10 years but are generally high and stable. Percent cover of mussels declined at Bodega Marine Life Refuge 2014-2016, and at Sea Ranch and Bolinas Point 2016-2020, but as of 2022, cover at all three sites appears to be trending toward recovery (MARINe, 2022).
  - Rocky Shore community stability - Stable with good diversity.
    - Species communities at Bodega Marine Life Refuge, Bolinas Point, and Santa Maria Creek (adjacent to the sanctuary) were remarkably stable over time while Sea Ranch varied more (plots in earlier years contained high cover of the turfweed (*Endocladia muricata*), black pine red algae (*Neorhodomela larix*), and acorn barnacles (*Chthamalus/Balanus* spp.), and more recent years shifted to higher cover of rockweed (*Pelvetiopsis limitata*).
- Climate Vulnerability Assessment Findings. Vulnerability is calculated from exposure to climate and non-climate stressors, sensitivity to those same stressors, and the resource’s ability to adapt to the impacts. Ratings presented are from the original 2015 report and from 2023 revisions of some indicators.

- Rocky intertidal habitat has a high vulnerability score based on high exposure to increased air and sea temperatures, changes in precipitation, salinity, pH, sea level rise and debris flow from storms; high sensitivity to increased sea surface temperature, sea level rise, disturbance regimes, and recreation (trampling); and high adaptive capacity (a decrease from very high) due to documented impacts from MHW events. The vulnerability of rocky intertidal habitat increased since the original assessment, due to documented disruptions from the marine heatwave including temperature stress and cascading impacts of changes to key species (seastars, intertidal kelp, urchins).
- Coralline algae (considered as a complex of species) has a moderate vulnerability score based on high exposure to reduced pH, moderate exposure to changes in sea surface temperature, and low exposure to changes in air temperature; very high sensitivity to increased sea surface temperature, and high sensitivity to disturbance regimes and urchin overgrazing; and low adaptive capacity due to the slow-growing nature of this species complex and slow recovery times from disturbance.
- Ochre seastar has a moderate vulnerability score based on high exposure to changes in air and sea surface temperature, precipitation, salinity, sea level rise, and decreased pH; moderate sensitivity to sea surface temperature, high sensitivity to disease and disturbance events; and moderate adaptive capacity due to the highly variable recovery documented throughout the sanctuary from massive mortality events (Sea Star Wasting).
- Sea palm has a high vulnerability score based on high exposure to increased sea surface temperature and disturbance (MHW), high sensitivity to temperature, disturbance regimes, and harvest, and moderate adaptive capacity due to extirpation at the southern end of the species' range.
- California mussels have a moderate vulnerability score based on high exposure to increased changes in air and sea surface temperatures, changes in precipitation, salinity, decreased pH, and sea level rise; moderate sensitivity to temperature, disturbance regimes, harvest, and dependency on sensitive habitat, and very high sensitivity to disturbance regimes; and moderate adaptive capacity due to impacts from the MHW and high species value.

### **Other Science Information**

- South Farallon Islands, Rocky Shore community stability - Stable with good diversity.
  - Species communities at Southeast Farallon and Maintop Islands (i.e., South Farallon Islands), were remarkably stable 1992-2010, prior to the 2014-2016 marine heat wave (MHW). Since the MHW, red and black abalone have not been documented in the low intertidal zone, drift algae appears to be absent, while high diversity and percent cover of algae and invertebrates greater than 100% continues (Roletto et al, 2014, GFNMS unpublished report, GFNMS unpublished data).
  - Increased storminess causing increased erosion and scouring of intertidal species was noted to correspond with decreased percent cover of

surfgrass in February 2023, on SE Farallon Island (GFNMS unpublished data).

## **Pressures on rocky shores**

Human activities and natural processes can affect the condition of rocky shores through a variety of pathways. This section has been included to inform the public about the most significant overarching pressures, past, present, and potential, that may impact rocky shores. While some pressures are beyond the scope of what ONMS can address, the sanctuaries are monitoring pressures from climate change including potential loss of rocky reefs due to sea level rise, storminess and improper tide pooling etiquette, collection, and trampling.

## **Summary of Relevant Regulations**

The following GFNMS prohibitions can prevent impacts to rocky shores from listed prohibited activities:

1. Exploring for, developing, or producing oil, gas or minerals.
2. Discharging or depositing from within or into the Sanctuary any material or other matter.
3. Discharging or depositing, from beyond the boundary of the Sanctuary, any material or other matter that subsequently enters the Sanctuary and injures a Sanctuary resource or quality.
4. Constructing, placing or abandoning any structure, drilling into, dredging, or otherwise altering the submerged lands of the Sanctuary.
5. Deserting a vessel aground, at anchor, or adrift in the Sanctuary.
6. Leaving harmful matter aboard a grounded or deserted vessel in the Sanctuary.

See links to full text, definition, exceptions, and exemptions on the regulations pages of the [GFNMS](#) website.

## **Summary of Relevant Sanctuary Projects**

### **Conservation Science:**

- Data on rocky shores are collected by GFNMS at Southeast Farallon Island since 1992 and along the mainland by partners such as Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) through the Multi-agency Rocky Intertidal Network (MARINE). Data are also collected through the Long-term Monitoring Program and Experiential Training for Students (LiMPETS).

### **Resource Protection:**

- The sanctuary reviews project proposals that could potentially violate sanctuary regulations or are likely to destroy, cause the loss of, or injure rocky shores.
- Through permitting actions the sanctuary manages, reduces, or eliminates injury to rocky shores.
- The sanctuary reviews monitoring data from California MPA watch, assesses if there are impacts to the sanctuary from human use (i.e. tidepooling), and engages with partners to address impacts.

- The sanctuary prioritizes the removal of large marine debris such as vessels, shipping containers and cars from rocky shore habitat given its extreme vulnerability to irreparable damage and permanent potential removal of rocks.
- The sanctuary works with NOAA's Office of Law Enforcement and the U.S. Coast Guard to document and enforce sanctuary regulations that protect rocky shores, works with NOAA's General Council to issue fines, conducts damage assessments, and works with responsible parties to address impacts to rocky shores.

#### **Education and Outreach:**

- GFNMS and CBNMS educate kindergarten through university students through classroom presentations and field trips about the importance of rocky intertidal habitats in the sanctuary and how to be stewards of rocky intertidal habitats
- GFNMS and CBNMS strive to inspire sanctuary volunteers, community members, and stakeholders to be habitat stewards through tide pool excursions to local rocky reefs, virtual tours of Duxbury reef, public lectures, and teacher workshops in addition to web stories, print, TV, and social media on rocky intertidal content.
- Rocky intertidal messages are also delivered through visitor center and museum exhibits and outdoor interpretive signs such as tide pool signs at Fitzgerald Marine Reserve that help increase appreciation and awareness of rocky intertidal habitats and highlight the value of sanctuaries.
- Partnerships extend our reach such as the Rocky Shore Partnership with the California Academy of Sciences where sanctuary staff partnered with Academy staff to jointly train field docents to monitor Duxbury and Mavericks reefs and also trained over 700 California Academy of Sciences docents in sanctuary messaging to work in the Academy's Coast Exhibit, primarily at the tide pool touch tank.

#### **Infrastructure and Vessels:**

Sanctuary infrastructure supports rocky shore work through office space, at sea assets, and administrative, logistical, and operational assistance.

- Meeting spaces for staff and partner collaboration on rocky shore projects and storage for field equipment.
- Crissy Field Visitor Center as a space to deliver rocky shore programs and educate teachers and the public about rocky reefs through exhibits such as rocky intertidal aquariums.
- GIS support to map rocky shore habitat, to conduct spatial analysis, and produce educational products.
- Government vehicles for transportation to and from rocky intertidal field sites for monitoring and education projects.
- Farallon Islands mooring buoy to prevent damage to rocky reef habitat.

#### Summary

Rocky shore communities that are monitored appear to have good diversity and most are stable. Data on rocky shores have been collected by GFNMS at Southeast Farallon Island since 1992 and along the mainland by partners. Data is also collected through LiMPETS. GFNMS engages with partners to address impacts on the rocky shores from human use (i.e.

tidepooling), and prioritizes the removal of large marine debris given its extreme vulnerability to irreparable damage and permanent potential removal of rocks. Education projects inform students and adults about the importance of rocky shores through classroom presentations, field trips, virtual tours, public lectures, teacher workshops, web stories, print, TV, social media, visitor center and museum exhibits and outdoor interpretive signs. The sanctuary supports rocky shore projects by providing meeting and storage spaces, supporting exhibits at the visitor center, providing GIS support, and maintaining government vehicles and the Farallon Islands mooring buoy.

## GFNMS Advisory Council Recommendations

*These recommendations were provided during a GFNMS Advisory Council meeting on December 15, 2023. To view council discussion on this topic, please visit [https://farallones.noaa.gov/manage/sac\\_meetings.html](https://farallones.noaa.gov/manage/sac_meetings.html) and view the meeting's highlights.*

### **Conservation Science:**

- Work with partners to continue and expand rocky intertidal sampling on the Southeast Farallon Island and continue partnership in MARINE to support data collection at mainland sites to provide data continuity and allow for long term trend analysis of climate and other impacts.
- Conduct analysis of status and trends of species and intertidal community metrics to understand and evaluate changes in this ecosystem in GFNMS to inform management. Increase capacity for data management and analysis to support these activities.

### **Resource Protection:**

- Prioritize the removal of large marine debris such as vessels, shipping containers and cars from rocky shore habitat to minimize irreparable damage to and permanent damage to rocky substrate.
- Review the effectiveness of rocky shore habitat protection measures, such as California's Marine Protected Areas, and recommend changes needed to increase protections.

### **Education and Outreach:**

- Continue to increase student, stakeholder, and community awareness about the importance of rocky intertidal habitats to the sanctuary's health.
- Support student, stakeholder, and community involvement in rocky shore protection where protection and messaging is most needed to ensure a healthy sanctuary.

### **Infrastructure:**

- Continue to maintain the Southeast Farallon Island mooring buoy to minimize rocky reef damage.
- Maintain meeting space, storage and offices in San Francisco and Point Reyes Station to facilitate collaboration among staff and with partners.
- Provide spatial analysis staff support

- Expand and update the Crissy Field Visitor Center to enhance the rocky shore habitat exhibit and to create teaching space to train teachers how to monitor rocky shore habitat and for staff to deliver student and public rocky habitat education programming, so that the public understands the importance and how to be stewards of rocky shores.
- Maintain vehicles, and field equipment so staff can access rocky shore sites to conduct monitoring and education programming.
- Ensure our team has access to advanced technology to create a comprehensive record of how these important ecosystems are changing.