

Overview of the Biological Sampling used to Assess California's Central Coast Marine Protected Areas – With an Emphasis on Rocky Intertidal Habitats.

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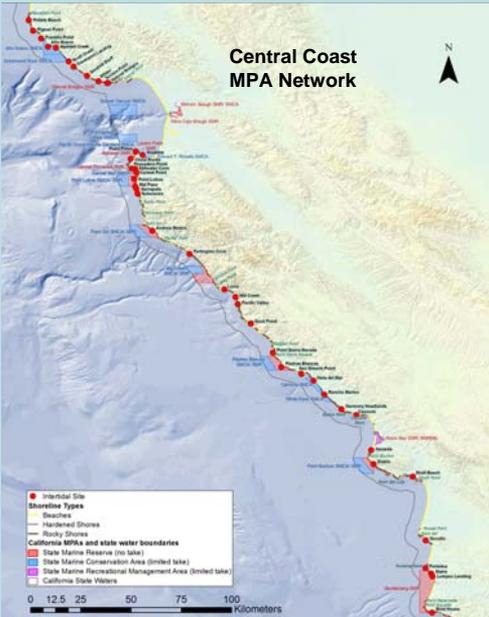


Figure 1. Map of the Central California Coast Marine Protected Areas. Red dots show locations of rocky intertidal sites used to assess MPAs. Map by Emily Saarman

Introduction

The Marine Life Protection Act was passed in 1999 by California State Legislature and requires the state to reevaluate marine protected areas (MPA). In 2007, the Central California Coast MPA Network was the first region to be implemented and is regulated by the California Department of Fish and Game. The network ranges from Pigeon Point to Point Conception and consists of 29 MPAs (18% of this region's state waters), each assigned one of three levels of protection (Figure 1). Four monitoring studies were conducted to create a baseline of marine resources, assess the performance of the MPAs, and provide adaptive management of the network. Each of the open coast MPAs were monitored by one or more of the following four groups. There is an emphasis here on intertidal habitats due to accessibility by the general public and vulnerability to human impacts.

4 Monitoring Studies

1. Collaborative Fisheries Research Program Rick Starr & Dean Wendt

This study utilized the knowledge and expertise of fishermen and skippers within a standardized experimental framework using a controlled hook-and-line, catch-and-release program as well as commercial trapping (Fig. 2). The project fostered communication and mutual education among the scientific, management, and fishing communities and demonstrated the advantages of this collaboration.



Figure 2. Traps being deployed. Figure 3. Lingcod being measured. Figure 4. Tagged Black and Yellow Rockfish. Mobile Yachium

2. Deep Rock Habitat Surveys Mary Yoklavich & Rick Starr

Scientists from Moss Landing Marine Lab and NOAA National Marine Fisheries Service surveyed fishes, macro-invertebrates, and associated habitats (Fig. 6) on rocky banks, outcrops, underwater pinnacles, cobble fields and mud flats (Fig. 7) at depths from 20 to 365 meters on the shelf and upper slope in Monterey Bay and along the Big Sur coast.



Figure 5. Delta submersible. Figure 6. Lingcod among brachiopods. During this 2007-2008 baseline study, 8 MPAs were surveyed using the manned submersible Delta (Fig. 5). Nearly 700 quantitative transects were conducted (Fig. 8) in species-rich seafloor habitats (Fig. 9) inside and outside the closed areas.

3. Subtidal Kelp Forest Surveys Mark Carr

Researchers from the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) at UC Santa Cruz monitored 14 of the Central Coast MPAs with 4 sites inside and 4 sites outside each of these MPAs. Fish and benthic surveys (Fig. 10) were carried out in rocky habitats between 5-20 m using SCUBA in order to quantify the density and abundance of invertebrates and macro-algae as well as document substrate composition.

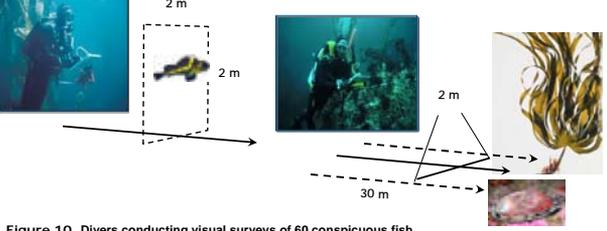


Figure 10. Divers conducting visual surveys of 60 conspicuous fish species (left) and counting 50 categories of invertebrates, sub-canopy and understory algae species along benthic transects (right). www.piscoweb.org

4. Rocky Intertidal Surveys Pete Raimondi

The Multi-Agency Rocky Intertidal Network (MARINE), is a consortium of government, academic, and private institutions that monitors rocky intertidal areas according to specific protocols for ease of large scale spatial and temporal comparisons. Two MARINE survey types were used in evaluating the Central Coast MPAs, one focused on biodiversity and the other on community composition.

Coastal Biodiversity Survey (CBS)

Researchers from UC Santa Cruz PISCO quantified algae and invertebrate species' distributions (Fig. 11) and abundances by mapping them over the topography of a rocky intertidal bench creating a 3D GIS map. Below are the types of data that were collected:

- Algae and sessile invertebrate point contacts
- Mobile invertebrate counts
- Seastar and abalone swaths
- Laser leveler and GPS readings for topography (Fig. 12)

Community Structure Monitoring

UC Santa Cruz PISCO researchers conduct surveys 2-3 times a year to monitor community structure by quantifying percent cover and distribution of algae and invertebrates (see Figures 13-18). These surveys have established a long term data set for the central California coast that include:

- 44 rocky intertidal sites
- Sampled between 2-17 years
- 8 sites added for MPA baseline study
- Sites within 12 MPAs

Community structure monitoring provides managers with insight into the causes and consequences of changes in species abundance resulting from human and/or non-human factors.

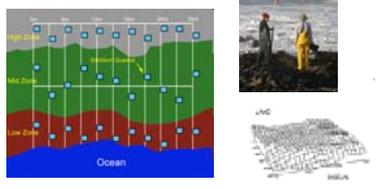


Figure 11. Schematic of a CBS intertidal site. Figure 12. Researchers using a laser leveler (top) to create a map (bottom) of an intertidal site.

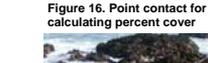


Figure 16. Point contact for calculating percent cover. Figure 17. Transects for surfgrass and sea palms. Figure 18. Counts and size frequency of abalone, seastars, and owl limpets. Figure 19. Data from 3 of 27 black abalone monitoring sites showing the northward progression of withering syndrome (BOA and PUR) and one of the healthy populations in MBNMS (MCR) that may be threatened if the disease continues to spread. Note differences in scale.

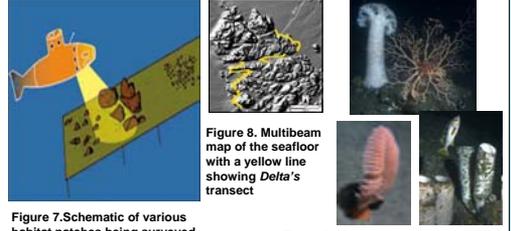


Figure 7. Schematic of various habitat patches being surveyed along a transect using Delta. Figure 8. Multibeam map of the seafloor with a yellow line showing Delta's transect. Figure 9. Macro-invertebrates and fish species sampled with Delta. http://seagrant.miml.calstate.edu/research/submersible-surveys/

Future Monitoring of California's MPAs

In January 2010, 21 new MPAs were established along the north central coast, ranging from Pigeon Point to Alder Creek (near Pt. Arena). Like the central coast MPAs, these were adopted as part of the Marine Life Protection Act. They represent 20% of state waters in this region, with approximately 11% of this area being no-take reserves. Two MPAs are within the MBNMS, the Montara State Marine Reserve and Pillar Point State Conservation Area. There are existing sites within this network that will continue to be monitored; new sites will be added within the MPAs as well as outside reference sites. Rocky intertidal monitoring will begin summer 2010 using the methods described above.

Contacts

Monitoring data collection for the Central Coast MPA Study Region (CCSR) has been a joint venture involving many people. Collaborative Surveys of Nearshore Fishes: Rick Starr, CSGEP/MML, r_starr@miml.calstate.edu and Dean Wendt, CPISLO, dwendt@cabopy.edu Deep-Water Demersals: Mary Yoklavich, NOAA/SWFSC, mary.yoklavich@noaa.gov and Rick Starr Subtidal: Mark Carr, UCSC, carr@biology.ucsc.edu and Dan Malone, dmalone@ucsc.edu Intertidal: Pete Raimondi, UCSC, raimondi@biology.ucsc.edu

