Monitoring Marine Protected Areas in Deepwater off Central California

2007-2008 IMPACT Submersible Baseline Survey

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Rosy rockfish and white-plumed anemone

Introduction

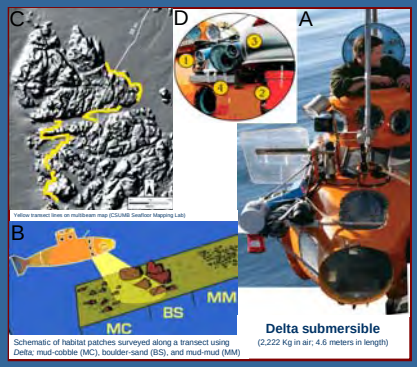
- On September 21, 2007, 29 marine protected areas (MPAs) were established off Central California, including two types in deep water: no-take State Marine Reserves (SMR) and State Marine Conservation Areas (SMCA).
- In 2007 and 2008, we collected baseline data on demersal communities in the deep portions of eight of these new MPAs and associated Reference sites.
- Deepwater habitats comprise 75% of the seafloor in state waters (3 nautical miles) of the central coast, and yet far less is known about these habitats and associated communities than those in shallow water.

Bank rockfish on sponge

Map of study area and dive sites

Methods

- We surveyed an area from Big Creek in the south to Soquel Canyon in Monterey Bay in the north (see map on left).
- We conducted over 700 visual strip transects using the two-person submersible, *Delta* (far right - A), to characterize seafloor habitats and to identify, count, and measure demersal fishes and structure-forming invertebrates.
- Transects were 2 meters wide and 10 minutes in duration (right - B and C). Length of each transect was determined using a Doppler velocity log and ring-laser gyrocompass (right - D2-3).
- We used paired lasers, set 20 cm apart, to estimate fish length underwater (right - D1). Three video cameras recorded the transects for later analysis (right - D4).



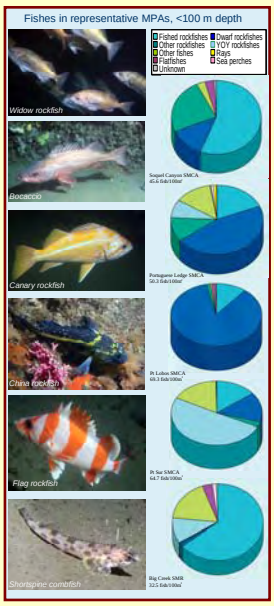
Yellow transect lines on multibeam map (CSUMB Seafloor Mapping Lab)

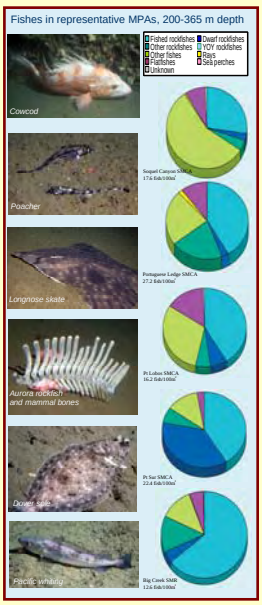
Schematic of habitat patches surveyed along a transect using *Delta*; mud-cobble (MC), boulder-sand (BS), and mud-mud (MM)

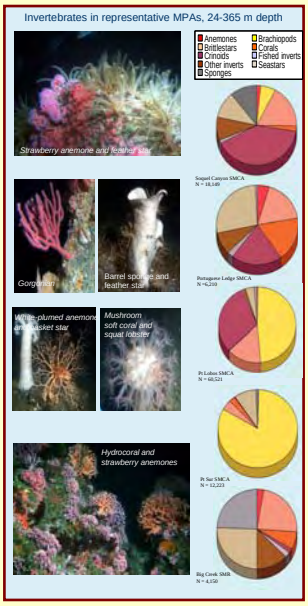
Delta submersible
(2,222 Kg in air; 4.6 meters in length)

Results

- Over 128,000 fishes in 110 taxa were counted during this two-year survey; 70 taxa of invertebrates were observed.
- Soquel Canyon SMCA provides increased protection to a diverse demersal community in water depths 100-600 meters. This site serves as a natural refuge for overfished species such as bocaccio, cowcod, and yelloweye rockfishes. We observed 70 taxa of fishes.
- Portuguese Ledge SMCA is expected to restore species and habitats in an area that has been fished heavily for decades. Pygmy rockfish (a dwarf species) were dominant in the shallow area. A variety of corals was an important component of the invertebrate assemblage.
- Pt. Lobos SMR and SMCA provide increased protection of seafloor communities across a wide depth range in close proximity to each other. The highest densities of fishes occurred in these MPAs; they were dominated by dwarf species.
- Pt. Sur SMR and SMCA protect a community living in a persistent upwelling plume. Young-of-the-year rockfishes dominated the shallow area. Brachiopods were extremely abundant in these MPAs.
- Big Creek SMR and SMCA expand protection from a previously existing small ecological reserve established in 1990. Fished rockfishes dominate both shallow and deep areas. Sponges, seastars, and brittlestars were abundant.







Conclusions

- The success of this collaborative partnership was achieved through the talents of many experts in fish and invertebrate ecology and marine ocean engineering.
- A manned submersible is the only method currently available to provide an accurate portrayal of the diverse communities that occur in deep rocky areas of the shelf and slope.
- In general, species composition was similar from year to year. However, variation in densities of fishes between the two years indicates that at least 3 years of data are needed to provide an adequate baseline for central California MPAs.
- This comprehensive survey will need to be repeated within 5 – 10 years to critically evaluate the effectiveness of these new MPAs by assessing changes in diversity, density, and size composition of species using seafloor habitats.
- Long-term monitoring needs to be supported to evaluate the benefits of these protected areas.
- These non-destructive survey techniques are necessary for an ecosystem approach to resource management.

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