Informing nearshore fishery management and monitoring California’s MPAs

David A. Osorio and Mary Bergen
California Department of Fish & Game, Marine Region, Monterey, CA

Overview

Effective fisheries management requires fishery-independent data. Similar data are also needed to evaluate the recently established Channel Islands Marine Reserves (Channel Islands Marine Protected Areas Monitoring Plan, 2004). Together, the needs are broad in biological and geographical scope. Fish and invertebrate populations in shallow, rocky habitats throughout California are accessible to divers. This has led to collaborative efforts between the California Department of Fish and Game (CDFG), various universities, private organizations, and government programs to gather and report data for fishery management and performance of marine protected areas. The resulting collaboration is known as the Cooperative Research and Assessment of Nearshore Ecosystems (CRANE) effort.

Data Needs

Two shallow water fishery management plans (Nearshore Fishery Management Plan, 2002; Abalone Recovery and Management Plan, 2005), will benefit from fishery-independent inputs provided by CRANE. Whether the goal is fishery management or MPA assessment, data on the following parameters are required:

- Abundance
- Mortality
- Age and growth
- Recruitment
- Ecological interactions
- Reproductive characteristics
- Distribution of stocks
- Movement patterns

In order to gather fishery-independent data, CRANE collaborators developed a common field protocol for surveying invertebrates and fish.

Survey Protocol

CRANE collaborators developed a common field protocol for surveying invertebrates and fish. Survey protocols were modeled on established rocky reef study design and survey techniques of the University of California, Santa Cruz and U.C. Santa Barbara affiliates of the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO).

Fish surveys

Divers enumerate fishes along randomized 30 x 2 x 2 m transects (Fig. 2), along the bottom and in mid-water. Twenty-four replicate transects are surveyed per site. Transects are allocated spatially and among three to four depth zones 5-20 m deep. Fish length is estimated to the nearest cm for fish up to 15 cm; estimates for larger fish are made to the nearest 5 cm. A graduated measuring device on the data slate is used to calibrate size estimates.

Invertebrate and urchin surveys

Divers record macroalgae and invertebrate abundance along twelve 30 x 2 m transects at each site. Data on percent cover are taken along the same transects using a point contact method (Fig. 3). In addition, size frequency of abalone and urchins is gathered.

Historical Data

In addition, collaborators, including CDFG, are providing data from historical fish and invertebrate surveys conducted along the coast (Table 1). Data at some sites were collected in the 1970s. The historical data will allow us to evaluate changes in the abundance of species over time. Careful interpretation is needed before trends are determined; sample units, seasons, sites, and survey design used by different programs must be reconciled.

Planned Analysis

The data for the 2004 field season are currently being analyzed. The following questions will be addressed:

- How does fish number and size vary among survey areas?
- Are the variations related to habitat quality, location, or fishing pressure?
- Has fish abundance changed over time?
- Has fish size changed over time?
- Were there major differences in habitat (e.g., kelp abundance, or bottom type)?
- Are changes over time related to fishing pressure?

Applications

In the end we will have an overall picture of the abundance and size structure of populations of select nearshore fish and invertebrates, including a perspective on how populations have changed over time. The data will be used in the evaluation of the Channel Island MPAs, and in implementing current fisheries management plans. Data may also be used for stock assessments of selected species (e.g., California sheephead, kelp greenling, gopher rockfish).

Survey Implementation

In 2004, supported by funds from the Coastal Impact Assistance Program, 88 sites were surveyed by collaborating groups (Fig. 4). During that summer’s field season, over 1,700 dives were made along 800 km of coastline from Santa Cruz to San Diego. At the northern Channel Islands, surveys were conducted in cooperation with the MPA monitoring effort at locations established during the MPA siting process. This represents an unprecedented cooperative effort to survey subtidal resources in California, and provides the most comprehensive snapshot of subtidal fish and invertebrate populations to date.

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