CA Collaborative Fisheries Research Program

Rod-and-Reel Surveys of Nearshore Fishes in and Near Central California Marine Protected Areas

Methodology Overview

For information that is more detailed see the project final report.

Workshops

During the planning phase of this project, a series of workshops were held in Morro Bay, Moss Landing, Santa Cruz, and Half Moon Bay, California to obtain ideas about protocols for this study from the fishing, science, and management communities. During the workshops, boat captains used their experience and knowledge to assist us in choosing sampling locations. Additional workshops were held after the field season, at which members from these communities offered suggestions on how to improve upon this project.

Sampling Locations

Areas

The Año Nuevo, Point Lobos, Piedras Blancas, and Point Buchon State Marine Reserves (SMR) were chosen as sampling locations for this study because the nearshore rocky habitat within the selected MPAs is extensive and representative of the rocky habitat in the central California coastal region, and the sites have long been popular fishing areas for both recreational and commercial fishermen. Additionally, a portion of the Point Lobos MPA has been closed since 1973. Including this area allowed us to compare fish communities from an area that has been closed to fishing for more than three decades to the newly established MPAs and their corresponding reference sites. The Año Nuevo, Point Lobos, Piedras Blancas, and Point Buchon SMRs encompass areas of 10.2 mi^2, 5.4 mi^2, 10.4 mi^2 and 6.7 mi^2 respectively. Reference sites were based on the criteria that they shared similar size, habitat, and oceanographic conditions with the nearby MPAs.

Grid Cells

Within each MPA and reference site, 500 m x 500 m grid cells were created and used to delineate sampling locations. The grid cells were positioned in nearshore rocky habitats, in water less than 40 meters deep (to limit fishing mortality from barotrauma), in areas that had previously been identified by fishermen as having suitable habitat for nearshore fishes.

Sampling Protocols

We planned to sample four days a month in each of three months in each area to account for temporal variability in the late summer months. We scheduled four days per month of sampling (2007: August, September, and October; 2008: July, August, and September) in each study area for a total of 12 days in each area. Half of the days were spent in the Marine Protected Area (MPA) sites and the other half in the reference sites.

During each day of sampling, four of the grid cells (in a given MPA or reference site) were chosen at random and sampled. In the morning, the captain was provided with the coordinates of the sampling cell and asked to fish in each cell in locations where he thought he could best catch fish. A total sampling time of 1½ hr was allotted for each grid cell. In order to account for the variability within each cell, the captain was instructed to locate three suitable fishing locations within each grid cell and complete a fishing drift in each for 15 minutes (Figure 1). If a single 15-minute drift was not possible, due to strong currents or other reasons, the captain could choose to make several drifts in the same location for a combined total of 10-15 minutes. The objective was to fish in three discrete locations within the grid cell for a total of at least 30 minutes, but no more than 45 minutes.

We recruited volunteer anglers to fish in this study. Anglers were recruited from various fishing clubs, online fishing websites, and from previous collaborative studies. Some anglers called us to volunteer after they heard of the project through local media. We required that all volunteer anglers were experienced with rockfish fishing, over the age of 16, and capable of fishing consistently for six hours.

At the beginning of the trip, each angler was assigned to a fishing station, which was organized by gear type. All anglers on the bow fished with hard tackle (i.e., lingcod bar) at the terminal end of the fishing gear with a shrimp fly teaser (a smaller lure used in addition to the main tackle to entice and catch fish) higher on the line. Only anglers experienced in fishing lingcod bars were assigned to these stations. Lingcod bars ranged in color and weight (4, 6, 7, 8, or 10 oz). The deckhand rigged the poles with the lightest sinker or lingcod bar that could counteract the current and would get the line to the bottom as fast as possible. The hooks on the lingcod bars were single and barbless (except for four trips where some double hooks were occasionally used in addition to the singles). Anglers on the starboard side of the vessel fished with two shrimp fly lures without bait, and anglers on the port side fished with two shrimp fly lures, baited with frozen squid (in strips 2-4 inches long). The shrimp fly lures were made of mylar, had single barbless 4/0 hooks, 30 lb hook line, and 60 lb main line. Both red and white shrimp flies were used in order to accommodate preferences of anglers in both the northern and southern regions of the study area. Anglers used sinkers of 4-12 oz depending on the currents. Skippers chose the weights based on the criterion of using the least amount of weight that would enable an angler to fish on the bottom.

Once on station, the captain signaled the start of the drift, and the anglers would commence fishing. During a drift, between six and twelve volunteer anglers fished using rod and reel fishing gear. The number of anglers that fished at a given time was always divisible by three so that each gear type was fished with equal effort. A member of the science crew fished at one of the stations if there were not enough volunteer anglers to achieve a balance of sampling among gear types. If there were extra anglers, they were rotated into the stations. For each drift, the number of anglers fishing, and the names of persons recording and tagging were noted on a data sheet. The start and end latitude, longitude, and depths were also noted, and the start and end times were recorded to the second. If at any time during the drift an angler had a problem with their gear, the deckhand or a member of the science crew would give them a new rod so that they were fishing during the entire drift. If the angler stopped fishing for more than a minute,

however, the time the lure was out of the water was noted on the data sheet and the time was subtracted from the overall effort.

When a fish was caught, it was identified to species, measured (total length) on a wooden v-board (Año Nuevo and Point Lobos) or a flat plastic measuring board (Point Buchon), tagged with an external T-bar anchor tag (unless the fish was in poor condition or was too small), and released. The location (latitude and longitude) and depth where a fish was released were recorded. In order to reduce incidental mortality, care was taken when handling the fishes, and the effects of barotrauma were ameliorated with venting needles and descending devices, and the duration of time that the fishes were on board the vessel was minimized. If a high catch rate precluded rapid processing of the captured fishes, anglers were instructed to stop fishing so that the fish on board could be processed and the number of anglers was reduced before fishing recommenced.

If a fish exhibited signs of barotrauma, its swim bladder was vented with a hypodermic needle and/or was released at depth with a fish-descending device (either the Ace Calloway Barotrauma Reversing Fish Release or a weighted milk crate). A coded number system was used to describe the condition of the fish upon release (Table 1). Caught fishes were released after processing, except for a sub-sample of gopher rockfish, which were retained for a diet study that will be completed later. The retained fish were measured, tagged, euthanized, put in an ice chest, and later bagged and frozen.

At each grid cell that was sampled in Año Nuevo and Point Lobos, we measured water temperature at depth using a sensor that continuously recorded temperature and pressure readings. Water clarity was measured with a secchi disc in each cell. Also, during each drift we recorded surface water temperature, observations on the weather (e.g., cloud cover), wind speed and direction, swell height and direction, presence of harbor seals and/or seal lions and/or kelp beds, and, if possible, current direction and speed and amount of relief.

Collaboration

Correspondence with Volunteer Anglers

At the end of each sampling day, an email was sent out to the volunteer anglers to thank them for their participation, to report how many fishes were caught, and to ask for feedback on the trip. At the end of each sampling month, volunteers were mailed a flyer summarizing the trips that month, including the number and species of fish that were caught, and the number of volunteers that participated. Also, some of the largest catches were listed next to photographs from the trips. A brief description was given about the project, our objectives, and appreciation to the volunteers was expressed. The objective of the update flyers was to acknowledge the anglers for their contribution to the project and to further engage them in the monitoring process.

Website Posting

Two websites were created for this project, one through a San Luis Obispo Science and Ecosystem Alliance domain (http://www.slosea.org/collaborative) and one through Moss Landing Marine Laboratories (http://seagrant.mlml.calstate.edu/crmpamonitor.php). On these websites, information about the study was posted, including a project overview, background information, a description of the study areas (including maps), sampling results, volunteer sign up

information, media related to the project, and information on what to do with a recaptured tagged fish. In addition, information about the project was posted periodically on well-known fishing websites.

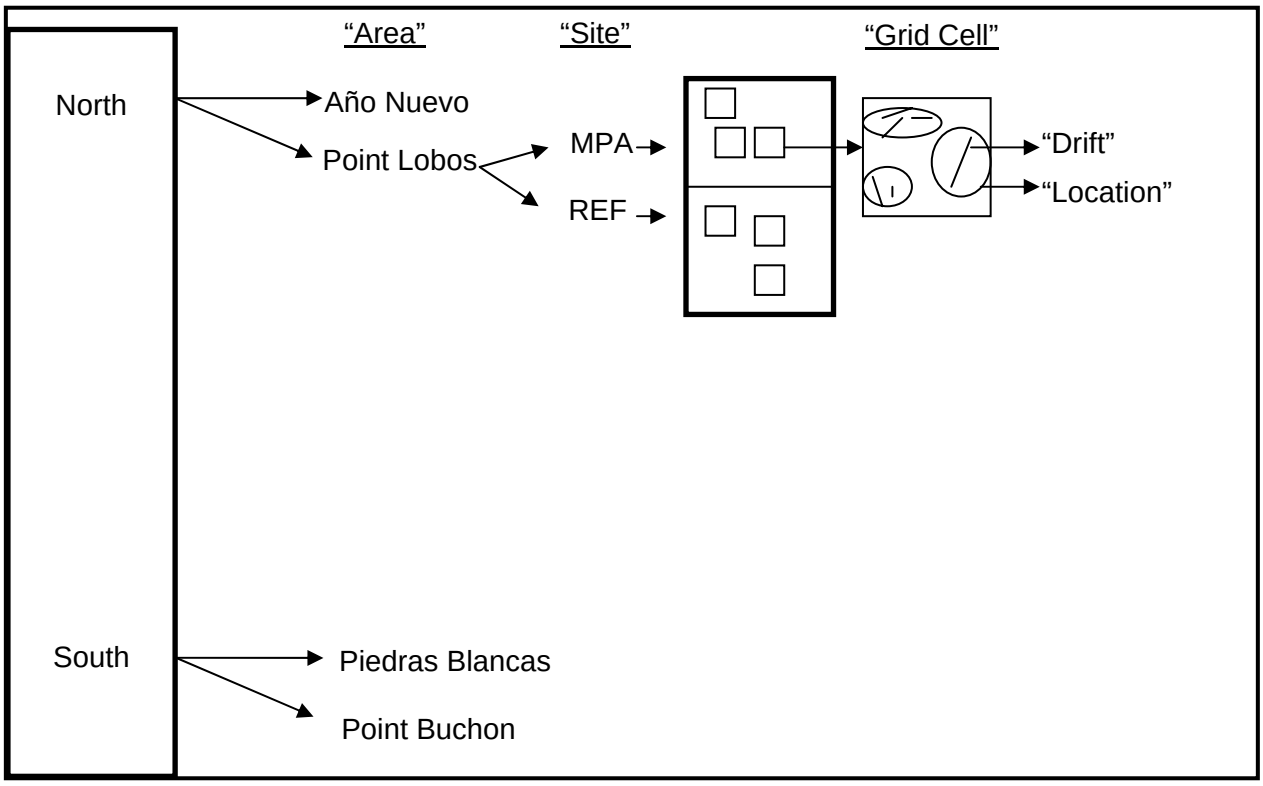
Tag Returns

Posters illustrating a tagged rockfish, with a summary of the objectives of this study, and an explanation of how and where to report a tagged rockfish were disseminated to all of the volunteer anglers, to local fishing websites, on the websites for this project, and were placed in key fishing areas along the central coast. These posters spread awareness about the project and will increase tag returns and participation in further collaborative projects.

Table 1. The codes used to express the condition of a caught fish upon release.

Condition	Description
1	The fish had eye damage due to barotrauma (crystallized eyes)
2	The fish was vented (swim bladder) with a hypodermic needle
3	The fish showed signs of marine mammal or fish predation, but was not a mortality
4	The fish showed signs of hook damage (including eye damage) or body cuts/scale loss, but was not a mortality
5	The fish was released using a fish descending device (either the Ace Calloway Barotrauma Reversing Fish Release or a weighted milk crate)
6	The fish was floating (did not swim down) upon release, but mortality was uncertain
7	The fish was a morality due to mammal or fish predation
8	The fish was a mortality due to causes other than mammal or fish predation (e.g., mortality due to barotrauma, handling injuries, etc.)

Figure 1. Terminology used to identify various levels of location information. Sampling was completed in three "Areas." In the north, there are two areas: Año Nuevo and Point Lobos. In the south, there are also two areas: Piedras Blancas and Point Buchon. Within each of these areas, there are two different "Sites:" either Marine Protected Area (MPA) or reference (REF). Within these sites are "Grid Cells," which delineate the sampling boundaries. In each of the grid cells "Drifts" were completed in three distinct "locations."



Sampling protocols developed collaboratively to survey nearshore fishes with CPFV vessels for baseline surveys of MPAs and for resource assessment

Sampling method:
- Rod and reel fishing from CPFV vessels with volunteer anglers

Sampling Locations:
- Rock habitat 10–120 ft deep, delineated and selected from charts and maps
- Grid cells 500 m x 500 m created and placed on all available habitat in MPA
- Grid cells 500 m x 500 m placed in appropriate habitat in Reference sites

Sampling Gear:
- Rod and reel with single barbless 4/0 hooks, 30 lb leader, and 60 lb main line
- Terminal weights just heavy enough to take line to the bottom (4–10 oz)
- Three types of terminal tackle:
  - Port side (3–4 anglers) – 2 mylar shrimp flies with ¼' strip of squid on each hook
  - Starboard side (3–4 anglers) – 2 mylar shrimp flies with no bait
  - Bow (3–4 anglers) – 1 "lingcod bar" at end of line (single hook) and 1 shrimp fly

Sampling Frequency:
- Surveys occur 12 days per year at each MPA/REF pair, spread across 3 months
- Surveys occur 2 days inside MPA, 2 days outside at Reference site each month
- Four grid cells are randomly sampled per day

Sampling Plan:
- Skippers conduct typical fishing operations for a total of at least 30 min but no more than 45 min of actual fishing time in each grid cell, evenly spread across 3 different areas of his/her choice in the grid cell.
- Skippers use GPS to ensure that all fishing occurs in the grid cell.
- Skippers signal start and end of fishing periods ("drifts" that are a maximum of 15 min in a given location). The time each angler spends fishing is measured to the nearest 1 min. If an angler is hung up on the bottom, he/she is given a second rod and the deckhand retrieves tangled gear.

Fish Handling:
- Fish are removed from the line, measured, tagged with a dart tag and released as soon as possible (no longer than 5 min).
- Fish with inflated swim bladders are degassed or helped back to the bottom with the aid of a fish-descending device.

Data recorded:
- Fishing effort: number of anglers and time fished to nearest minute
- Environmental variables: wind, swell, cloud cover, water clarity, temperature profile surface to near bottom

Biological variables: species, total length, sex, external condition, tag number