

Channel Islands Marine Protected Areas Monitoring Framework

Introduction

In April 2003 the California Department of Fish and Game (Department) implemented a new network of Marine Protected Areas (MPAs) in the State Waters within the National Oceanic and Atmospheric Administration's (NOAA) Channel Islands National Marine Sanctuary (Sanctuary). The network consists of ten State Marine Reserves, where no take of living, geological, or cultural resources is allowed except for permitted scientific collection and two State Marine Conservation Areas where limited commercial and/or recreational take is allowed. The no-take areas represent 132 square nautical miles, or approximately 19% of the State waters within the Sanctuary. The limited take areas represent an additional 10 square nautical miles of area.

These MPAs were established to meet a variety of goals including: to help protect the natural diversity and abundance of marine life, and the structure, function, and integrity of marine ecosystems; to help sustain, conserve, and protect marine life populations, including those of economic value, and rebuild those that are depleted; to improve recreational, educational, and study opportunities provided by marine ecosystems that are subject to minimal human disturbance; and to manage these uses in a manner consistent with protecting biodiversity. MPAs help achieve these goals by creating areas where species occur at more natural abundances, size ranges, and diversities and which protect critical interactions between species and habitats. An important part of the long term management of these areas is the monitoring of changes within, nearby, and distant from the MPAs. This monitoring includes biological, social, and economic monitoring. Together, the monitoring programs will help managers determine the effectiveness and impacts of the MPA network.

This document provides an overview of activities that may be included in the monitoring programs. The questions that will be addressed by the monitoring program are provided. The document includes descriptions of several categories of monitoring and suggests activities within each category that are proposed to effectively monitor the MPAs. The framework also provides descriptions of lower priority activities that could potentially enhance the monitoring programs, should additional funding and personnel become available. These potential activities also provide a guideline for individuals or institutions interested in supporting additional monitoring efforts.

The details of monitoring have been included for activities where existing protocols meet the needs of this framework. For some activities, the details have not been included, but will be added as monitoring protocols are developed. Certain activities will begin immediately, in order to ensure that appropriate first-year data are collected. Work will be conducted in a cooperative effort among established university and agency field research programs as well as new volunteer and contracted data collection efforts. A complete long-term monitoring program is expected to be in place by the winter of 2003.

Monitoring Questions

I. Changes within MPAs Compared to Adjacent and Distant Areas

1. Do species inside MPAs increase in size, density, richness/diversity and biomass relative to areas adjacent to and distant from reserves?
 - 1a. How do these changes occur over time?
2. How do changes in size, numbers and biomass of animals and plants differ between MPAs?
3. Does larval production increase after protection?
4. Is larval production correlated to MPA size?

II. Spillover

1. Do adults and young move from MPAs to non-MPA areas and if so, how far?
2. Do adults and young move on a daily or seasonal basis or permanently to establish new territory?
3. Does larval production in MPAs contribute to an increase in populations outside reserves?
4. Does movement of fish and invertebrates from MPAs increase catch outside the MPAs (only if questions 1 or 3 are true)?

III. Habitat and Ecosystem Effects

1. Do changes in fishing effort affect populations and/or habitats within and/or close to MPAs?
 - 1a. Is this correlated to MPA size?
2. Does protection from fishing cause changes in ecosystem structure and function including potential trophic impacts?

Biological Monitoring

Biological Monitoring activities have been separated into four general habitat/ecosystem categories. The categories include: shallow subtidal; deep subtidal; intertidal; and seabirds and marine mammals. The monitoring categories have been prioritized based on the expected level of impact MPAs will have on the species or habitats within the categories, the need for new monitoring activities within the categories, the feasibility of determining changes within the categories, and the relative level of previous consumptive use within the categories. For each category, a list of recommended monitoring activities and potential additional monitoring activities is given. Following the activities the monitoring question addressed is listed in parenthesis.

Shallow Subtidal Monitoring

Shallow subtidal monitoring (from 0 to ~100 feet) will be the highest priority activity. The shallow subtidal region includes the primary areas for consumptive uses at the islands, has the highest number of existing monitoring programs available, and provides information not only on MPAs but the entire nearshore ecosystem.

A major part of the shallow subtidal monitoring will include SCUBA surveys using existing and new protocols. In particular the Cooperative Research and Assessment of Nearshore Ecosystems (CRANE) protocol will be used for surveys in the additional sites listed below as well as on additional survey dates for existing sites. Many existing programs will continue to collect additional information that will enhance overall knowledge. The Department will ensure that these programs collect information using the CRANE protocol as a minimum standard. Details on the CRANE protocol are provided in Appendix 1.

Site Selection - Additional sites will be selected to bring the totals in selected areas to 3 sites within, 2 near, and 2 distant from each MPA. The new MPAs will be prioritized for monitoring based on bioregional representation and pre-implementation fishing effort, as well as direct input from constituents on their desires for monitoring activities. It is noted that all MPAs may not need annual monitoring at this level and certain sites may be monitored more frequently, depending on the question being examined.

Existing Sites:

- a. **Santa Barbara** – 1 National Park Service Kelp Forest Monitoring Program (KFM) site within and 2 sites near.
- b. **Anacapa** – 2 existing KFM, Partnership for the Interdisciplinary Studies of Coastal Oceans (PISCO), and University of California, Santa Barbara (UCSB) sites inside, 1 KFM distant.
- c. **Scorpion** – 1 existing KFM/UCSB site inside.
- d. **Santa Cruz** (far from MPAs) - Existing KFM, PISCO, and UCSB sites on North side. Existing KFM/UCSB on Southeast side.

- e. **Painted Cave** - No existing sites.
- f. **Gull Island** – 1 existing KFM site inside and 1 UCSB site near.
- g. **Santa Rosa** – 2 existing KFM sites near South Point, 1 existing KFM site near Carrington.
- h. **Santa Rosa** (far from MPAs) - No existing distant sites.
- i. **San Miguel** – 1 existing KFM site inside Harris Point, 1 existing KFM/Jim Marshall at Wyckoff far.

New Sites - (See Figure 1):

- a. **Santa Barbara** – Add one site inside the MPA, one on east side of SBI outside and one on west side of SBI for reference.
- b. **Anacapa** - Add new site on north side of Middle Anacapa Island to compare to “Goldfish Bowl”, add new site at far northwest end and southwest end and sites on south side.
- c. **Santa Cruz** - Add two inside Scorpion and one west of Potato Harbor. Add new sites inside Malva Real, southeast of Morse, and south of Kinton.
- d. **Santa Rosa** - Add adjacent inside and outside at south Skunk Point. Add one near the Chickasaw wreck, one northwest of the Chickasaw wreck and one just outside the west edge of South Point SMR. Add one near Cluster Point and one between Bee Rock and Sandy Point. Add one north and one south of the pier in Bechers Bay. Add 1 west of Beacon Reef and one southeast of Talcott Shoals.
- e. **San Miguel** - Add one south of Prince Island, one on the line at Bat Rock, one between Nifty and Hare Rock and possibly one at southeast Castle Rock. Add one near Pt. Bennet and one outside Adams Cove.

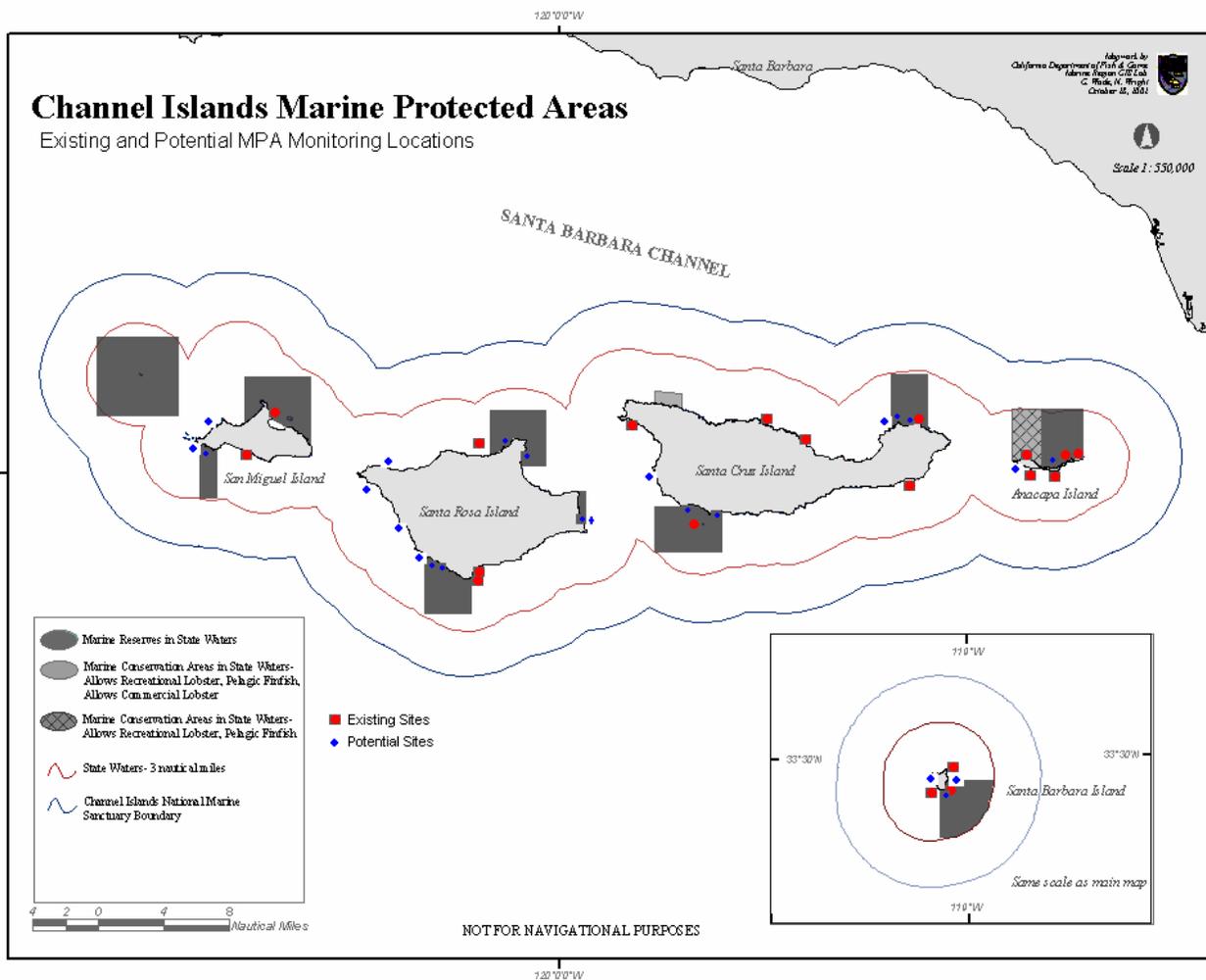


Figure 1. Existing and potential monitoring locations.

Recommended Activities

1. **Dive Survey Protocols (I1, I2, III1, III2)** - Existing PISCO/CRANE protocols will be used for fish surveys. Existing PISCO/KFM protocols will be used for invertebrate surveys. A new commercial sea urchin diver size frequency program has been proposed. If implemented this program would add significant detail on sea urchin population structure over time.
 - a. **Coordination** - Need to ensure that PISCO, KFM, and CRANE are all in agreement on MPA monitoring protocol and additional sites and that data are made available in a timely manner. If adopted, there is a need to coordinate with the proposed new urchin survey to ensure it is providing useful data.
 - b. **Initial Work** - Need to perform fish counts and benthic invertebrate counts along non-permanent, randomly located transects at all above sites and newly selected sites as soon as possible to ensure

comparable data from "Year 0". There is a potential for use of both Coastal Impact Assistance Program funding and Nearshore Fishery Permit funds to assist with this work.

2. **Trap/Fixed Gear CPUE** (I1, I2, II1, II2, II4) - Need to establish a program to collect fish, lobster, and crab trapping and/or other fixed gear Catch Per Unit Effort (CPUE) information. This program could be funded by the Nearshore Fishery Permit fund and would enlist selected commercial fishermen to trap in the vicinity of the various subtidal sites. All fish caught would be identified, measured, sexed if possible, and released. Trained fishermen, or fishermen working in conjunction with scientists, would also tag fish prior to release.
3. **Plankton/larval Surveys** (I3, I4, II3) - Need to establish a regular ichthyoplankton and zooplankton monitoring schedule within and outside the MPAs. These surveys will be carried out using existing Department, UCSB, and Sanctuary Vessels, with NMFS assistance for species identification. Surveys would follow protocols developed during the MERRP (Marine Ecological Reserves Research Program-Sea Grant) and that are modifications of the CalCOFI plankton surveys. Continuous underway egg pump CUFES, vertical BONGO, and MANTA net tows would be carried out along the 20, 40, 60 and 100m depth contours within the MPA and in adjacent fished areas outside the MPAs. PISCO recruitment modules would sample newly settling juvenile fishes. These surveys would also sample eggs and larvae produced from the Deep Subtidal Habitats. GPS drifters would be deployed during sampling to estimate the trajectory of the drift plume from the MPA.
4. **Annual Kelp Aerial Surveys** (III2) - Existing surveys using Department aircraft and photographic equipment will continue. These surveys will not only provide kelp canopy cover information but some sub-surface algal cover data. Annual surveys can be compared to those for the rest of southern California to examine seasonal variability within and outside MPAs.
5. **Stock Assessment Surveys** - Many constituents have requested that the new MPAs be monitored as part of stock assessment programs. It is important to note that stock assessment, from a fisheries management perspective, requires surveying much larger areas than those addressed in this monitoring framework. Certain assessments, however, could include sampling within and near the MPA monitoring locations.

Stock assessments for a variety of species are necessary for continued State and Federal management. In particular, many currently assessed species have not had surveys completed in Southern California and nearshore species have not received any assessments. To the extent possible, the above surveys would be used to contribute information to this effort, or specific stock assessment surveys would occur in the region.

Additional Activities

1. **Bottom Habitat Mapping 1** - USGS is planning to expand its sidescan sonar database to include more of Harris Point area. Much of the islands are

already mapped to 100m with a major gap at Santa Rosa. Sidescan data can be collected close to the shoreline in appropriate conditions with good detail on type of habitat. It is recommended that this type of survey be expanded and continued.

2. **Bottom Habitat Mapping 2** - This June, NMFS is planning to perform multibeam sonar mapping in as many MPAs as possible, including areas out to 3 miles, these data would supplement the sidescan information. Multibeam data can be collected as shallow as 10-20 m depth with less resolution than sidescan. These data would supplement the sidescan information by providing detailed information on habitat classification.
3. **Urchin Diver Project** (I1, I2, III1) - If funded this program would allow size-frequency data collection by divers during their normal fishing operations. It has not been determined how this program would expand into MPAs (e.g., paying select divers to measure urchins within MPAs).
4. **Volunteer Diver Project** - Several existing volunteer-based programs can be called on to assist with or enhance SCUBA data collection. Examples include the REEF Fish Survey Project, as well as AAUS member programs (e.g., Aquarium of the Pacific) that already provide secondary volunteer diver certification and training. These programs may be asked to facilitate data collection efforts, help with species identification, and perform modified surveys of key species. A critical long term need for volunteer programs is to provide oversight and coordination. Training and monitoring volunteers, as well as ensuring the integrity of data, are ongoing tasks. This would likely require a volunteer coordinator position and staff time to compile and maintain quality data.

Deep Subtidal Monitoring

While many species occupy depths both shallower and deeper than 100 feet, the methods used to monitor species in the deeper ranges are generally different. In addition, the level of pre-implementation monitoring and fishing effort differs between shallow and deep subtidal areas in the region. Finally, due to other recent management activities, there are several confounding factors that will complicate interpretation of data from deeper surveys.

The primary methods for monitoring deep water habitats include visual surveys using both Remotely Operated Vehicles (ROVs) and Submersibles as well as plankton/larval surveys. In addition, fixed gear surveys such as traps or hook and line can be used in certain areas. Fixed gear surveys may not be appropriate within MPAs due to the difficulty of releasing catch alive. This application of fixed gear surveys within MPAs will have to be examined on a case by case basis.

Site Selection – This framework focuses on monitoring a subset of MPAs in order to maximize data collection and eliminate areas that are covered by other programs. While the overall focus will be on rocky reef areas, some soft bottom monitoring is recommended. Following are potential locations for

Submersible/ROV surveys. Some areas outside 3 miles should be included in order to help determine impacts of trawling (which is prohibited closer to shore) and to provide a baseline if Federal MPAs are implemented.

Potential Sites:

- a. **Santa Barbara** - Use existing submersible surveys as reference to choose two inside, two near, and two far sites in comparable depth range and habitat.
- b. **Anacapa** - Use footprint area to continue baseline data collection
- c. **Scorpion** – This area is not recommended for Submersible/ROV due to limited rocky habitat. It should be included in other types of surveys (see Bight study below).
- d. **Painted Cave** - Too shallow for these methods.
- e. **Gull Island** - Very good potential for comparison of Spot Prawn Trapping impacts. Select three sites inside the MPA and three outside, on the northern slope of Santa Cruz Canyon (known Spot Prawn Trapping locations). Annual transects would be performed in random locations within these sites.
- f. **Carrington Point** - Select two sites inside and two outside after habitat mapping survey to ensure good habitat comparability.
- g. **Skunk Point** - Too shallow for these methods
- h. **South Point** - Habitat maps need to be developed for this area. It should not be included in Submersible/ROV if there is only limited rocky habitat. It could be included in other surveys.
- i. **Harris Point/Richardson** - Choose similar habitats inside and outside.

Recommended Activities

1. **Visual Survey Protocols** (I1, I2, III1, III2) - Use primarily UCSB/NMFS submersible protocols and established protocols for ROV. Annual Submersible surveys would be complemented by more extensive and frequent ROV surveys. Existing National Marine Fisheries Service and Department ROVs need to be supplemented with a locally owned/operated ROV. These surveys may be supplemented with hook and line or trap surveys for CPUE and population status information where appropriate.
2. **Bight Surveys** (I1, I2) - This year, a soft bottom habitat survey of the area will be repeated. These surveys use both trawl and benthic sediment sampling to compare sites throughout the Southern California Bight. It is recommended that the sites for this survey be located in areas within and outside MPAs that are not appropriate for Submersible/ROV surveys. This survey should be repeated at regular intervals.
3. **Plankton/Larval Surveys** (I3, I4, II3) - See Item 3 in the Shallow Subtidal recommended activities above.
4. **Coordination** - Ensure that UCSB/NMFS surveys include above sites. Work with Sanctuary and Park to fund annual submersible surveys (10 - 14 days per year).

- a. **Initial Work** - Completed in 2002, need to continue. Need to map more habitat to determine final site selection. Potential for use of Department Nearshore Fishery Permit funds to assist with this work.

Additional Activities

1. **Tagging surveys** (II1, II2, II4) - Archival and sonic tags may be used to determine the range of fish movements for a variety of deeper species. It is difficult to perform tagging without high incidental death rates and high expense making this a lower priority to be completed with outside funding only. Some continuing work by the Pflieger Institute for Environmental Research around Anacapa Island may be expanded to other islands and depths.

Intertidal Monitoring:

Intertidal consumptive use at the Channel Islands is relatively low, and fishing restrictions from the new MPAs are not expected to directly affect these areas. In the intertidal zone at the islands, regulations on fishing probably have a smaller direct impact than would prohibitions on access or entry. In many cases, access is either limited by National Park or other regulations or by the nature of the environment. Changes to the intertidal zone are primarily expected through secondary ecosystem effects, such as increased production in the shallow subtidal zone leading to increased recruitment in the intertidal. In addition, these secondary effects may take many years to be recognizable. Therefore, intertidal monitoring is a lower priority than shallow and deep subtidal monitoring.

Necessary intertidal monitoring will primarily be completed through ongoing programs. Efforts will be made to ensure that some new sites are added to reflect the MPA locations. These new sites may not require annual monitoring, reducing the overall cost of adding them. In addition, Department coordination to ensure that data are made available in a timely manner will be critical.

Site Selection – Additional monitoring sites will be added at Santa Cruz and Santa Rosa Islands within and outside one of the new MPAs at each island. The total number of new sites need is approximately four. Sites will be selected, whenever possible, in areas where one time or historical surveys were completed whenever possible and in areas of comparable rocky intertidal habitat.

Recommended Activities

1. **Intertidal Survey Protocols** (I1, I2, III1, III2) - Existing Multi-Agency Rocky Intertidal Network (MARINE) and PISCO protocols are adequate to answer all top priority questions (Population and Community monitoring)
 - a. **Coordination** - Need to ensure that the additional sites are added to a biennial monitoring program and that data are made available in a timely manner.

- b. **Initial Work** - Continue with existing efforts in intertidal monitoring, establish new sites and perform initial monitoring within 1 year, and collect data into useable formats.
- c. **Volunteers** – Volunteer programs may be established to assist with staffing needs for annual surveys. A volunteer coordinator would be necessary to ensure ongoing participation and adequate training. Volunteers would assist normal monitoring staff in performing normal monitoring protocols.

Additional Activities

1. **Landscape Monitoring** (III2) – This would involve aerial photographs of the intertidal zone to determine long-term changes in the overall habitat stratification. This type of monitoring is not currently in place and would require helicopter surveys. The MPAs are not expected to have direct effects on landscape.
2. **Sandy Beach Monitoring** (I1, I2, III1) - Existing National Park Service protocols cover some of the areas, though these surveys are not completed every year. Additional funding is necessary for a comprehensive program.

Seabirds and Marine Mammals

Seabirds and Marine Mammals are not expected to be directly impacted by the establishment of MPAs as they were not the subject of fisheries prior to implementation. MPAs are likely to indirectly impact some of these species in a variety of ways, such as through increases in forage base or by reduced vessel traffic near breeding colonies. The primary effects that can be monitored are likely to be related to the foraging activities of these species within and nearby the new MPAs. Monitoring activity patterns could show how MPAs affect seabirds and marine mammals and how these species impact the trophic structure within MPAs through foraging.

Recommended Activities

1. **Activity Surveys** (III2) - Foraging activities of mammals and birds would be monitored within and outside MPAs. These surveys would examine diet and location of foraging to determine potential impacts both on the animals (e.g., diet changes corresponding to increases or decreases in prey availability) and to the MPAs from the animals (e.g., increased feeding leading to decreases in prey populations). These surveys would occur from paired sites inside and outside MPAs. Seabird surveys could occur from shore-based locations while marine mammal surveys would likely occur from kayaks or small vessels. Key seabird species would include Brandt's and Pelagic Cormorants, Pigeon Guillemot, and Brown Pelican. All other foraging seabirds would be recorded. Key marine mammal species include California sea lion and harbor seal. Other marine mammals such as sea otters would be included if encountered. Sites for seabird activity:

- a. **Santa Barbara** - Southeast and Southwest SBI.
 - b. **Santa Rosa** - Carrington Point and Brockway Point
 - c. **San Miguel** - Prince Island and Castle Rock
2. **Diet and Population Surveys (III2)** – Seabird diet would be included in the activity surveys wherever possible through visual observations. This would allow determinations of whether diet trends follow changes in prey abundance within MPAs. An ongoing study at San Miguel Island may provide additional information for marine mammals. Existing programs monitoring seabird and marine mammal populations are recommended to continue.
 3. **Light and Sound Level Surveys (III1)** - Comparative surveys of light and sound levels within and outside MPAs at seabird breeding locations. These surveys would determine whether reduced fishing activities have a correlating reduction in noise and sound disturbance to nesting seabirds. Surveys would be conducted during breeding seasons and times when squid and other fishery activities are high and low at non-MPA sites.

Additional Activities

1. **Shorebird Surveys (III2)** – Shorebirds could be added to the above monitoring given adequate funding. They have a much lower priority because MPAs are not expected to have direct impacts on these species. It is recommended that outside groups undertake shorebird monitoring if possible.

Appendix 1

DRAFT shallow subtidal SCUBA survey protocols for Channel Islands Marine Protected Areas

The Cooperative Research and Assessment of Nearshore Ecosystems (CRANE) protocol is being developed to provide Statewide information on nearshore fish and invertebrate population status. The following are a subset of the CRANE protocols as they relate to Channel Islands. The two monitoring programs will be coordinated to ensure compatibility of data. The SCUBA protocol is limited to a maximum depth of 20 m (60 ft.) While SCUBA can be used for deeper surveys, this technique is generally inefficient due to safety considerations and limits on the amount of time available under water. The area between 60 and 100 feet will be included in ROV surveys discussed in the Deep Subtidal section below. Specific deployment protocols may differ: some projects may collect additional information, or conduct the fish, habitat, and invertebrate sampling on different dives. The MPA monitoring will be satisfied by sampling programs that collect (at a minimum) data using following criteria. Definitions:

- Site:** A discreet area of rocky reef habitat between a minimum of 5 m (15 ft.) depth and maximum of 20 m (60 ft.) depth. A site must be large enough to complete 24 random transects (in general 6 offshore, 12 mid-reef, 6 inshore) for fish and 18 for invertebrates. Sites must be greater than 240 m and less than 500 m long to ensure adequate transect coverage. Each site will be described by its latitude/longitude corners to allow for random transect location within the boundaries. Sites are to be selected in areas where there is adequate coverage of rocky reef to limit the number of random transects in different micro-habitats (e.g., sand) (See Figure 2).
- Transect:** A transect is 2m x 2m x 30m (120 m³) and contiguous to the bottom. Transects are run along a depth contour generally parallel to shore, with no more than a 5 m change in depth. Transects continue regardless of habitat change along their length (e.g., sand areas) Random start points are determined using a Geographical Information System Database for each transect within three depth strata (16-20m, 11-15m, 5-10m) unless the site's slope is less than 10°, or the overall depth range is less than 5 m. In this case, the start points will be randomly selected throughout the site within three strata (inshore, middle, and offshore). To facilitate continuation of sampling underwater, the relative position of subsequent transects will be defined prior to the dive based on a distance and direction from the initial transect.
- Fish Counts:** Fish Diver 1 counts and estimates size of all conspicuous fish encountered along a benthic transect. Large fish (>15 cm Total Length) are estimated to the nearest 5 cm interval and small fish (=15 cm) to the nearest 1 cm. Though certain key species will be the focus of monitoring and reporting, all

species encountered will be recorded. Fish Diver 2 will follow Fish Diver 1 and collect data on bottom type (i.e., rock, sand, mixed), relief (0-1m, 1-2m, 2-3m or >3m), and bottom cover (e.g., coralline algae, invert, bare rock, etc.). Fish transects are conducted between the hours of 9:00 a.m. and 4:00 p.m. to ensure adequate light and limited to underwater visibility of 4m or greater to ensure divers' abilities to identify fish.

Video Verification: Four video transects will be collected per site per year (randomly selected among all fish transects). The videos will serve as both habitat and species assemblage verification and as a long term source for comparison. Videos will use enhanced lighting and be compiled digitally. The Video Diver will maintain a distance of approximately 1 m off the bottom and use a standard wide angle (no special lenses) to ensure the full transect area is included. Swim speed for video transects will be 3 minutes per 30 m (10 m/min.). Videos will be equipped with paired, 10cm parallel, lasers to assist with fish size verification of appropriate species.

Invert./Algae: Invertebrate Diver 1 counts all emergent urchins, sea stars, cucumbers, kelleys' whelk, and other key species (see species list below) and measures and counts all abalone. Invertebrate Diver 2 collects red sea urchins (within 1 meter increments until 25 are obtained) for later measurement, counts kelp holdfasts, and collects data on bottom type (e.g., rock, sand), relief (0-1m, 1-2m, 2-3m or >3m), and bottom cover (e.g., coralline algae, invert, bare rock, etc.). Invertebrate/algae transects are less constrained by time and visibility, but are conducted without artificial lighting and do not include invasive survey techniques (e.g., turning rocks).

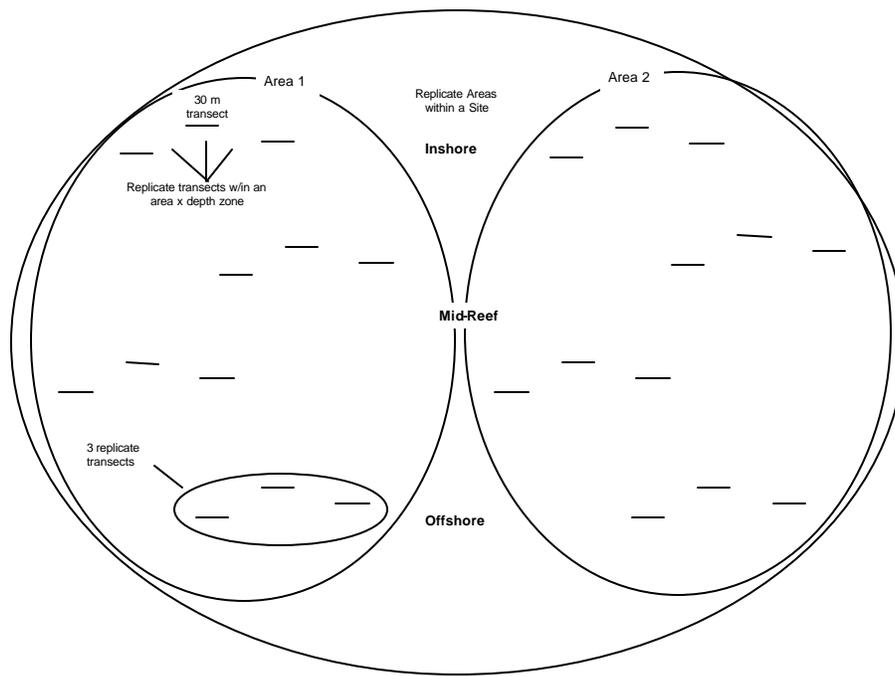


Figure 2. Site and transect schematic. Diagram depicts full-site survey of 24 transects.

Species List for Invertebrate/Algae Counts (Note that other categories may be used for habitat descriptions):

Algae

Giant Kelp	<i>Macrocystis pyrifera</i>
Oar weed	<i>Laminaria farlowii</i>
Southern sea palm	<i>Eisenia arborea</i>
California sea palm	<i>Pterygophora californica</i>
Bladder Chain	<i>Cystoceira germinata</i>
Feather Boa	<i>Egregia menziesii</i>
Acid Kelps	<i>Desmarestia spp.</i>
Sieve Kelp	<i>Agarum fimbriatum</i>

Invertebrates

Orange puffball sponge	<i>Tethya aurantia</i>
California hydrocoral	<i>Stylaster californicus</i>
Abalone (all species)	<i>Haliotis spp.</i>
Red top snail	<i>Lithopoma gibberosum</i>
Wavy top snail	<i>Lithopoma undosum</i>
Chestnut cowrie	<i>Cypraea spadicea</i>
Giant keyhole limpet	<i>Megathura crenulata</i>
Kellett's whelk	<i>Kelletia kelletii</i>
Rock scallop	<i>Crassedoma giganteum</i>
California sea hare	<i>Aplysia californica</i>
Red sea urchin	<i>Strongylocentrotus franciscanus</i>
Purple sea urchin	<i>Strongylocentrotus purpuratus</i>
Bat star	<i>Asterina miniata</i>
Giant spined sea star	<i>Pisaster giganteus</i>
Sunflower star	<i>Pycnopodia helianthoides</i>
Warty sea cucumber	<i>Parastichopus parvimensis</i>
California spiny lobster	<i>Panulirus interruptus</i>
Stalked tunicate	<i>Styela montereyensis</i>