

ROCKY INTERTIDAL COMMUNITIES MONITORING HANDBOOK

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Channel Islands

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Park

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ROCKY INTERTIDAL COMMUNITIES MONITORING HANDBOOK

CHANNEL ISLANDS NATIONAL PARK CALIFORNIA

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ment and refinement through a contract with the National Park Service. VTN Oregon, Inc. established and documented the first monitoring sites on Anacapa Island. California Department of Fish and Game cooperated in sampling and data collection and conducted an abalone tagging study that has increased knowledge of this resource.

INTRODUCTION

Long-term monitoring of the rocky intertidal community is accomplished at Channel Islands National Park by biannual sampling of permanent photo-quadrats and black abalone plots. The first rocky intertidal monitoring sites were established on Anacapa Island in 1982 by a consultant to the National Park Service, VTN Oregon, Inc. In 1985, the monitoring program was expanded with the addition of permanent sites on San Miguel and Santa Barbara islands. The purchase of Santa Rosa Island in December of 1986 added a rich and varied intertidal resource to the program. New sites have been added each year bringing the total number of sites monitored in 1988 to 15. Because of the addition of new sites and improved sampling equipment, field techniques, and data management capabilities, this handbook has been completely rewritten since 1984 when VTN Oregon, Inc. developed the original version.

The monitoring program is expected to expand further with the addition of owl limpet and sea star monitoring, the development of a comprehensive species list, and additional black abalone studies.

MONITORING DESIGN CONSIDERATIONS

To monitor seasonal and annual changes in populations of rocky intertidal organisms, 15 monitoring sites representing the range of biogeographical and ecological conditions found in the park have been established on Anacapa, Santa Barbara, San Miguel, and Santa Rosa islands. Site selections were made based upon the following criteria:

- Representative of different aspects of geology, currents, and wave action
- Representative of various levels of visitor use and popularity

- Good access from the island or a protected safe landing nearby if boat access is necessary
- Protected from large waves at low tide
- Relatively level for ease in monitoring the site
- Representative of intertidal resources for that particular island
- Representative coverage of the five tidal zones to be monitored
- Close proximity to kelp forest monitoring sites

Sites were also chosen to coincide with sites used in the Southern California Bight baseline studies conducted by the Bureau of Land Management in the 1970's.

The organisms selected for monitoring represent five tidal zones common throughout the park. These five zones are generally the dominate high and mid-intertidal zones on the islands, although all zones may not be present at each site. The acorn barnacle, *Chthamalus fissus/dalli*, generally dominates the highest zone, where it is commonly found with other barnacles, such as *Balanus glandula* and *Tetraclita rubescens*. A low turf-like red alga *Endocladia muricata* represents the next lowest zone. The rockweed zone is represented by brown algae, primarily *Pelvetia fastigata* and *Hesperophycus harveyanus*. At Santa Barbara Island, the red algae *Gigartina canaliculata* and *Gelidium* sp. are monitored in a zone below the rockweeds. The lowest zone monitored is represented by the California mussel, *Mytilus californianus*. Black abalone, *Haliotis cracherodii*, which support the largest portion of California's abalone fishery, are monitored to evaluate both fishery harvest and environmental conditions. In addition to these index organisms, the abundance of tar (a common occurrence in the Santa Barbara Channel) and bare substratum are monitored at all sites.

MONITORING PROTOCOL

SAMPLING METHODS

Several methods are used to monitor rocky intertidal areas. A random point contact method using photographs (slides) taken of permanent photoquadrats is used to determine percent cover of the dominant organisms in five intertidal zones (described under Photoquadrat Sites). Another method measures movement and abundance of black abalone in permanently established plots (described under Black Abalone Plots). Counts of owl limpets and sea stars have also been initiated (described under Owl Limpet Plots and Sea Star Monitoring).

This section first provides general information that applies to all sampling methods, then describes specific sampling methods and their requirements. Monitoring sites (including how to get to sites and what to monitor) are discussed in the general sampling information section under island site locations.

General Sampling Information

Scheduling

Scheduling for both the establishment of quadrats and monitoring activities is done in January (or as soon as a tide table can be obtained). Check the tide tables for appropriate tides. Low tides of zero or lower are essential for enough working time. Low tides that fall mid-day are the best. Allow enough daylight to work two hours before and after low tide. Plan on sampling one site per day; however, it is possible to sample two sites per day if they have only one set of black abalone plots.

Personnel

A network of volunteers has been established which assists in data collection for both the kelp forest and intertidal monitoring programs. Island staff can also be used when they are available, but it is best not to count on their availability because of other duties. Once the schedule has been established, arrange for volunteers. Teams of four or more (in multiples of two) provide the most flexibility. California Fish

and Game biologists have assisted at black abalone tagging sites on San Miguel and Santa Rosa islands which are checked once each year. These biologists can be called upon to assist with monitoring of these tagging sites and potentially sampling of nearby monitoring plots.

Logistics

Transportation. Low tides do not provide much flexibility in scheduling. Therefore, plan trips well in advance and make arrangements for appropriate transportation at the scheduling meeting each month.

Food. The general procedure on overnight trips to the islands is to buy food for the entire crew, using a purchase order in lieu of per diem. A food order is made from a menu and sent to Kathy or Lee at Ven Oak Market in Oak View, 649-1241. They will accept purchase orders and deliver food when needed. As an alternative, participants can all contribute for the food purchase and be reimbursed through per diem or the volunteer account (see the Volunteer Coordinator.) A travel authorization is needed if using per diem.

Island Site Locations

The 15 monitoring sites and a summary of what to do at the sites on each island is described below. Figure 1 indicates the general locations of the sites. More specific maps locating the sites as well as detailed drawings of the photoquadrats and plots are found in Appendix A.

San Miguel Island

The four sites on San Miguel Island are best serviced by land, although on very calm days Harris Point and Cuyler Harbor can be reached by boat. Crook Point can also be reached by boat if there is no south swell; however, there are usually elephant seals on the beach that may be disturbed by a landing craft. Reserve bunk space in advance as limited overnight space is available. For this reason, it is also best to keep the monitoring crew small. For lodging arrangements, Harris Point, Crook Point, and Cuyler Harbor are closest to the ranger station. Otter Harbor is closest to the Point Bennett research station but can also be monitored by personnel staying at the ranger station. Allow approximately two

hours to hike to Otter Harbor from the ranger station. Crook Point is approximately one to one and one half hours hiking time from the ranger station and involves a fairly steep hike. Be aware that Crook Point is the most exposed site when seas are rough. Plan on one day per site plus two days travel to complete San Miguel Island monitoring.

Depending on condition of crew and weather, it is possible to complete photoquadrats at Cuyler Harbor and Harris Point using two people to photograph while the other two people count abalone at Harris Point. It is best to start at Harris Point as sampling Cuyler Harbor on a travel day is possible if flights can be scheduled to allow working time that also coincides with favorable tides. Adverse weather conditions can prevent completing some stations in one day.

Santa Rosa Island

There are currently five sites on Santa Rosa Island. Check with the island rangers about housing at Johnson's Lee or Arlington Camp and available transportation. Johnson's Lee is more convenient when working sites on the south side of the island. Vehicles are needed to traverse the island so check on current policies about off road driving and road conditions which may add time to get to the site. Travel times are slow and two hours or more may be required to drive to a site. Talcott and Fossil Reef sites will require the longest and most arduous hiking. Because of a steep bluff, the Talcott site is accessed via a point of land, approximately 1/4 mile east of the monitoring sites. Fossil Reef requires hiking down the south slope of the island from an accessible bluff. Five days plus travel are required to complete the Santa Rosa Island monitoring.

Anacapa Island

Five different areas are sampled on Anacapa Island. On West Island, photoquadrats at South Frenchy's Cove can be reached at the gap at the east end. Landing is best on the north side on the sand beach. This is where Island Packers Company lands. The photoquadrats and abalone plots at Cat Rock can be reached by hiking from Frenchy's Cove, (a fairly long walk with equipment), or by raft landing on the

sand and cobble beach just west of the monitoring site (between Cat Rock and the monitoring site).

Middle Island has three sites that must be reached by small boat. The first photoquadrat site at Middle Anacapa Island West, (formerly MAI Test) is at the landing where the National Park Service sign is located. The second photoquadrat site at Middle Anacapa Island East, (formerly MAI Control) is just to the east of the first site but is inaccessible from the island because of a deep surge channel. An abalone plot site at Harbor Seal Arch is further east and has an easy landing next to the arch onto a sandy-cobble beach between rocky reefs. Beware of occasional waves washing onto this beach.

Because of the proximity of sites, the suggested procedure is to use half the team to shoot both photoquadrat sites on Middle Island one day while the other half counts abalone at Harbor Seal Arch, then work West Island the next day with the same procedure.

Three, one day trips to Anacapa Island are usually required to complete the monitoring. Because Anacapa can be monitored on day trips, it offers a good opportunity for using volunteers from the staff or others who cannot afford much time away.

Santa Barbara Island

Both sites are easily reached by land or by boat. The monitoring can be accomplished by flying to the island and hiking to each site. Or, if lodging on the island is a problem, the work party can utilize one of the NPS boats as transportation to the island and then as a bunkhouse once there. If using a raft, both sites can be photographed in one day, but landing a raft can be dangerous because of the steep reef and occasional large swells. Walking to the sea lion rookery site is not difficult. It is best to follow the trail to the lookout above the sea lion rookery before going down the hill to the intertidal site. The landing cove site is divided, with half the photoquadrats on each side of the dock.

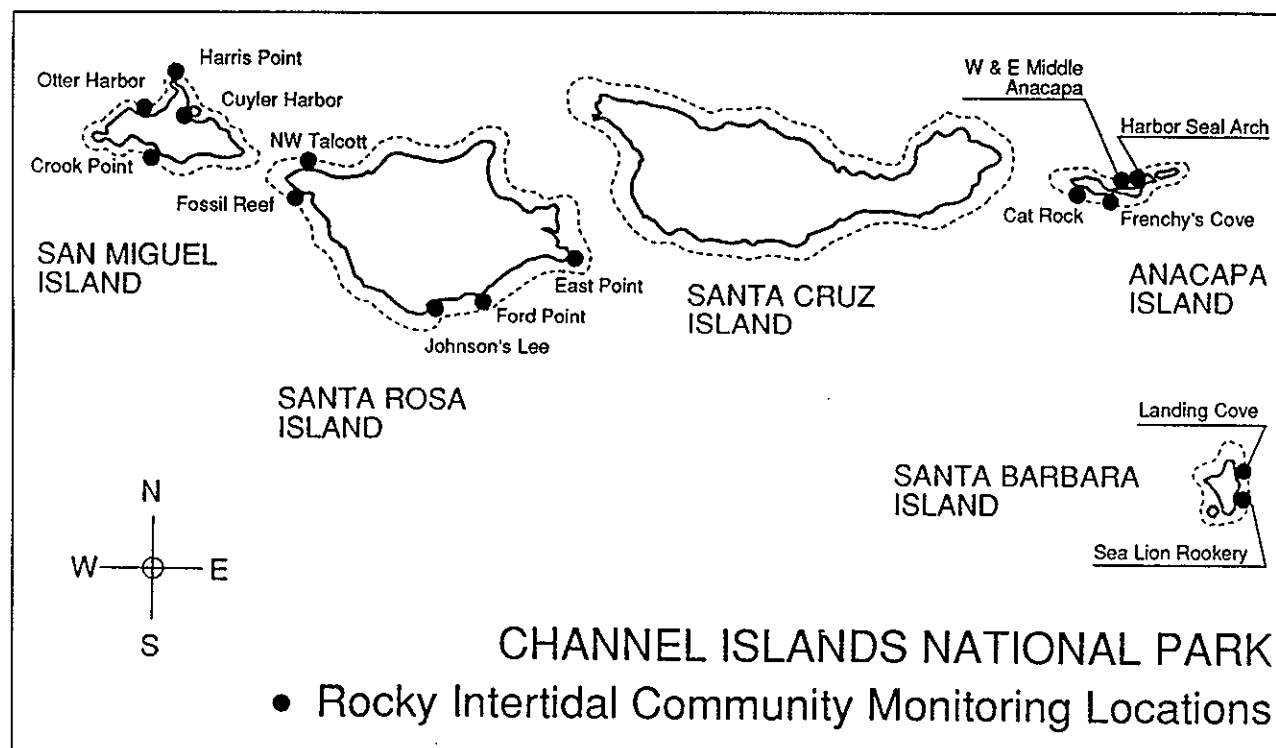
Two work days plus two days travel should be scheduled whether by helicopter or boat.

Table 1. Summary of Monitoring Activities at Each Rocky Intertidal Monitoring Site.

What to do at each Rocky Intertidal Monitoring Site

At all sites-- make a species list; repair epoxy and bolts; record weather and general observations

Island	Site	Photo-quadrat	Abalone Plot	Lottia Plot	Photo Point	Other
San Miguel	Crook Point	20	5	3		observe sea birds, elephant seals
	Cuyler Harbor	20				observe abalone, <i>Phragmatopoma</i>
	Harris Point	20	5			observe tar, tagged abalone
	Otter Harbor	20	5	2		count harbor seals, observe elephant seals, tagged abalone
Santa Rosa	East Point	20	1transect		3	observe seabirds, harbor seals
	Ford Point	15	5	5		observe <i>Phragmatopoma</i>
	Fossil Reef	20				abalone and area photos, observe harbor seals, abalone
	Johnson's Lee	15	5	5		observe tidepool, <i>Phragmatopoma</i>
	Northwest Talcott	20	5		3	observe shorebirds, harbor seals
West Anacapa	Cat Rock	36	5			monitor shells on beach
	Frenchy's Cove	20				observe trampling, visitor impact
Mid. Anacapa	East and West	12(E)20(W)				observe harbor seals,
	Harbor Seal Arch		5			<i>Phragmatopoma</i>
Santa Barbara	Landing Cove	20				observe sea lions, urchins, seastars, algae, damaged areas, recovery
	Sea Lion Rookery	20	5			observe sea birds, sea lions



Data Sheets

The following data sheets are used to record information. Blank data sheets can be copied from the forms in this handbook (Appendix B).

Data Sheet # Title

1	Study Site Map
2A	Abalone Plot Location Data
2B	Photoquadrat Location Data
3	Photoquadrat Description Log
4A	Photodata Log (# 1-#20)
4B	Photodata Log (#21-#40)
5	Black Abalone Density
6	Field Log
7	Photoquadrat Data
8	Black Abalone Size and Condition

Sheets 4A and 4B can be copied onto each side of one sheet of paper. Sheet 5 should be copied onto both sides of the paper.

Personal Gear Needed

Boots	Notebook
Day pack	Field guides
Foul-weather gear	Cloth gardening gloves
Wetsuit	Swim trunks
Booties/ tennis shoes	Old towels
Sunglasses	Knee pads
Hat or visor	Camera
Watch cap	Binoculars
First aid kit	Waterproof protective bag
Food and drink	(for camera and
Flashlight	binoculars)

Photoquadrat Sites

Establishing Intertidal Photoquadrats

Each area chosen for monitoring must have a high percentage of coverage of the target species and needs to be relatively flat but not necessarily horizontal. Photoquadrats are originally laid out in the intertidal area using a flat, rectangular rebar frame the size of the base of the quadrapod (50 cm x 75 cm) as a guide. At each corner of the chosen

area, a space approximately 5 cm x 5 cm is cleared using wire brushes, chisels, hammers, or scrapers. Helor Hi-Water Epoxy is made according to manufacturer's directions. A small dollop is placed at each corner, pressed onto the rock, and smoothed to form an epoxy corner approximately 2-3 cm square. A pre-numbered brass tag is pressed into the upper left corner of the quadrat (when viewed from the seaward side) and smooth, hard plastic disks approximately 15 mm in diameter are pressed into the other three corners. (After a period of two or three years it is often very difficult to differentiate epoxy from natural surroundings while the hard plastic disks maintain their identity.) These epoxy corners should be installed on the outgoing

In mussel quadrats it is desirable to place as many corners as possible on raised ridges to prevent them from being overgrown. A bronze bolt in the upper or lower right corner (when viewed from the seaward side) is helpful in relocating quadrats in mussel or other plots prone to overgrowth.

NOTE: Careful descriptions, maps, and photographs should be taken to help relocate quadrats during subsequent surveys. Distances and compass bearings between quadrats will help relocate quadrats should all four corners be missing. Record information on quadrat locations on Data Sheet #2.

Equipment and Materials

Before each sampling period begins, check the status of equipment and materials. Replace epoxy, bronze bolts, film, and batteries as needed. Also check that the drill, camera, and strobes are in good working order, and that the drill batteries are charged.

For Site Establishment and Repairs

	LOCATION
2 5-gallon plastic buckets/ lids	Closet
2 Paint scrapers	Bucket
2 Wire brushes	Bucket
2 Rock hammers	Bucket
1 Chisel	Bucket
Two-part epoxy, 1 set for each site	Closet
1 Mixing bowl	Bucket
1 Mixing knife	Bucket
Pre-numbered brass tags	Closet

1-5 Rebar quadrat frames (used as guides)	Closet
Plastic disks for quadrat corners 3/quadrat	Bucket
Data Sheets, #1, #2, #3	Handbook

For Monitoring Photoquadrats

	LOCATION
1 Pelican case	Closet
1 Nikonos V camera	Pelican Case
1 28-mm land lens (LW28)	Pelican Case
2 Nikon SB 15 strobes	Pelican Case
2 Nikon SC 15 power cords--strobes	Pelican Case
1 Adapter for E-O plug	Pelican Case
1 3-way connector from E-O plug to power cords	Pelican Case
2 Strobe holders which screw into quadrapod	Pelican Case
1 Quadrapod frame & camera mount	Closet
2 Clipboards with rubber bands	Workroom
4 Pencils	Workroom
4 AA batteries for each strobe + extras	Cabinet
1 Roll/site, 36 exposure, Ektachrome 100 Slide Film	Cabinet
1 Each/site, data sheets 4A, 4B, and 6 (Field Log)	Workroom
Area maps and quadrat location information	Workroom
1 Compass	Cabinet
1 Tape measure	Closet
Plastic bags	
2 Waterproof bags for gear and papers	Closet
Collecting vials, formalin, labels	Bucket
1 Thermometer	
Towel	Optional

Monitoring Photoquadrats

Percent cover of the dominant organisms is determined in five intertidal zones using the random point contact method on slides taken of permanent photoquadrats in each zone. Generally five replicate photoquadrats are established in each zone; four zones are usually represented at a site, so twenty quadrats are photographed. The quadrats are photographed with 35-mm slide film twice a year during daylight low tides, fall and spring. Quadrat images are later projected nearly life-size onto a 100 point grid, and the number of points overlain by each of the monitored taxa is recorded to estimate abundance as percentage of area covered.

Personnel Required

Two people are necessary to shoot the photoquadrats; one to do the actual camera work and one to record data. A third person can work ahead finding the next quadrat and cleaning the corners. A fourth person can clean and repair photoquadrat corners.

Photographing Quadrats

Quadrat corners are located (using Data Sheet #2, quadrat location data in Appendix C), cleaned of growth, and repaired. Cleaning all corners with a wire brush or paint scraper is important during every sampling period as one year's growth can completely obscure the epoxy, making it impossible to find.

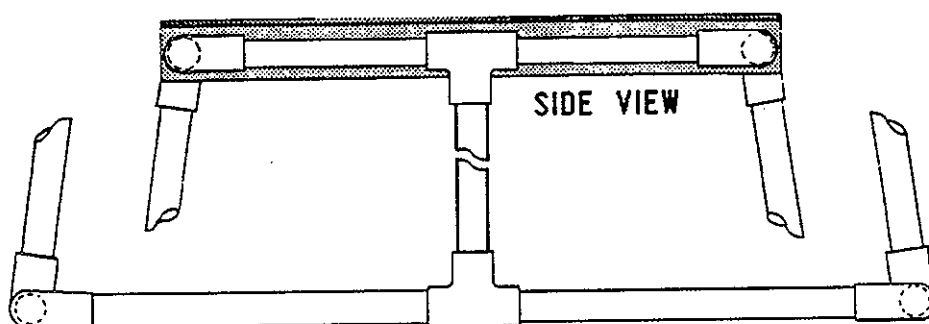
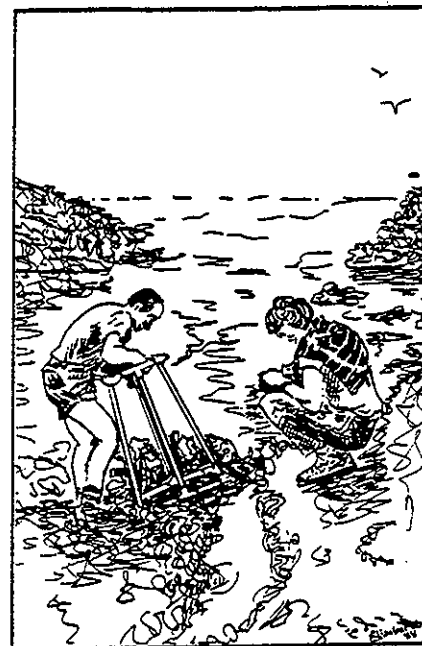
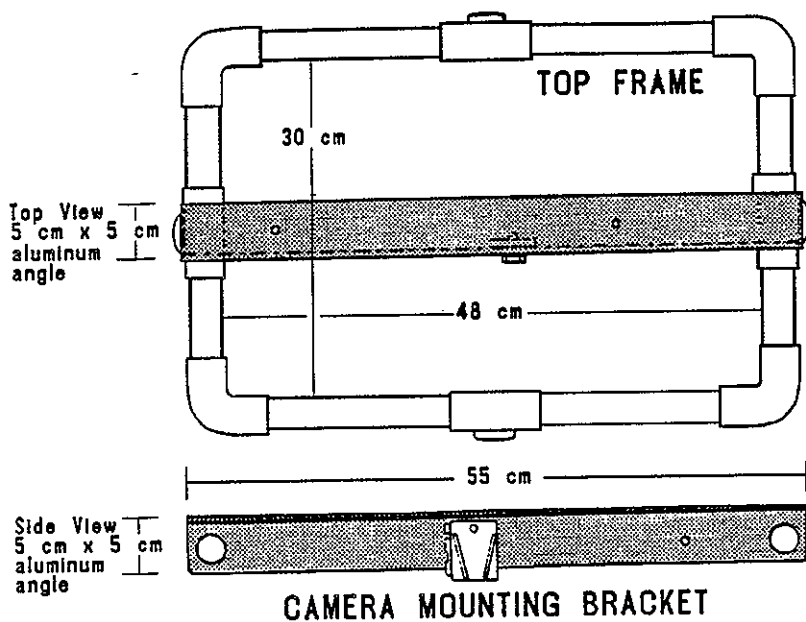
Pictures are taken using the quadrapod which places the camera and strobes directly over each quadrat (see Figure 2 for details for constructing a quadrapod). The corner with the numbered tag is generally placed in the upper left corner of the quadrapod frame and the remaining three epoxy/disk corners are lined up with the corners of the frame. There are three groups of numbers on the base of the quadrapod which are used as numbering reference guides (these will appear in the top of the photo). To change the counter number, slide the indicator rings to where they rest just to the left of the desired number digit, i.e. #s 4 7 3 in quadrapod drawing, Figure 2.

Using Ektachrome 100 slide film, the camera settings should be:

Shutter speed	1/60
f-stop	f-16
Focus	.9 m (just below the 1 m setting)

Strobe settings should be:
A1 and TTL

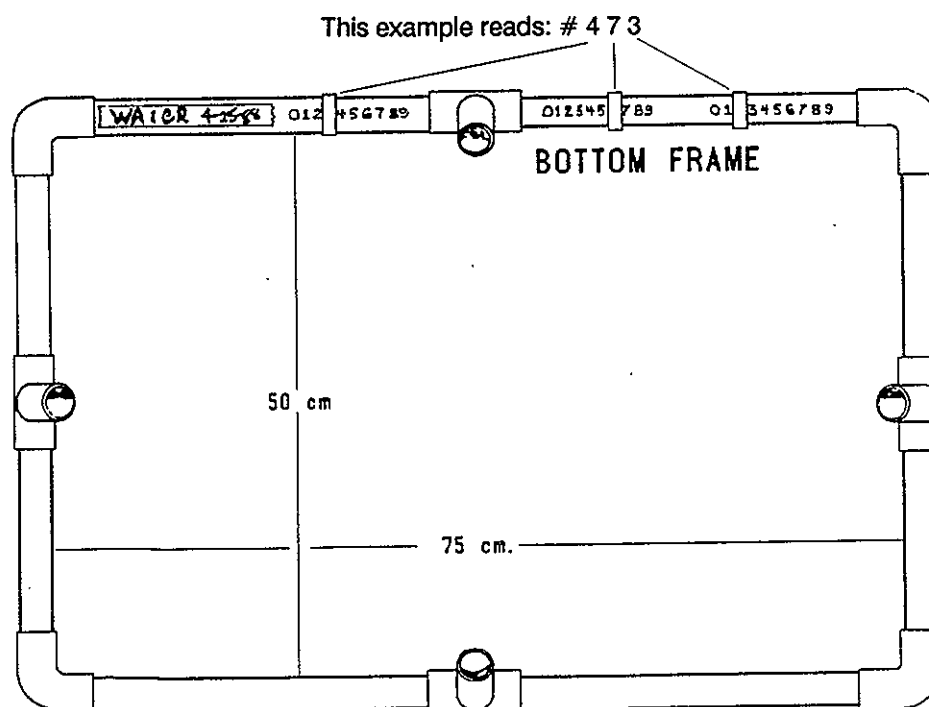
The LW 28-mm lens is water resistant, but will not stand submergence. The strobes are not water resistant and should be protected. Plastic bags over the strobes will protect them from spray; however, when plastic bags are over the strobes this will modify the light source and require all pictures to be "bracketed", i.e., three pictures are taken, one at f-8, one at f-11, and one at f-16.



78 cm
cut length
of
pipe

94 cm
Ground to
front of
camera
lens

104.8 cm
Ground to
top of
Bracket



LIST OF MATERIALS

1 each, 5 cm x 5 cm x 55 cm
Aluminum "L"
for camera mounting support

1 each, Quick Release
Camera Mount

1" PVC PLASTIC PIPE:

For Top Frame

4 each, Elbows

4 each, T's

4 each, 12 cm pipes

4 each, 20 cm pipes

For Bottom Frame

4 each, Elbows

4 each, T's

4 each, 23 cm pipes

4 each, 35 cm pipes

For Legs

4 each, 78 cm pipes

For slip ring indicators

1 each, Union cut into 1" pcs
and sanded so as to slide
on pipe frame.

Figure 2. Quadrupod Construction Details

Notes are kept on picture order, settings used, problems, and organisms present on the photoquadrat. Use Data Sheets #4A and #4B for this purpose. Extra film at the end of the roll can be used to shoot area photos and abalone plots. At some sites, photo points have been set up to document the intertidal area or feature from the same vantage point each monitoring season. Consult the area maps for directions. Use the daily field log (Data Sheet #6) to record weather information and pertinent data such as personnel, species lists, general description of site, work done, and repairs needed. Any pertinent observations are worth noting as they may prove important at a later date. Photoquadrat Logs, Abalone Plot Logs, and Daily Field Logs are stored in the appropriate island binder for use in labeling slides.

Photoquadrat Lab Procedure

Process film and label slides as soon as possible. Taking good notes during photography sessions will now help in properly labeling slides. Labeling should include station, quadrat number, and sampling date.

Slides are scored by projecting onto a 100 point 40 cm x 50 cm grid. Percent cover of the different taxa are determined by a random point contact method. By determining the cover at 100 random points an estimate of percent cover is derived. This size allows projection to nearly life size with room on the margins to allow some projection latitude. The use of a tally meter facilitates the counting of species under each point.

In addition to the five zone taxa categories of other objects such as miscellaneous algae, miscellaneous animals, bare rock, tar, unidentifiable points, or the name of an abundant species are recorded. When layering is apparent as with barnacles or algae on mussels, but where mussels are the primary concern, the surrounding layers should be noted as a different category. This will preserve the accuracy of the primary data (100 points) and provide additional general information concerning the quadrat for future reference.

Time required to score one station of 20 slides is usually less than two hours.

Photo Interpretation Equipment

	LOCATION
1 Slide projector with stack loader	Interp. Room
1 100 point grid on white paper	Workroom
1 Intertidal photoquadrat Data Sheet #7 for each site	Workroom
1 Tally meter	Workroom
1 Darkened room for projection	Training Room

Black Abalone Plots

Establishing Plots

Fixed, permanently established plots approximately one to two square meters each are used for monitoring the size, movement, and abundance of black abalone.

Five such black abalone plots have been randomly selected at nine of the fifteen monitoring sites. These plots were chosen using the following guidelines:

- Each plot contained 30 to 100 black abalone
- Black abalone present are countable and measurable, i.e., no deep crevices
- Plot is high enough in the intertidal zone to allow sufficient time to work

Silicon bronze, hex head, 3/8 in. x 3 in. bolts are fused permanently in place with epoxy at corners such that a string around them will define the plot, and choosing high corner points for these bolts will make them easier to find in the future. Use a rechargeable hammer drill with a masonry bit to create a hole deep enough to bury at least one inch of the three inch bolt. Epoxy is pushed into the hole with the bolt and mounded up around the bolt and a pre-numbered brass tag is sealed in epoxy next to the upper left bolt (when viewed from the seaward side). The rechargeable hammer drill will make two to six holes per battery, depending on the rock.

NOTE: Careful descriptions, maps, and photographs should be taken to relocate plots during subsequent surveys. Distances and compass bearings between plots will help relocate plots should all four corners be missing. Distances and angles between bolts will help in determining plot area and reestablishing corners.

Equipment and Materials

For Plot Establishment and Repair

	LOCATION
1 5-gallon plastic bucket with lid	Closet
Two-part epoxy	Closet
1 Mixing bowl	Bucket
1 Mixing knife	Bucket
2 Paint scrapers	Bucket
2 Wire brushes	Bucket
1 Power drill w/extra batteries & drill bits	Closet
Silicon bronze, hex head 3/8" x 3" bolts, 4/plot	Closet
Brass pre-numbered tags	Closet
2 Star drills	Bucket
1 Hammer	Bucket
Tubing to blow drill dust from holes	Bucket

For Monitoring

1 5-gallon plastic bucket with lid	Closet
2 10-m lengths nylon or polypropylene line	Bucket
2 Caliper gauges	Bucket
1 Tape measure	Closet
2 Waterproof lumber crayon	Bucket
2 Clipboards and pencils	Workroom
Data sheets #5 and #6 for each site	Workroom
Maps and quadrat location data	Workroom
Pre-numbered brass tags	Closet
Stainless steel wire	Closet

Monitoring Black Abalone Plots

Personnel Required

Volunteers can be utilized to help with data recording and also help with measuring if shown the proper methods. Two people are essential; one to measure abalone and the other to record data. Do not assume that everyone knows the proper way to

measure abalone or even identify an abalone from a limpet!

The time requirements discussed in reference to the individual island sites are based upon a minimum crew of four people where abalone measurements and photoquadrats are performed simultaneously.

Physical ability is important because of the amount of hiking and difficulty of the terrain, particularly on San Miguel Island.

Plot Monitoring Methods

The number and sizes of black abalone are monitored twice a year when the photoquadrats are photographed. Black abalone have been tagged at sites on Anacapa, San Miguel, and Santa Rosa islands in cooperative studies with California Fish and Game. Tag numbers of these tagged abalone in the plots should be noted.

Monitoring plots are defined by string or nylon line around the four corner bolts. Using a caliper gauge, all black abalone inside or under the string are measured across the longest part of the shell. (The abalone are measured without removal from the rocks.) The sizes are noted by the recorder on Data Sheet #5. After measuring, the shell is marked with a waterproof crayon to avoid duplicating measurements. Because of irregularities in the rock, some abalone cannot be measured and are noted as such or a best estimate is given and noted on the data sheets with an approximate sign.

At sites with previously tagged abalone (Anacapa), a search is made for these individuals, including outside the plots, and their length and distance from the upper left bolt of the nearest plot is noted.

At Santa Rosa Island, East Point, a transect running between two mussel quadrats is used for abalone sampling. The transect runs from the bolt in upper right corner of photoquadrat #590, south 18 meters to the bolt in upper right corner of photoquadrat #593. Abalone within 1.5 meters of each side of the transect line are measured and recorded as noted above. (Note - The entire length of the transect is not used because of the difficulty measuring the abalone in the surge channel.)

Data collection on abalone condition began in 1987 because of observations of abalone decline and die-off. Shell measurements and total weights are taken from collected abalone. Empty shell data can be useful also. At present four conditions categories are used to measure abalone condition.

- Shell only
- Dead
- Healthy
- Unhealthy

The health of abalone are determined by their ability to attach to rock (unhealthy abalone are easily pulled off by hand). Activity and muscle size are also considered in the determination of health.

Fouling of the shell is observed and recorded using the following four subjective categories.

- Clean - no growth on the shell
- Light - only a small amount of barnacles or algae (<5% cover)
- Moderate - 5 to 30% cover
- Heavy - 30% or more cover or a large barnacle or growth that definitely affects the weight of the abalone

All pertinent abalone information should be recorded on Data Sheet #8.

Owl Limpet Plots

In 1987 owl limpet (*Lottia gigantea*) plots were established at several sites. At Johnson's Lee and Ford Point (Santa Rosa Island), bolts and numbered brass tags were set into the rock. Monitoring is accomplished by counting and measuring the owl limpets within a 0.5 m circle around the bolt. At Otter Harbor (San Miguel Island) owl limpets are counted in a abalone plot (#369) and in a 2-m wide transect between bolts 367 (upper left corner of abalone plot 367) and bolt 496 (installed for the transect) approximately 8 m to the west. At Crook Point (San Miguel Island) owl limpets are monitored in plots 391, 392, and 393. Owl limpet data are recorded on Data Sheet #5 (abalone density). The abalone data computer programs can be modified to accommodate the owl limpet data, but as of 1988 no data management program has been developed.

Sea Star Monitoring

Sea stars (*Pisaster ochraceus* and *P. giganteus*) should be counted in each abalone plot at all sites. Crook Point (San Miguel Island) is the only site that consistently has sea stars in the plots. A transect 20 m long and 2 m wide running along the outer reef near abalone plot 515 at Johnson's Lee on Santa Rosa Island is used to count sea stars, but a permanent transect has not been established. Any sun stars (*Pycnopodia heliathoides*) should be noted at sites. General observations on sea stars are also helpful. Sea star counts are recorded on Data Sheet #5 (abalone density).

DATA MANAGEMENT

Photoquadrat Data

Introduction

All programs and data files are on hard disk on the resource management Sperry computer. Backups of both programs and data files should be on floppy diskettes in that area. After data is entered and checked for accuracy new backup copies should be made. The programs are written to be as user friendly as possible, however basic computer knowledge is a must as is some general familiarity with dBase III and SPSS/PC+ programs since detailed steps require constant changes with new program editions.

dBase III Plus is used for data management of the photoquadrat data. For summarizing the data and generating reports, the statistical software package SPSS/PC+ is used. Once the data is entered into dBase III files, the SPSS/PC+ translate program is used to translate the dBase III data file into an SPSS file. SPSS programs are then used to summarize the data and create a report.

dBase III Plus file structure for photoquadrat data:
(all fields are numeric)

Field # & Name	Width	Comments
1 Station	2	Location code number
2 Year	2	Last two digits of the year
3 Month	2	Month number (1-12)
4 Quadrat	3	Quadrat number
5 Bare Rock	3	Percent cover*
6 Acorn Barnacle	3	Percent cover*
7 Turf Weed	3	Percent cover*
8 Rock Weed	3	Percent cover*
9 Mussel	3	Percent cover*
10 Red Algal Turf	3	Percent cover*
11 Misc. Algae	3	Percent cover*
12 Misc. Animals	3	Percent cover*
13 Sand	3	Percent cover*

*as determined from random point contact

One dBase III file contains all the intertidal photoquadrat data for all years, and is stored on the hard disk under C: PHOTO.DBF

Entering Data and Updating Existing Files

The programs discussed in this section (PHOTO.TRN, PHOTO.RPT, PHOTO.TAB, ABS.RPT, and ABSHELL.RPT) are included in Appendix D.

Enter dBase III, once at the dot, type the commands:

- . use c:PHOTO.DBF
[accesses file]
- . append from c:TIDEBLK.DBF
[adds 60 blank records to the file]
- . locate for station = 0
[locates the first record of the station (blank files)]
- . replace next 20 station with ____
[enter location code for the station you are entering]
- . go ____
[enter record number of the first record for that station given with the third command]
- . replace next 20 month with ____
[enter month for data you are entering]
- . go ____
[same as fifth command]
- . replace next 20 year with ____
[enter year for data you are entering]
- . go ____
[same as fifth command]
- . browse
[puts you in the data base file at the first record for that station]

You can now move over to the quadrat column and start entering data. Use the photoquadrat score sheets for data entry. If a species is not used in scoring, enter 999 (Use the replace command).

Make sure that you close the file when you are done editing. To do this enter the following commands

Press Ctrl End

[Exits and saves file]

. Close all

[Closes all data bases]

Data Analysis and Report Making with SPSS/PC+

Enter SPSS and the \TIDEPOOL subdirectory.

Run PHOTO.TRN, by typing **INCLUDE PHOTO.TRN** at the SPSS command, which translates the dBase file into an SPSS file labeled PHOTO.SYS. This program also calculates the percent cover from the total number of points scored, creates visible labels and sorts the data by station, then by year, before saving to PHOTO.SYS. This program only needs to be run after changes are made to the dBase file. All records are stored in this file so all reports can be printed using PHOTO.SYS.

To print a report, call up PHOTO.RPT. This program uses PHOTO.SYS and creates a report broken into zones by year and month with summaries of the mean abundance of the replicate quadrats for each taxa, the standard deviation and total number of points scored. The reports will have titles with the station names but changes will have to be made for each report. Changes to the program will not be saved unless you write the program to a file.

Changes that must be made for each report are:

(1) Replace *** with appropriate quadrat numbers at each SELECT IF statement in the second half of the program. Quadrat numbers are given in the comments immediately below the select statement.

(2) Replace station name and table number in title. Table numbers are given in the comments below quadrat numbers.

(3) If reporting Landing Cove, Santa Barbara Island, additional changes need to be made to the turfweed report. Replace PENDO with PTURF, and replace PMISCALT with PMISCAL in VARIABLES statement, SUM=MEAN statement, and SUM=STDEV statement. Replace TURFWEED ZONE in the title with RED-ALGAL TURF ZONE.

These changes are temporary and are not saved.

Because of the experimental quadrats at Cat Rock, West Anacapa Island, a separate program has been written. WAICR.RPT will print a report for Cat Rock, no changes are needed for the printout.

Review the output in the upper window of SPSS review. Block and write the table to a temporary file to print out.

Tables can also be created using PHOTO.TAB. This program also uses PHOTO.SYS created by translating the dBase file. Call up the file to make the changes listed in the first comments statement. The output will be saved to a diskette in the B: drive and no further editing should be necessary. As of August 1988, this program still has a minor bug or two and will not separate experimental treatments at WAICR.

Abalone Data

The raw intertidal abalone data is all stored and processed using SPSS/PC+. At present all data and programs are in the TIDEPOOL directory on the hard disk of the resource management Sperry computer with backup files on floppy diskettes. All data is entered using the REVIEW editor in SPSS. Data entry and reporting are straight forward, however the operator should be familiar with SPSS first, as it is impossible to give all the details in the instructions here.

From the main menu enter SPSS and then the tidepool subdirectory. Once in SPSS call the file you need in order to enter data or print reports.

Entering Data

SPSS file structure for abalone data

<u>Field Name</u>	<u>Columns</u>
Station	1-2
Month	4-5
Year	6-7
Plot 1	9-11
Plot 2	13-15
Plot 3	17-19
Plot 4	21-23
Plot 5	25-27

See the report program for the station code numbers. The following are the black abalone data files in the TIDEPOOL directory:

SBIABS.DAT = SBI SEA LION ROOKERY
SRIABS.DAT = SRI FORD POINT
SRIJABS.DAT = SRI JOHNSONS LEE
SRIEPABS.DAT = SRI EAST POINT
SRINWABS.DAT = SRI TALCOT
SMIHABS.DAT = SMI HARRIS POINT
SMICPABS.DAT = SMI CROOK POINT
SMIOHABS.DAT = SMI OTTER HARBOR
WAIABS.DAT = WAI CAT ROCK
MAIABS.DAT = MAI HARBOR SEAL ARCH

Enter the station number in the first two columns, the date in columns 4-8, followed by the data in millimeters for each of the five plots. The plots are set up in the file with lowest to highest plot number, left to right. Since some plots have been renumbered because of tag replacement, refer to the original plot number for entry sequence (the actual plot number is not entered into the data file). The station and date can be entered once and copied for efficient data entry. After entering station and date, block the line (F7) and copy it (F8) for as many new entries as you wish to make. Enter one plot at a time, moving about with the arrow keys. Save the file, after checking the numbers, by writing it to the disk (F9). At this point you will still be in the same file and can continue to edit or append data or you can exit SPSS or go to another file. If you do not save the file the program will ask if is OK to discard when you try to leave the file. Save it or you will be reentering the data. At this point continue to edit or append the same data file, or press F10 to leave SPSS, or press F3 to go to another program.

Report Program

Calling up \TIDEPOOL\ABS.RPT brings up the file defining variables in the data files and creating the report. The report gives summary information on totals for each plot and for the station as well as the percentage breakdown of size classes, mean, maximum, and minimum sizes. Comments in the report give the information needed for plot numbers and station codes. When printing a final report, a few changes need to be made in the program. On the first line the data file name should be changed to the appropriate name. The plot numbers must also be changed. (For Santa Rosa Island, East Point, label Quad 1 as Transect, delete the other plots from the

variable list in the report command, and make the label 8 spaces long--do not forget to move the period!). The only other change is the station title. Change Table # for output file and title.

Run the file (F10). Changes should not normally be saved. There is an additional section in this program which will produce a histogram of size frequencies. This histogram can be produced at the same time as the other data, or left off and run at a later date.

The report OUTFILE will be saved to a file on the B drive with the name of the table (e.g. Table 20.RSL) so be certain to have a diskette in the B drive. Further editing of the report can be done in a word processing program. To examine the report without saving it to a diskette, just delete the SAVE OUTFILE line, and run the report.

Weight Measurement Data

Data on black abalone size and condition are entered into a dBase III file called ABSHELL.DBF. Regression analysis of the data is run from an SPSS/PC+ program named ABSHELL.RPT.

dBase III Plus file structure for plot data (all fields are character fields)

Field # & Name	Width	Comments
1 Station	2	Station code
2 Condition	1	Condition code ¹
3 Weight	3	Weight (g)
4 Length	3	Length (mm)
5 Width	3	Width (mm)
6 Volume	3	Volume (ml)
7 Fouling	1	Fouling code ²

¹ [condition code: 1 = empty shell, 2 = healthy animal, 3 = moribund, 4 = dead]

² [fouling code: 0 = clean, 1 = light, 2 = moderate, 3 = heavy]

Enter dBase III; once at the dot, type the commands:

. use c:ABSHHELL.DBF
[accesses file]

- . append from c:SHELBLK.DBF
[this adds 60 blank records to the file]
- . locate for station = 0
[this locates this first record of the station (blank files)]
- . replace next __ station with __
[enter station location code]
- . go __
[enter record number of the first record for that station given with the third command]
- . replace next __ month with __
[enter month of data being entered]
- . go __
[same as fifth command]
- . replace next __ year with __
[enter year of data]
- . go __
[same as fifth command]
- . browse
[to obtain the data base file that is the first record for that station]

Now move over to the weight column and start entering data. Use the black abalone size and condition sheets for data entry.

Make certain the file is closed when editing is complete. To do this enter the following commands:

- Press Ctrl End [Exits and saves file]
- . Close all [Closes all data bases]

To run a regression curve with this data, enter SPSS, call up ABSHELL.RPT. If new data was entered into the dBase file since the last translation, run the entire program by blocking and running it. If no changes have been made to the dBase file, just run the file from GET FILE='ABSHELL.SYS' statement to the end. Adjust SELECT IF statements as necessary.

REFERENCE LIST

- Abbott, I. A. and G. J. Hollenberg. 1976. Marine algae of California. Stanford University Press, Stanford CA. 827 pp.
- Foster, M.S., A. P. DeVogelaere, C. Harrold, J. S. Pearse, and A. B. Thum. 1986. Cases of spatial and temporal patterns in rocky intertidal communities of central and northern California. Prepared for the Minerals Management Service, U.S. Dept. of Interior by Kinnetic Laboratories, Inc. in association with Moss Landing Marine Laboratories under Contract No. 14-12-0001-30057. Vols. 1 and 2. OCS Study MMS 85-0049. 126 pp.
- Hardin, D., L. Kiguchi, C. Harrold, A. DeVogelaere. 1986. Study of the rocky intertidal communities of central and northern California. Year 1. Minerals Management Service. Contract No. 14-12-0001-30057. Los Angeles, CA. 448 pp.
- Morris, R. H., D. P. Abbott, and E. C. Haderlie. 1980. Intertidal invertebrates of California. Stanford University Press, Stanford, CA. 690 pp.
- Smith, R. I. and J. T. Carlton (eds.) 1975. Light's Manual: Intertidal invertebrates of the central California coast. Third edition. University of California Press, Berkeley. 416 pp.
- VTN Oregon, Inc. 1983. Visitor impact and recovery on Channel Islands tidepools: Final report. National Park Service, Contract No. CX 8000-1-0054, Ventura, CA. 80 pp.
- VTN Oregon, Inc. 1984. Visitor impact on tidepools, field and laboratory handbook. National Park Service, Contract No. CX 8000-1-0054, Ventura, CA. 26 pp.

APPENDIX A. Location of Rocky Intertidal Monitoring Sites.

The following maps indicate the general locations of monitoring sites on each island. The island maps are followed by a series of specific drawings that indicate locations of photoquadrats and plots within each site. Data locating the photoquadrats and plots (bearings and distances between quadrats) are found in Appendix C.

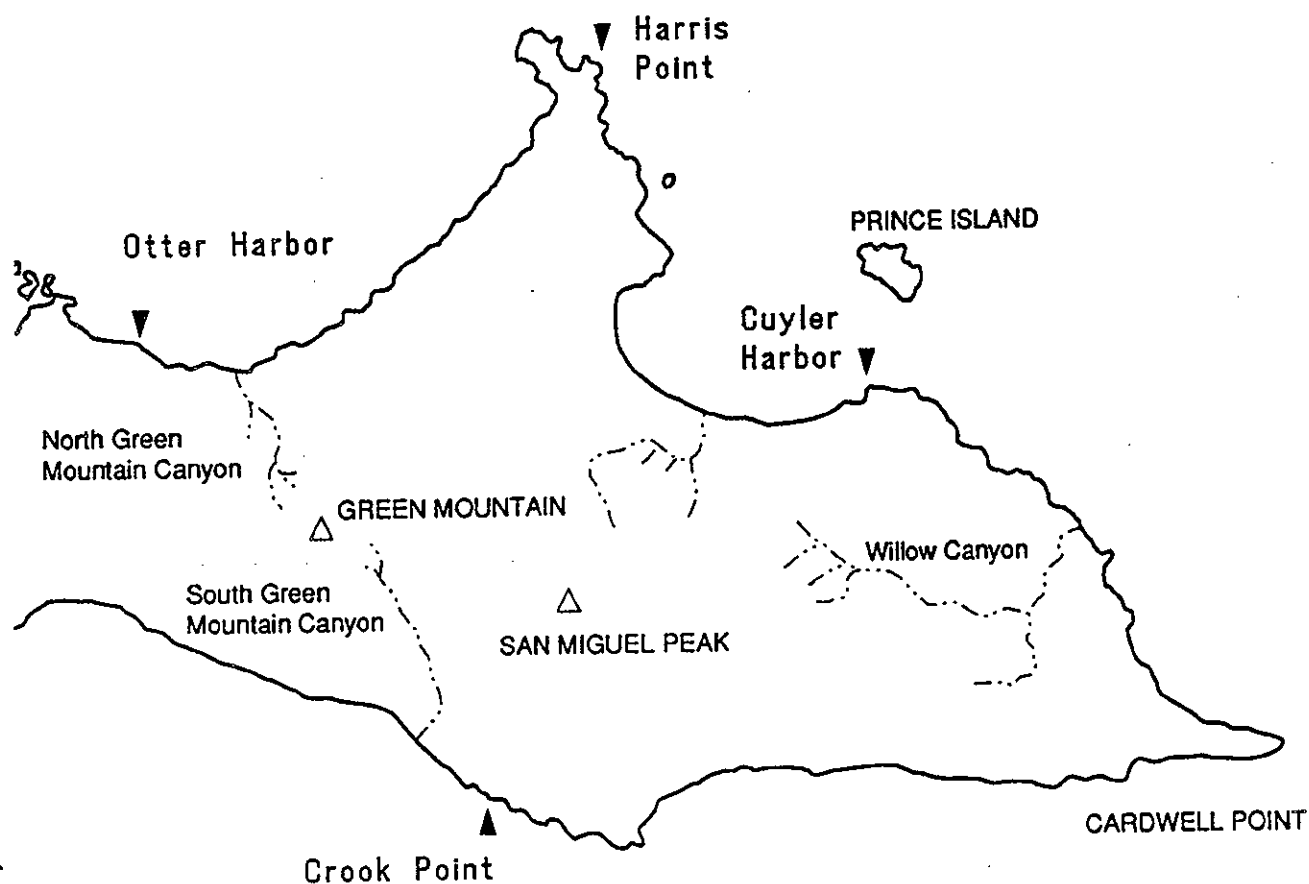


Figure A - 1. **SAN MIGUEL ISLAND**

Intertidal Monitoring Sites

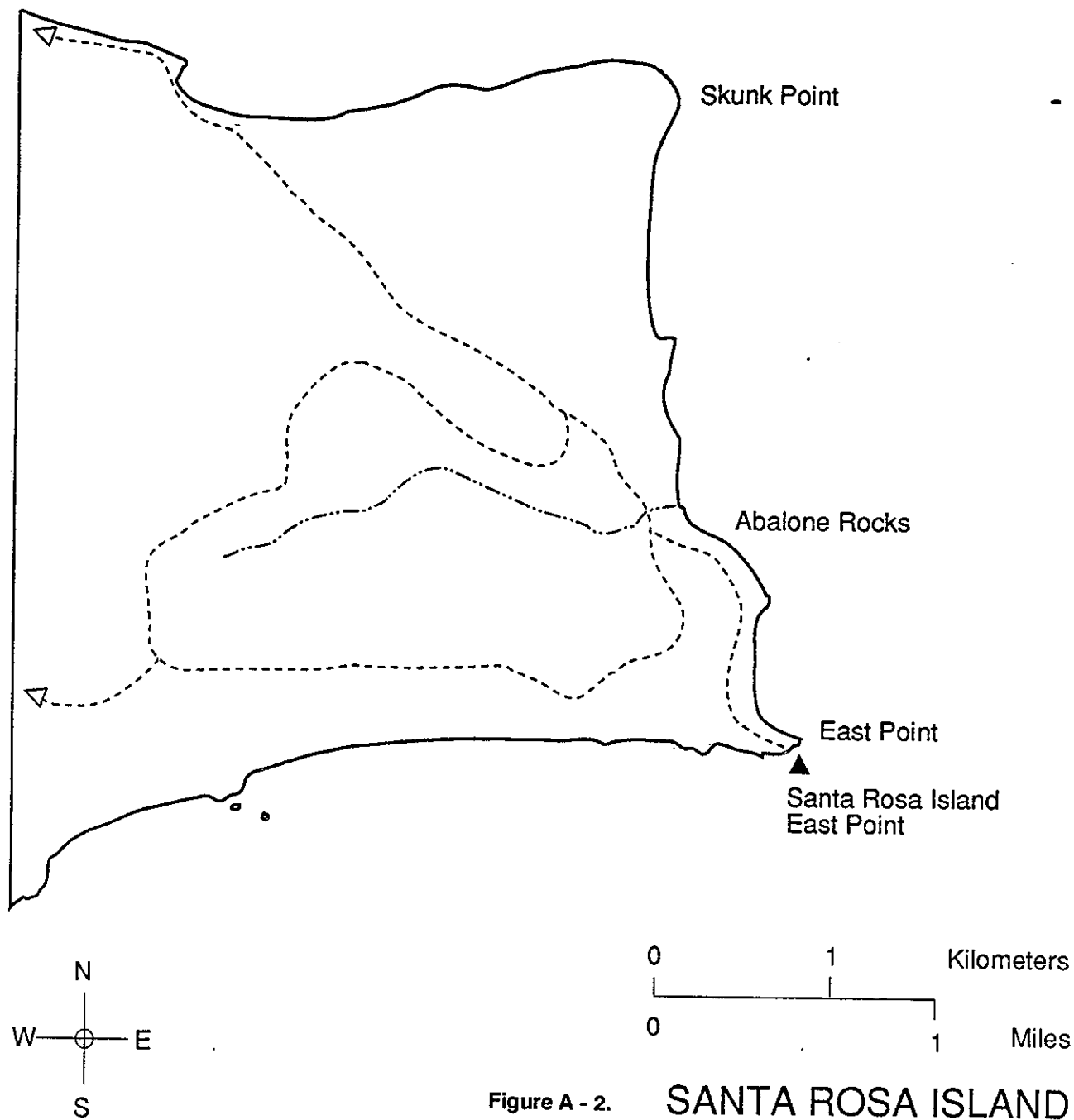


Figure A - 2.

SANTA ROSA ISLAND

Intertidal Monitoring Sites

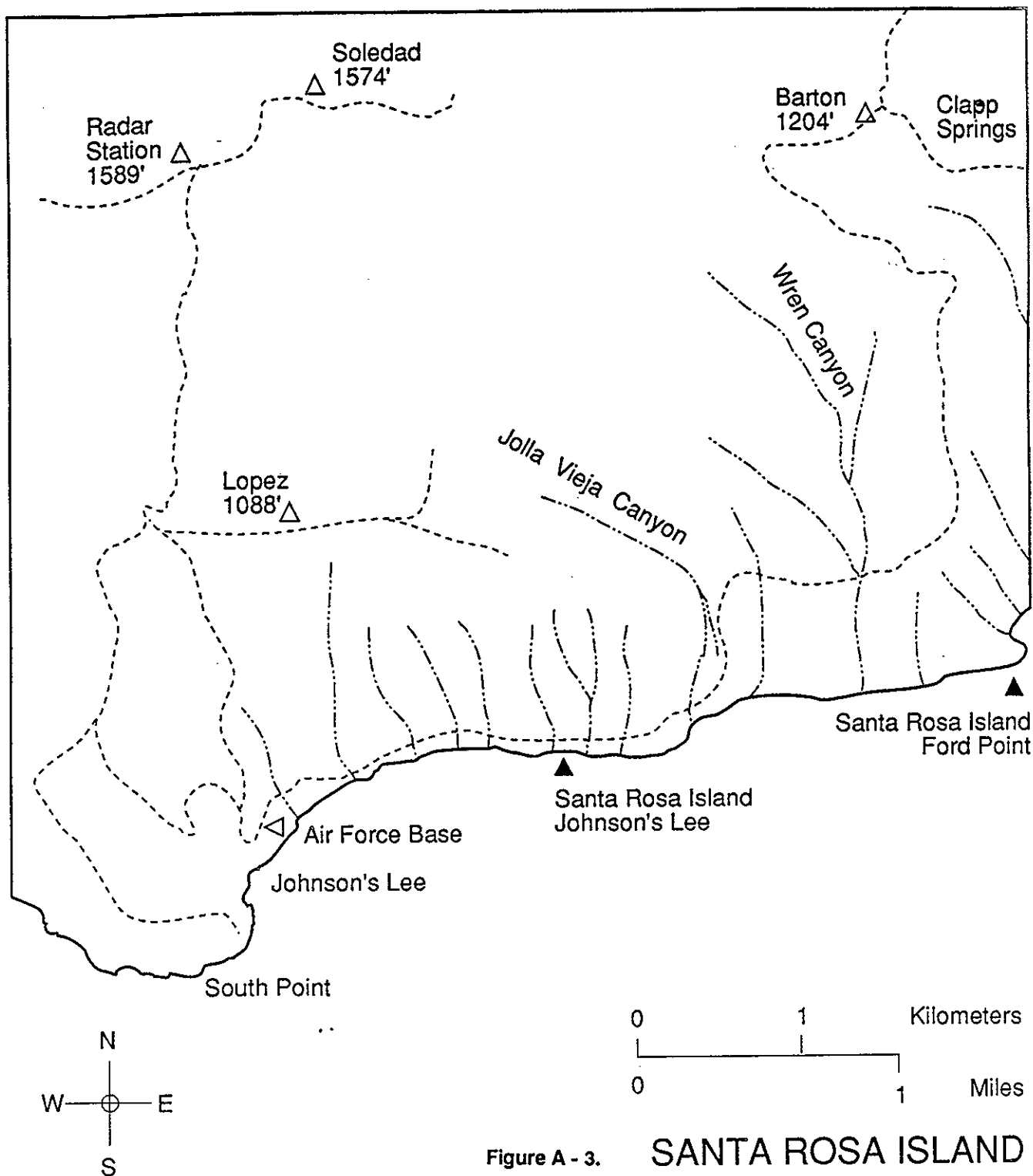


Figure A - 3. SANTA ROSA ISLAND
Intertidal Monitoring Sites

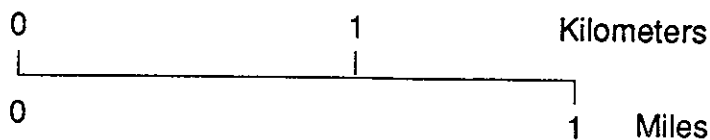
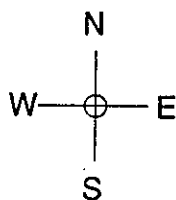
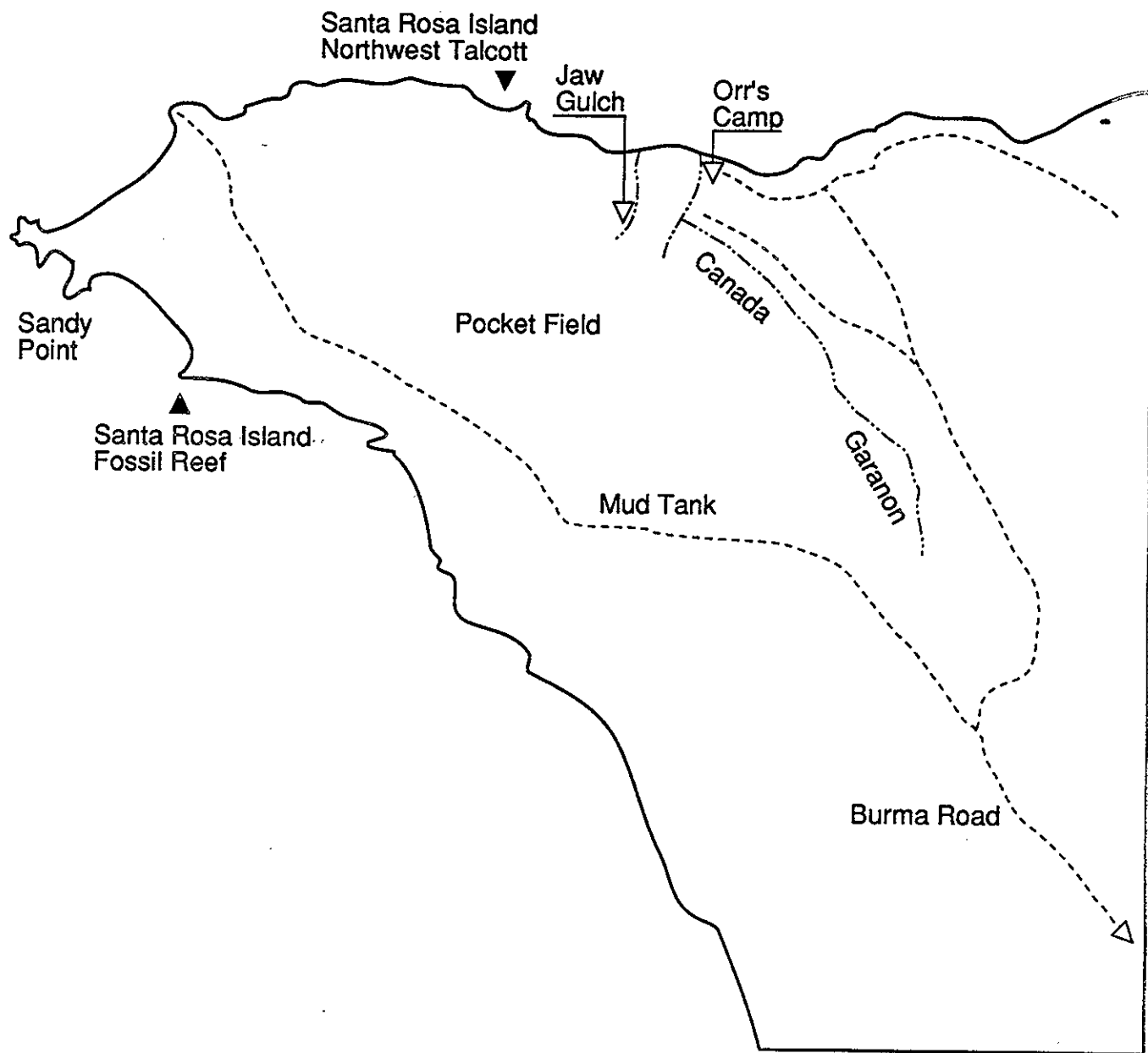


Figure A - 4. SANTA ROSA ISLAND
Intertidal Monitoring Sites

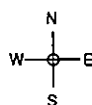
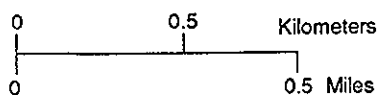
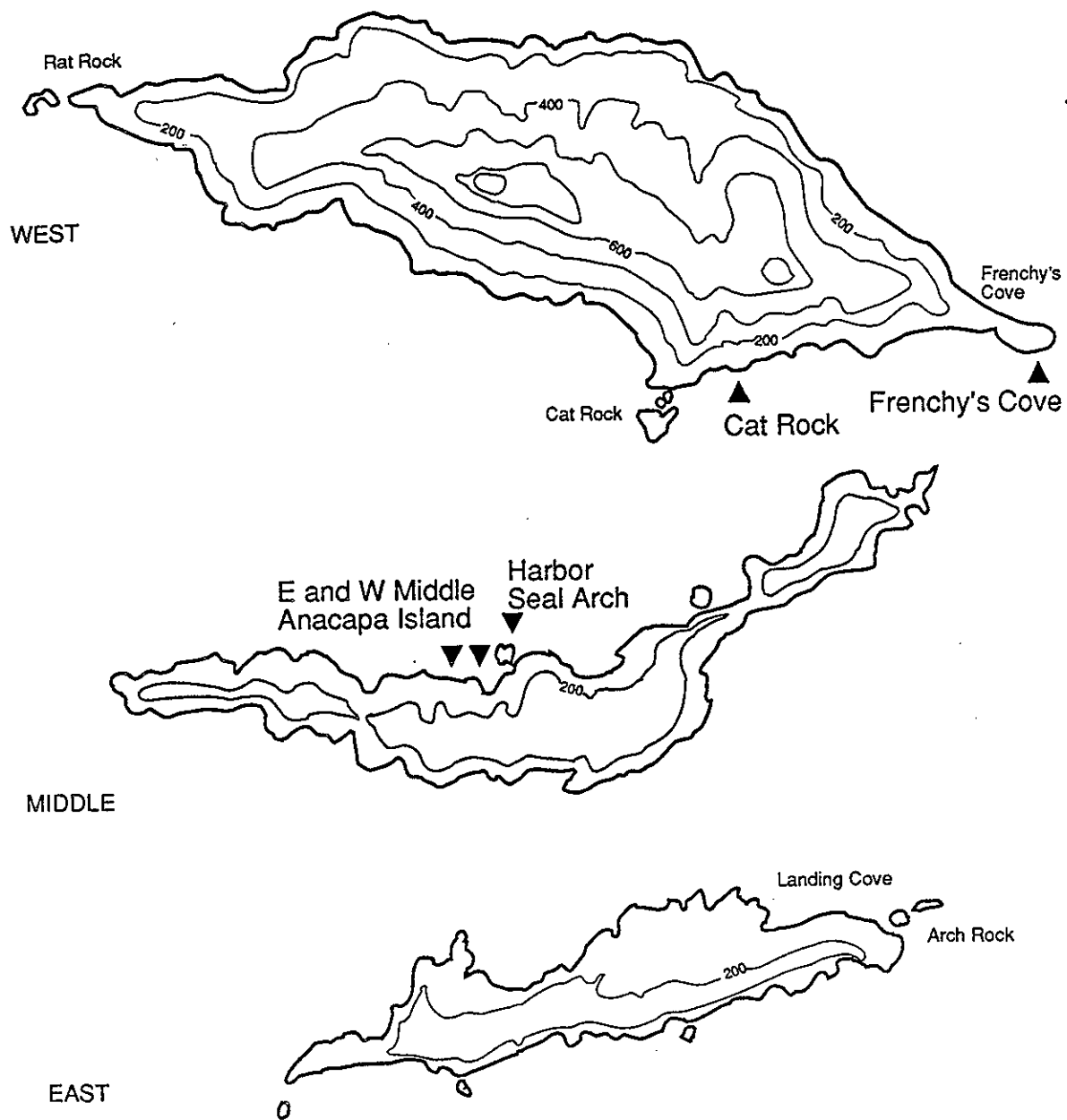
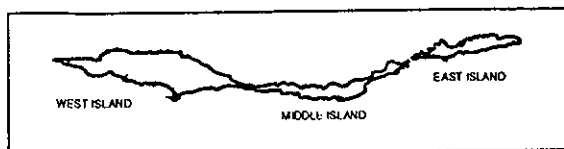


Figure A - 5. ANACAPA ISLAND

Intertidal
Monitoring Sites



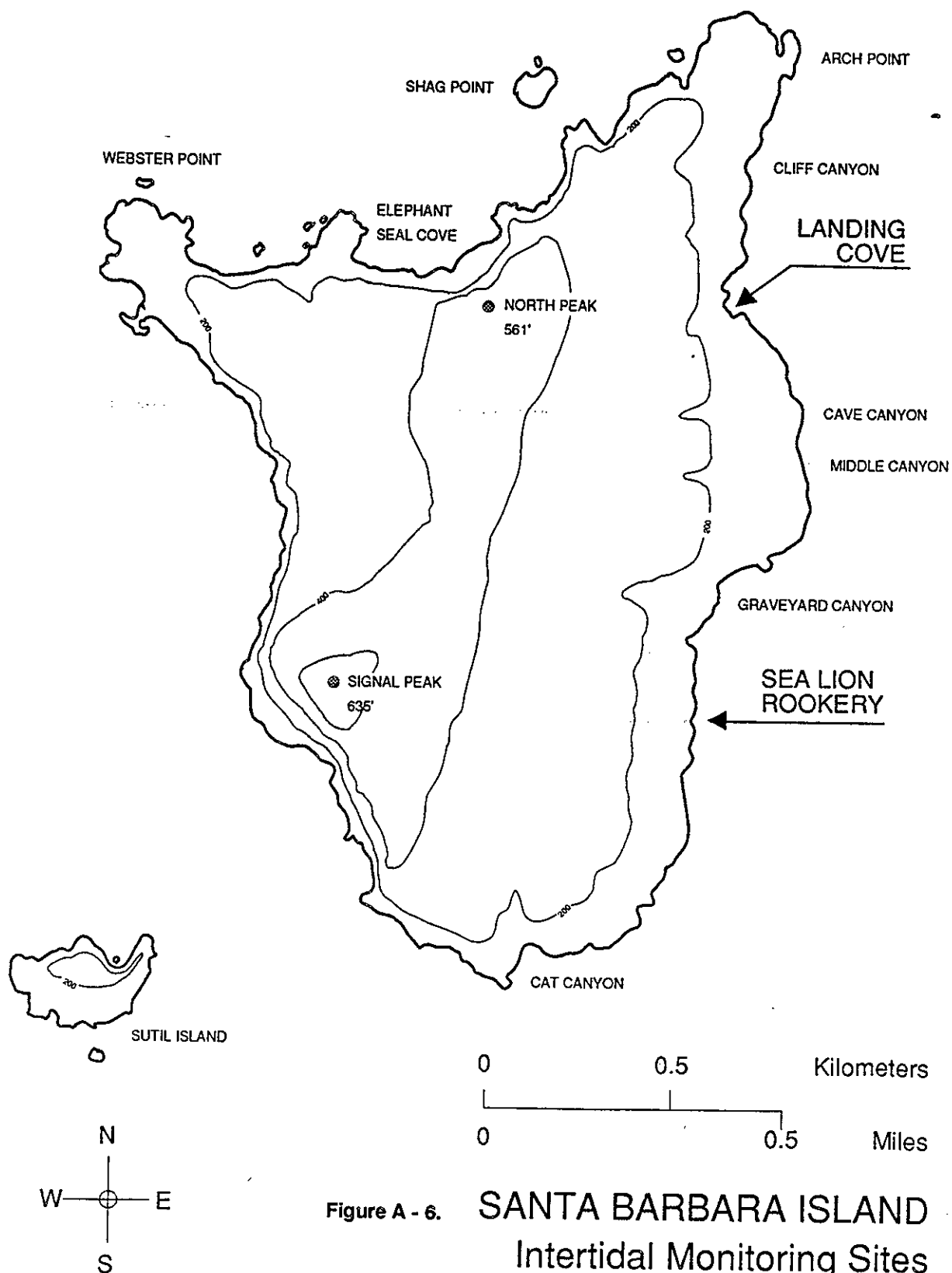
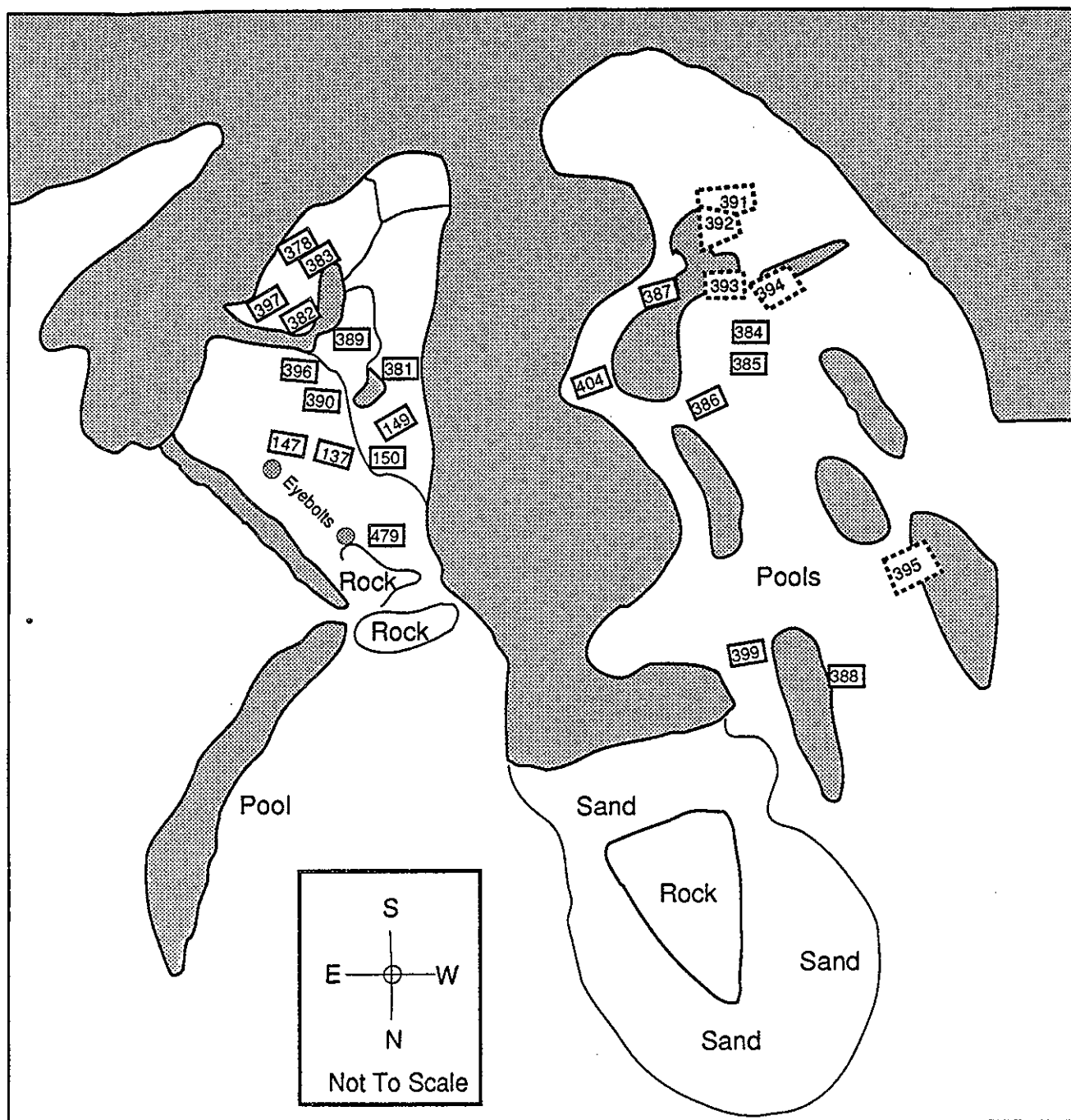


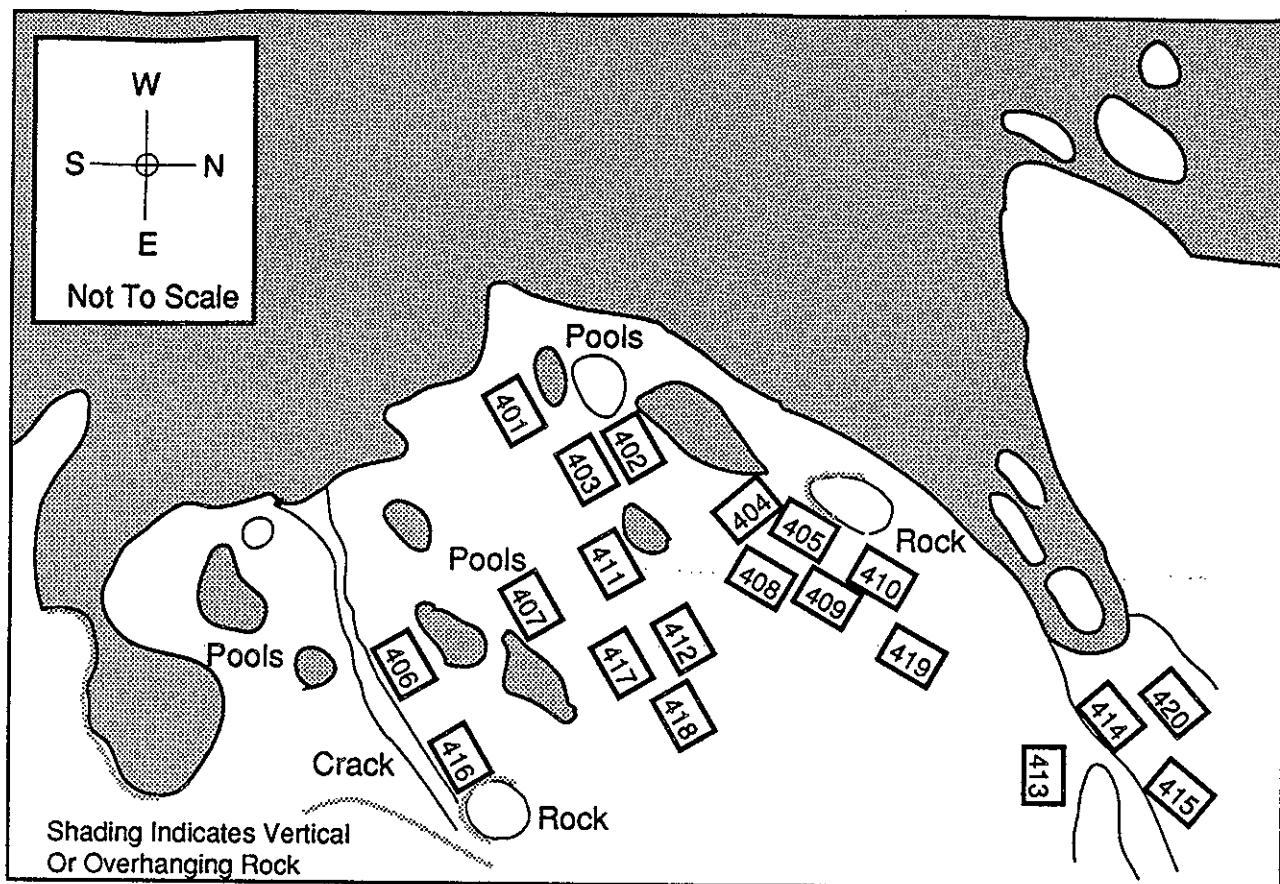
Figure A - 6. SANTA BARBARA ISLAND
Intertidal Monitoring Sites



QUADRAT NUMBERS

	Barnacle	137 - 150, 479
	Endocladia	386 - 390
	Mussel	381 - 385
	Rockweed	396 - 400
	Abalone Plots	391 - 395

Figure A - 7. **SAN MIGUEL ISLAND**
Crook Point
Intertidal Monitoring Site
 Established March 1985



QUADRAT NUMBERS



Barnacle	416 - 420
Endocladia	411 - 415
Mussel	401 - 405
Rockweed	406 - 410

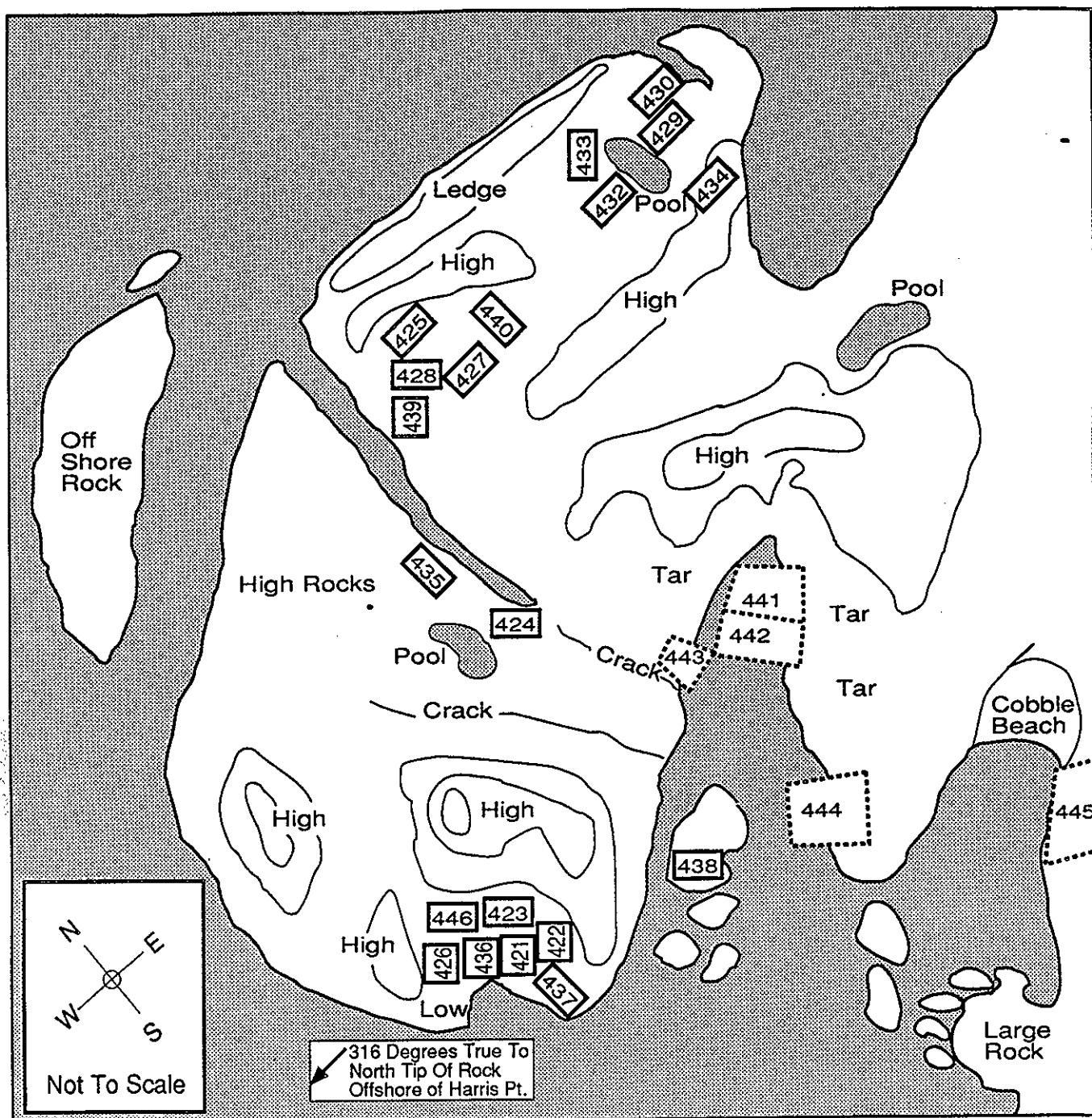
Figure A - 8.

SAN MIGUEL ISLAND

Cuyar Harbor

Intertidal Monitoring Site

Established April 1985



QUADRAT NUMBERS

	Barnacle	436 - 440
	Endocladia	431 - 435
	Mussel	426 - 430
	Rockweed	421 - 425
	Abalone Plots	441 - 445

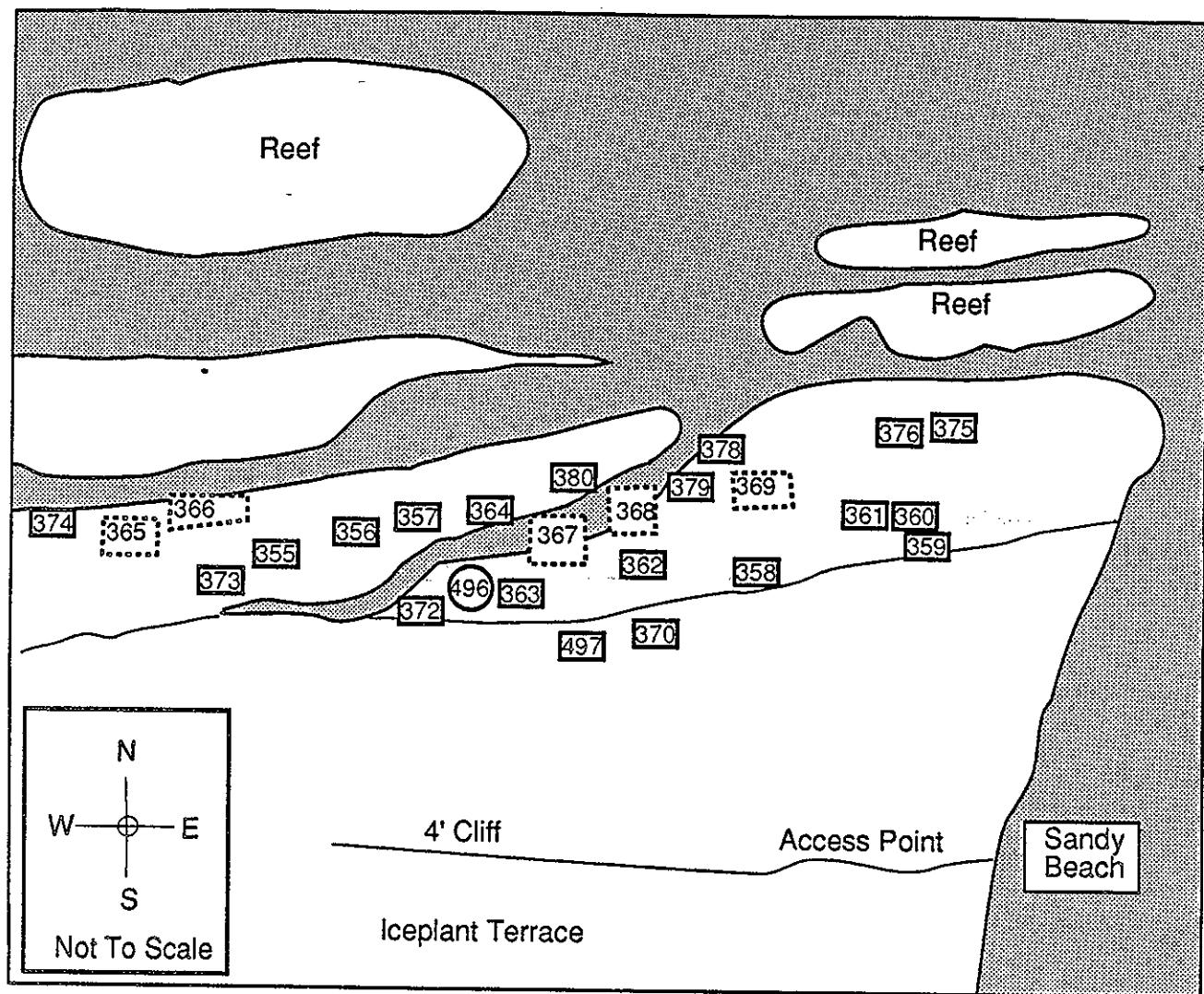
Figure A - 9.

SAN MIGUEL ISLAND

Harris Point

Intertidal Monitoring Site

Established April 1985



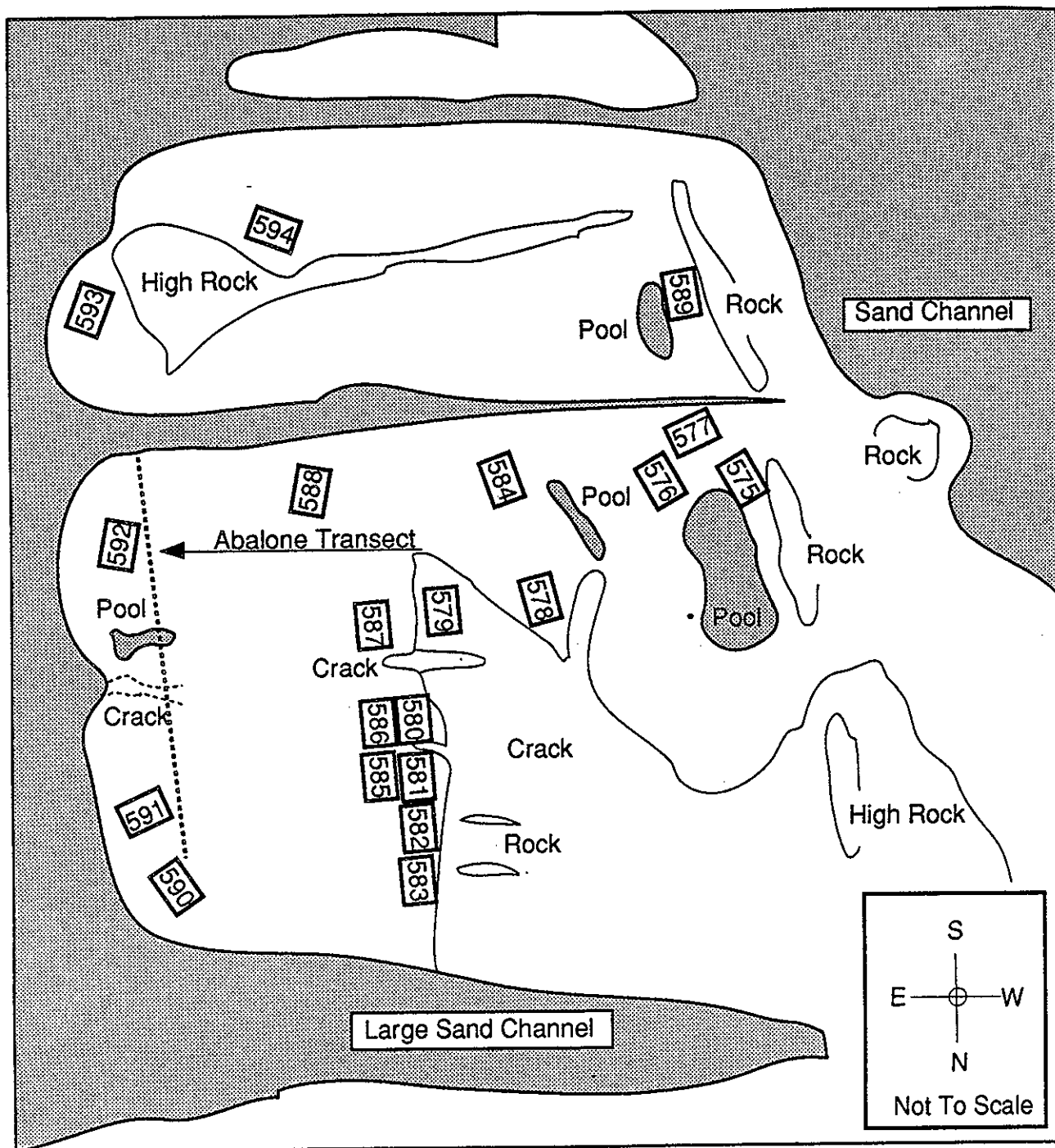
QUADRAT NUMBERS

	Barnacle	370 - 374, 497
	Endocladia	360 - 364
	Mussel	375 - 380
	Rockweed	355 - 359
	Abalone Plots	365 - 369
	Lottia	496 Bolt For Transect

Figure A - 10. SAN MIGUEL ISLAND

Otter Harbor
Intertidal Monitoring Site

Established March 1985



QUADRAT NUMBERS



Barnacle
Endocladia
Mussel

575 - 579
580 - 584
590 - 594

Bolt in upper right corner
of mussel quadrats

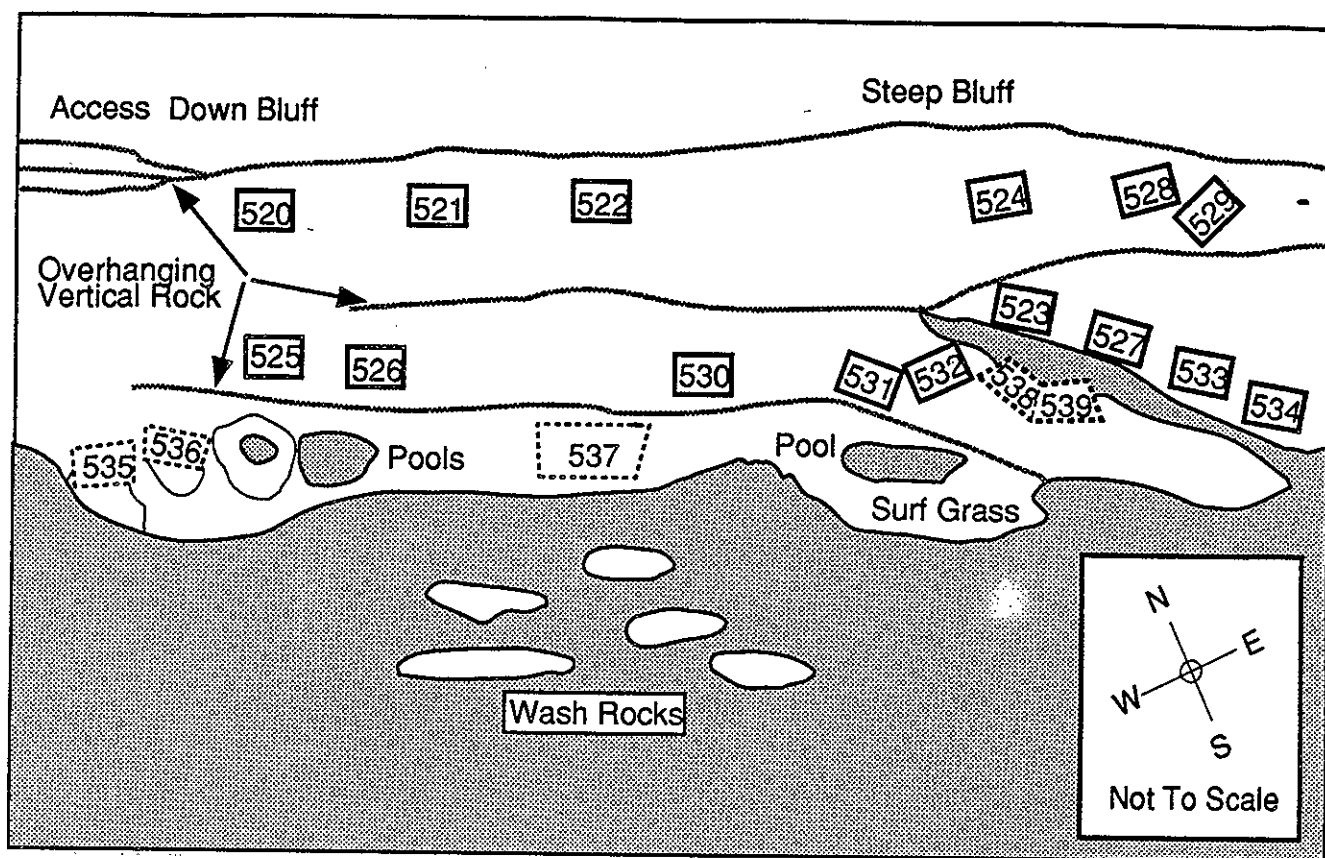
Rockweed

585 - 589

Figure A - 11.

SANTA ROSA ISLAND East Point Intertidal Monitoring Site

Established December 1986



QUADRAT NUMBERS

	Barnacle	520 - 524
	Endocladia	525 - 529
	Mussel	530 - 534
	Abalone Plots	535 - 539

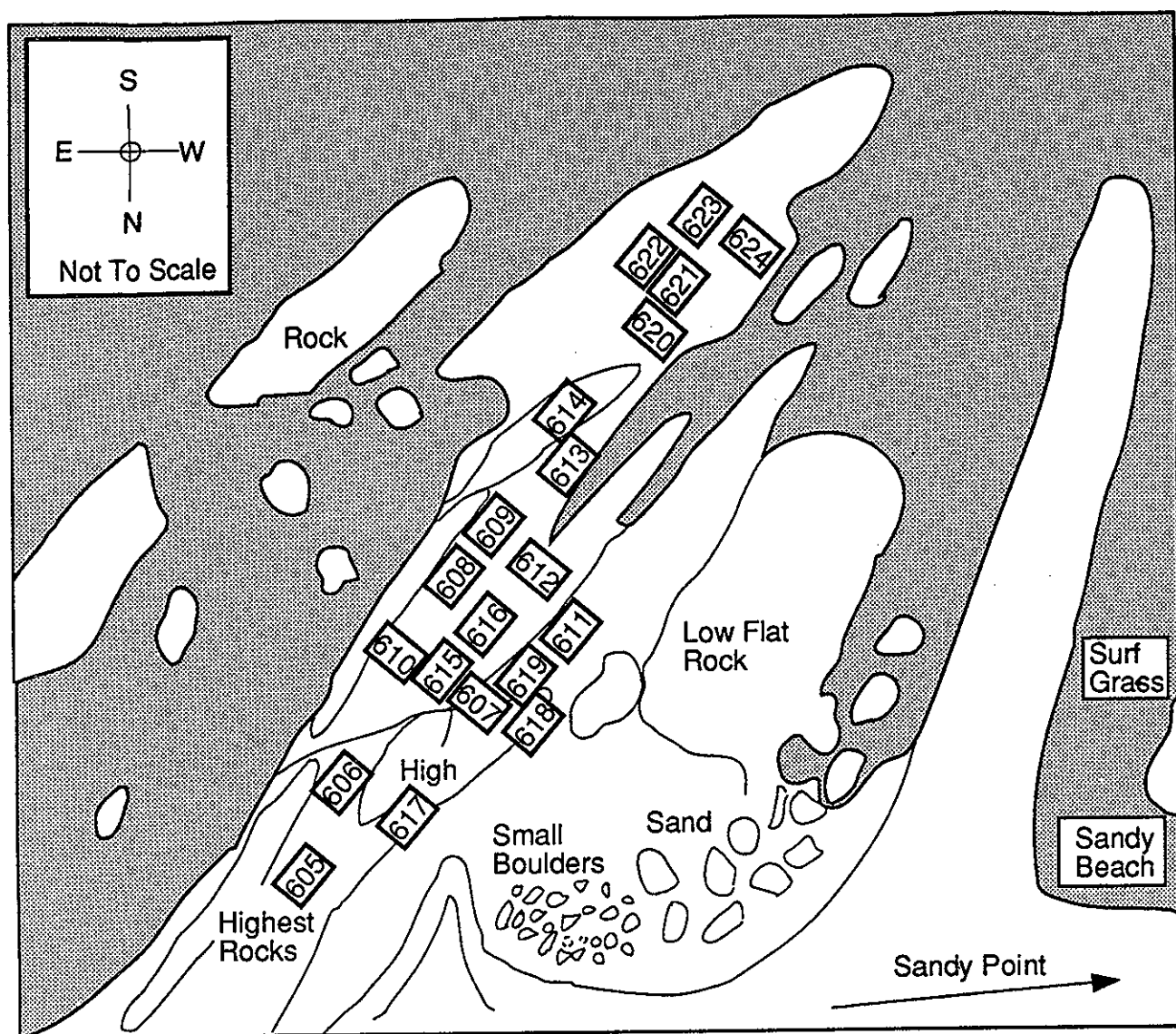
Figure A - 12.

SANTA ROSA ISLAND

Ford Point

Intertidal Monitoring Site

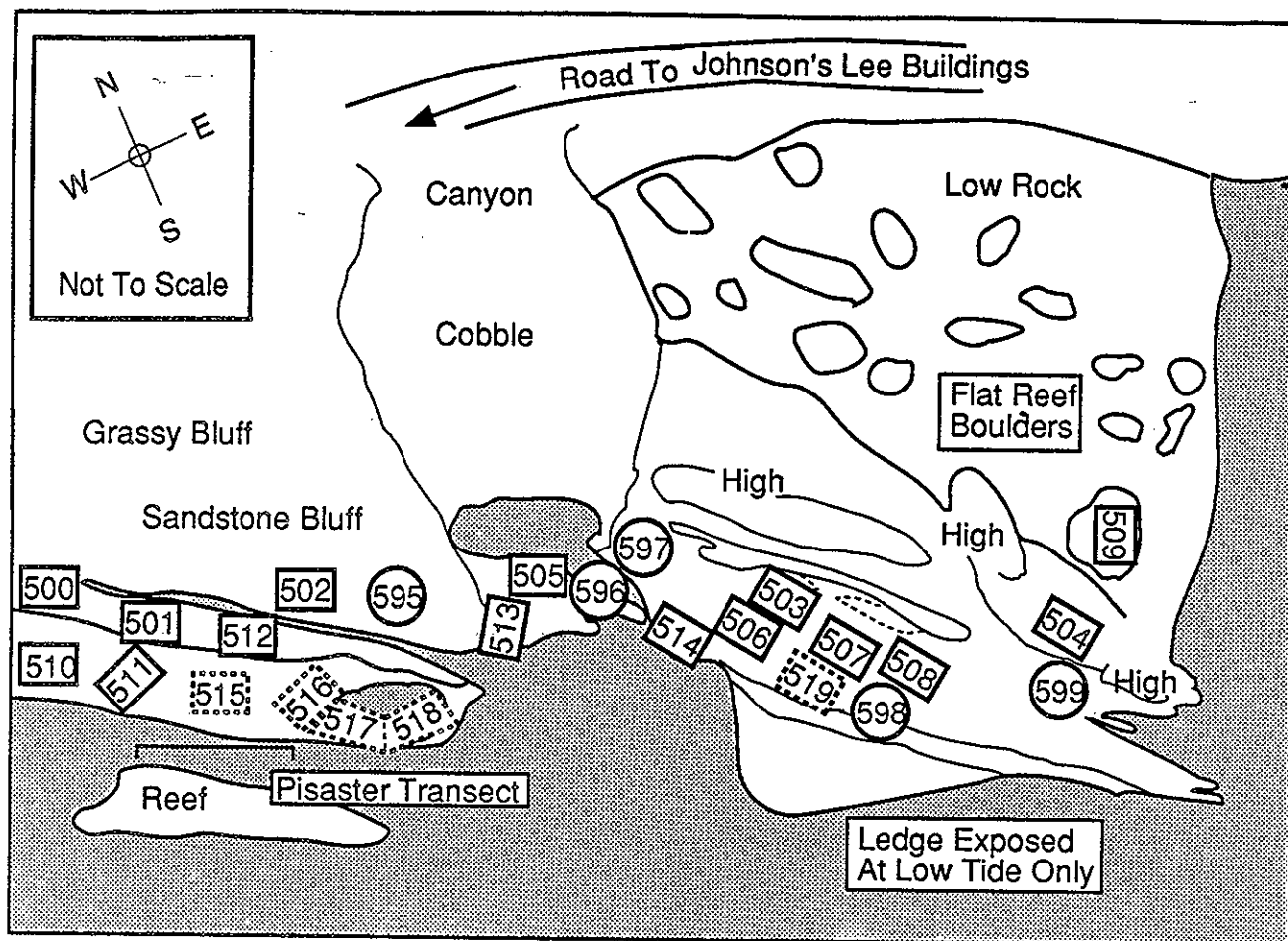
Established December 1985



QUADRAT NUMBERS	
	Barnacle 605 - 609
	Endocladia 610 - 614
	Mussel 620 - 624
	Rockweed 615 - 619

Figure A - 13. SANTA ROSA ISLAND
Fossil Reef
Intertidal Monitoring Site

Established March 1988



QUADRAT NUMBERS

	Barnacles	500 - 504
	Endocladia	505 - 509
	Mussel	510 - 514
	Abalone Plots	515 - 519
	Lottia	595 - 599 One Bolt Only

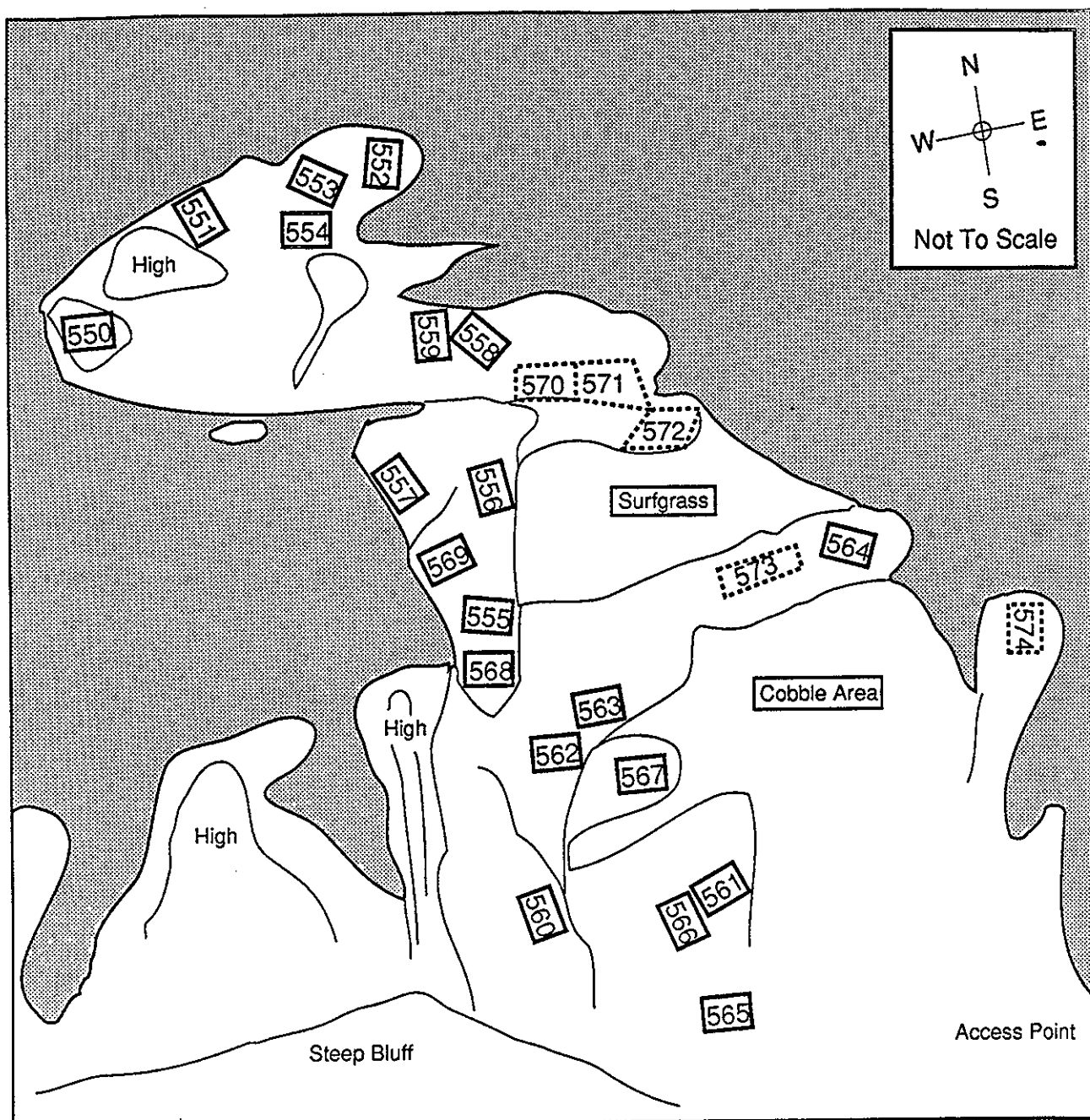
Figure A - 14.

SANTA ROSA ISLAND

Johnson's Lee

Intertidal Monitoring Site

Established December 1985



QUADRAT NUMBERS



Barnacle 560 - 564
 Endocladia 555 - 559
 Mytilus 550 - 554
 Rockweed 565 - 569



Abalone Plots 570 - 574

Figure A - 15.

SANTA ROSA ISLAND Northwest Talcott Intertidal Monitoring Site

Established November 1986

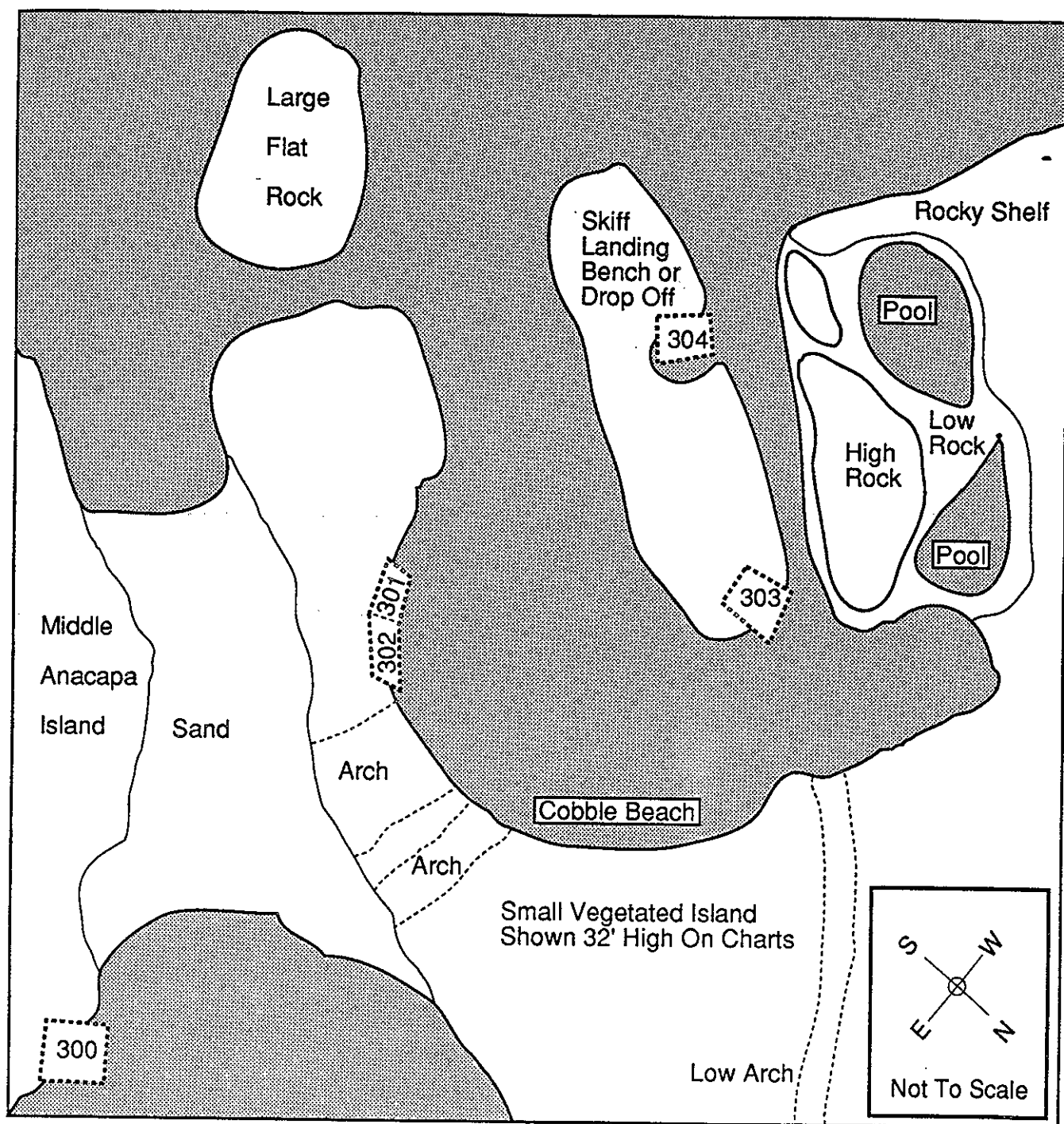
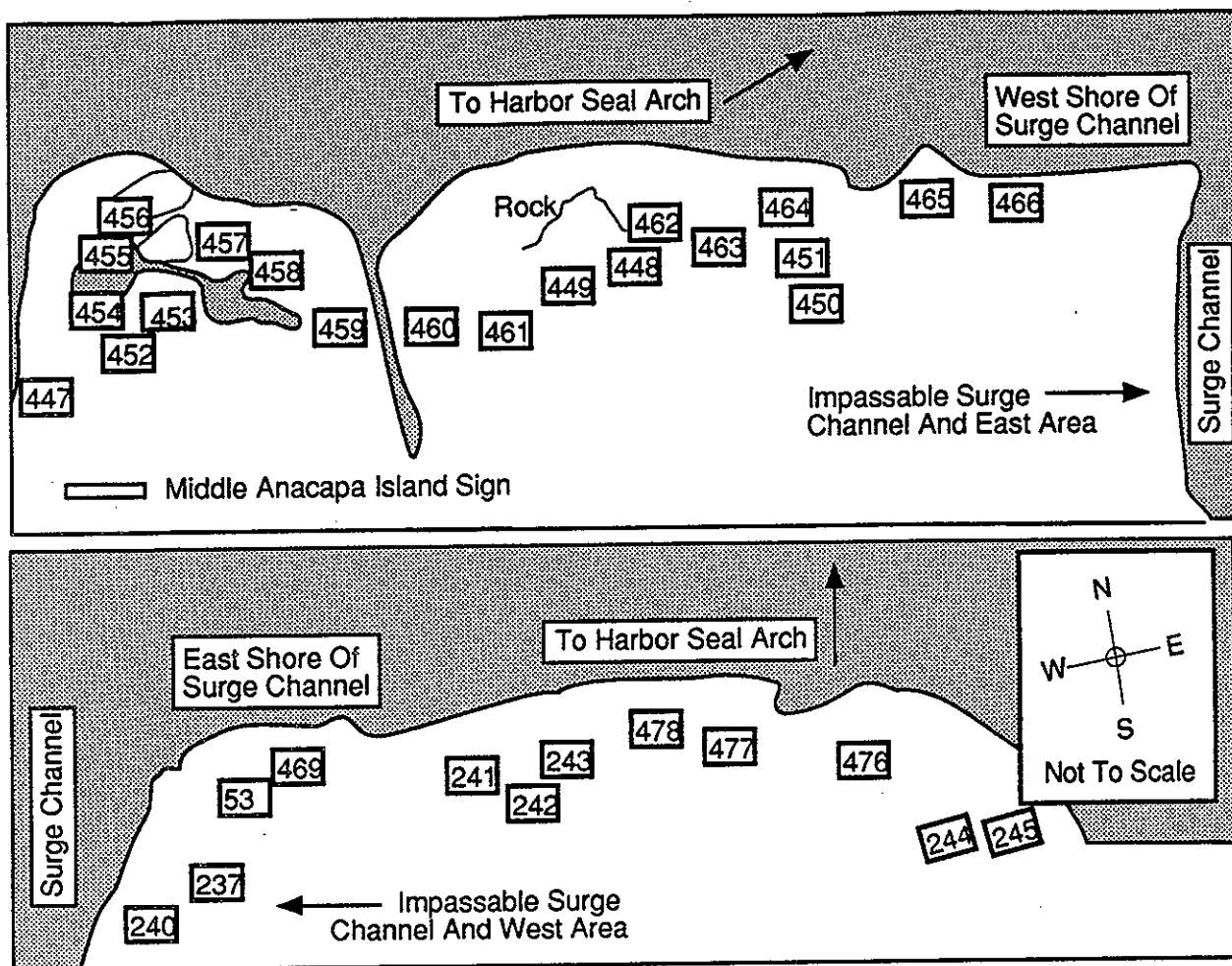


Figure A - 16. **ANACAPA ISLAND**
Harbor Seal Arch
Intertidal Monitoring Site
 Established March 1985

 Abalone Plots 300 - 304

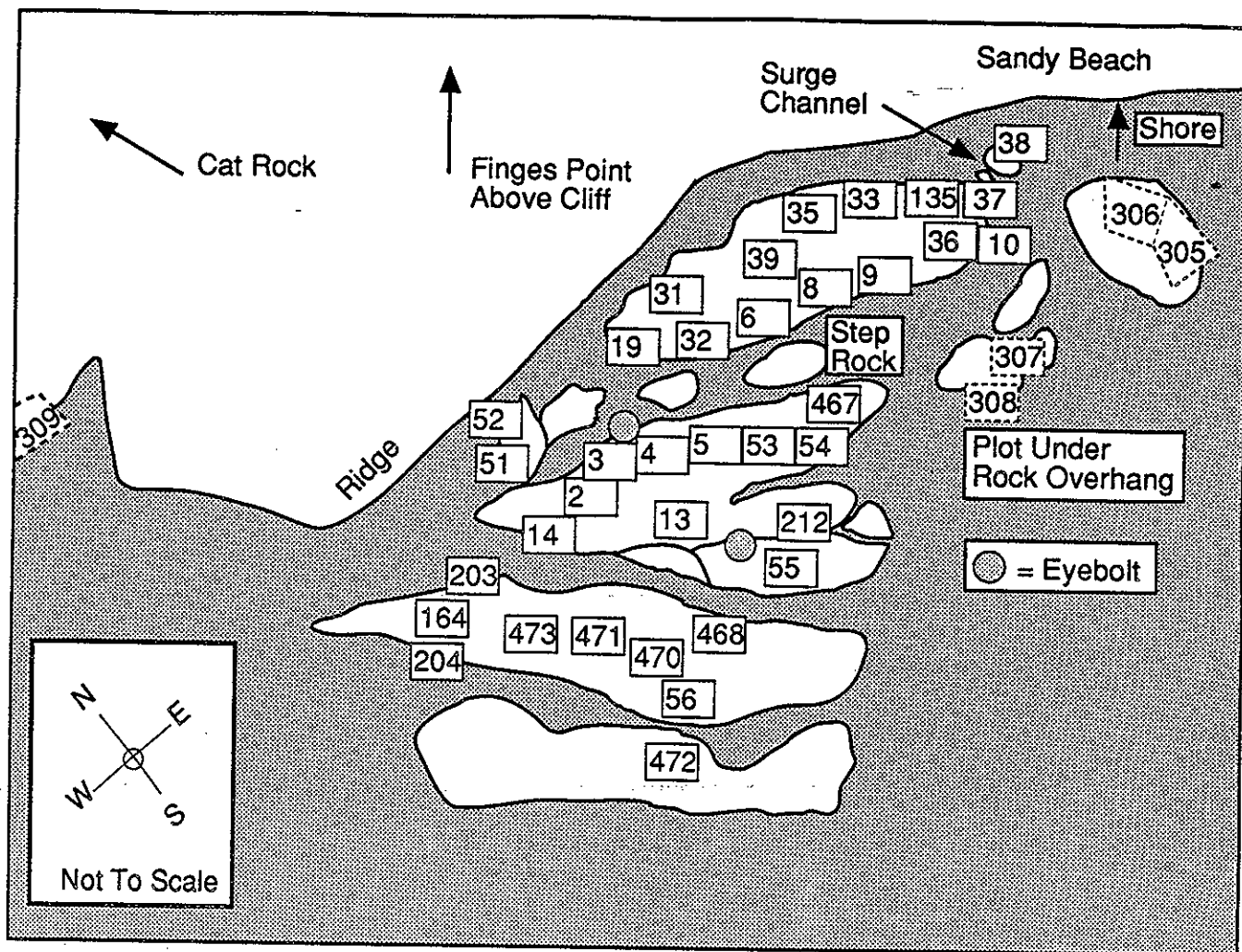


QUADRAT NUMBERS **Figure A - 17. MIDDLE ANACAPA ISLAND**

	Barnacle	243 - 245, 447 - 451
	Endocladia	240 - 242, 457 - 461
	Mussel	476 - 478, 462 - 466
	Rockweed	53, 237, 469, 452 - 456,

West and East Intertidal Monitoring Sites

Established 1982

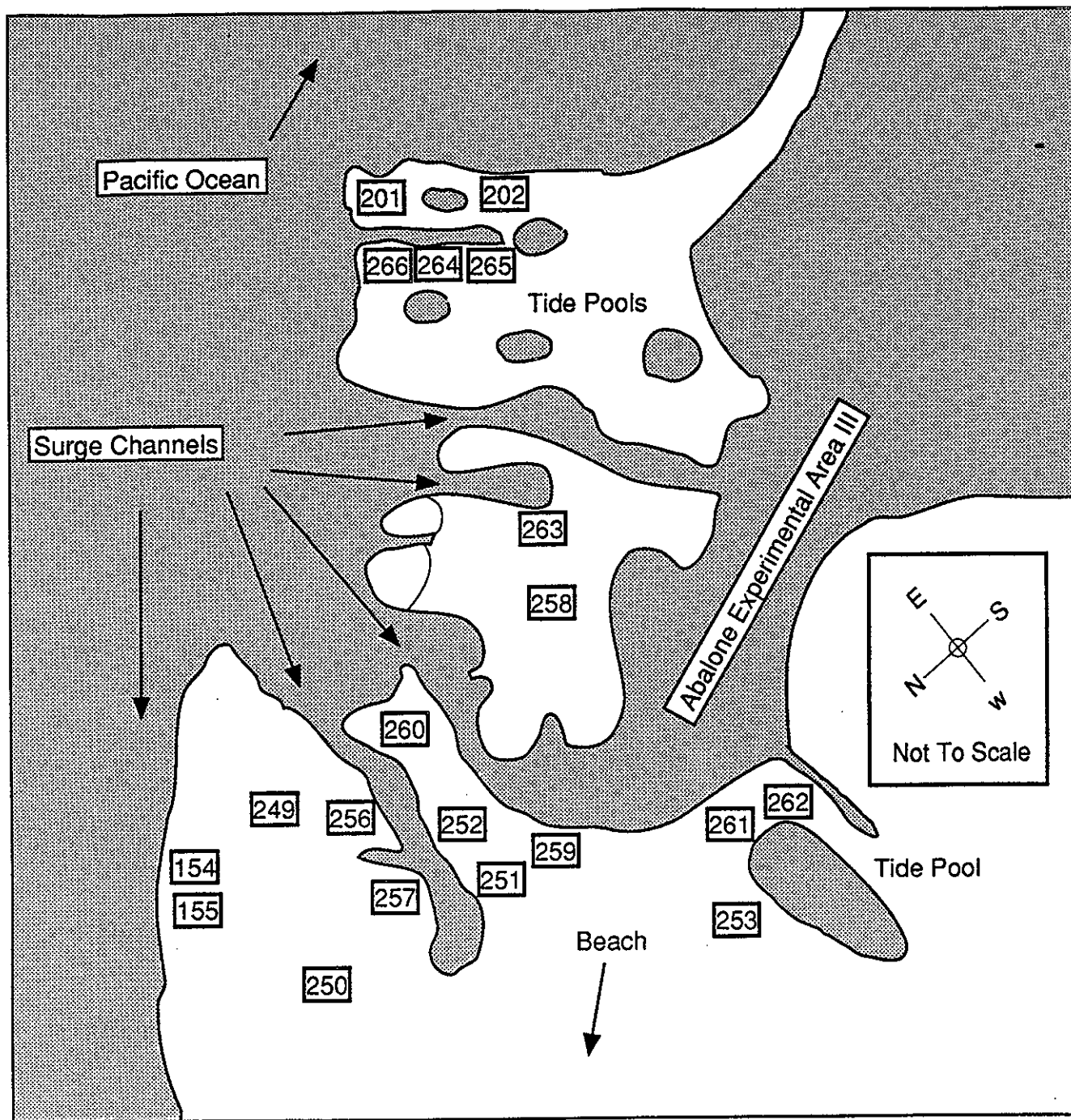


QUADRAT NUMBERS

	Barnacle	31 - 33, 35 - 39, 135
	Endocladia	13, 14, 19
	Mussel	51 - 54, 212, 467
		56, 164, 203, 204, 468, 470 - 473
	Rockweed	2 - 6, 8 - 10, 55
	Abalone Plots	305 - 309

Figure A - 18. WEST ANACAPA ISLAND Cat Rock Intertidal Monitoring Site

Established 1982



QUADRAT NUMBERS

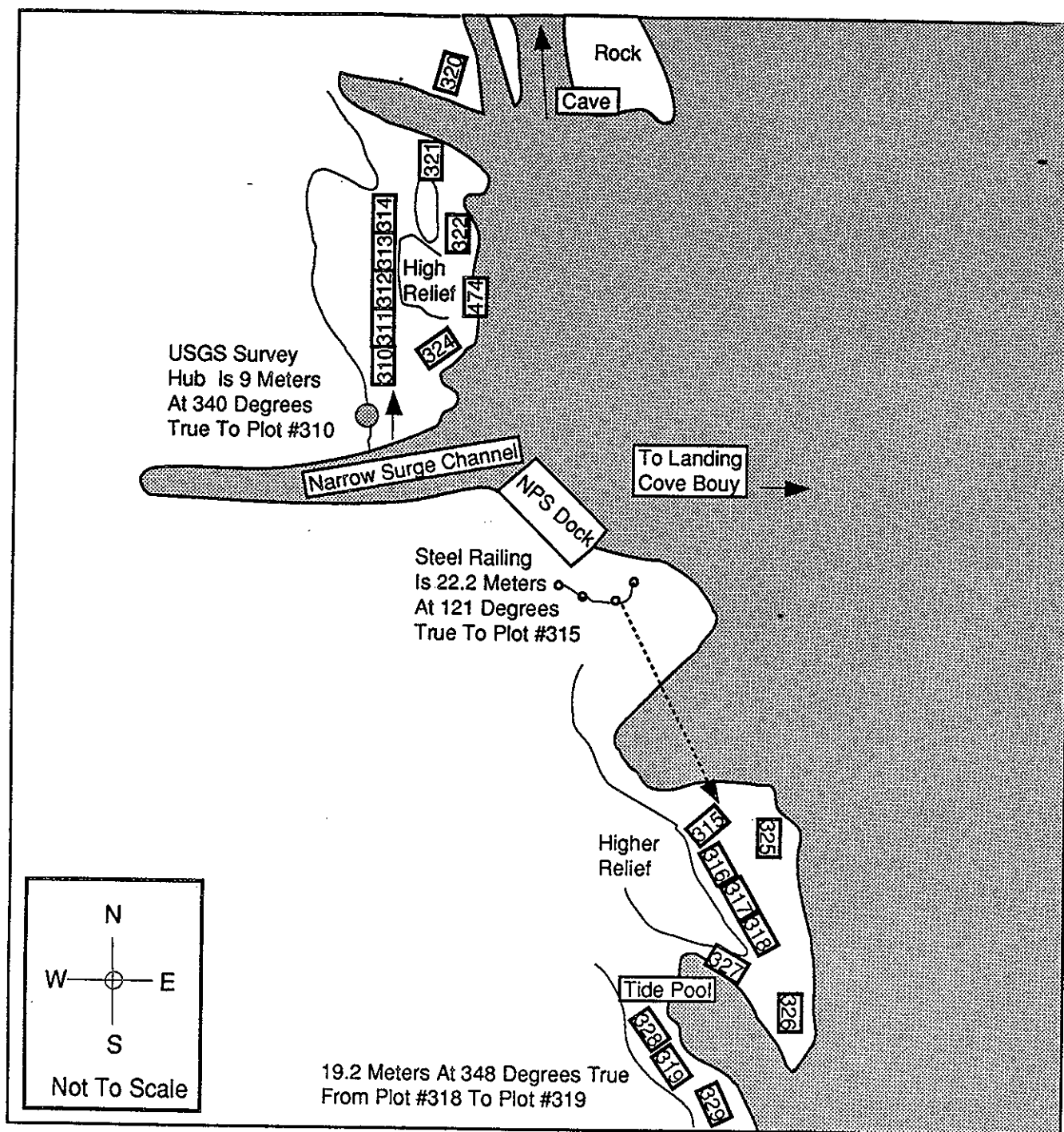


Barnacle	249 - 253
Endocladia	254 - 258
Mussel	201 - 202, 264 - 266
Rockweed	259 - 263

Figure A - 19.

WEST ANACAPA ISLAND Frenchy's Cove Intertidal Monitoring Site

Established 1982



QUADRAT NUMBERS

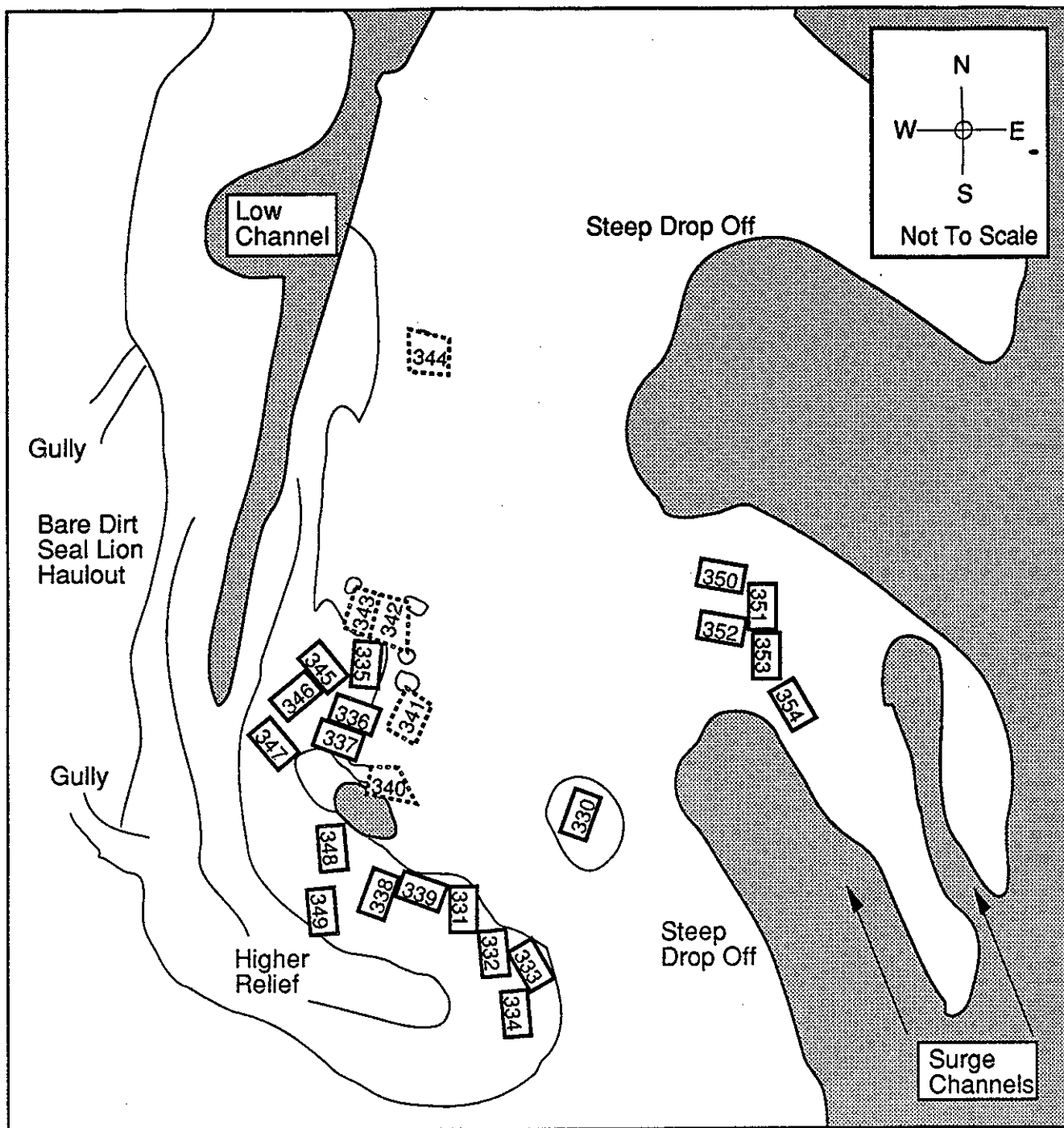


Barnacle 315 - 319
 Mussel 325 - 329
 Red Algal Turf 320 - 322, 324, 474
 Rockweed 310 - 314
 Bolts in upper right corner

Figure A - 20.

SANTA BARBARA ISLAND East and West Landing Cove Intertidal Monitoring Site

Established March 1985



QUADRAT NUMBERS

	Barnacle	345 - 349
	Endocladia	335 - 339
	Mussel	350 - 354
	Rockweed	330 - 334
	Abalone Plots	340 - 344

Figure A - 21.

SANTA BARBARA ISLAND

Sea Lion Rookery

Intertidal Monitoring Site

Established March 1985

SUMMARY OF MONITORING LOCATIONS

Island	Site Name	Site Abreviation	Quadrat Data ¹ Location Code	Abalone Data ¹ Location Code
San Miguel	Crook Point	SMICP	7	7
	Cuyler Harbor	SMICH	15	
	Harris Point	SMIHP	6	6
	Otter Harbor	SMIOH	8	8
Santa Rosa	East Point	SRIEP	9	9
	Ford Point	SRIFP	2	2
	Fossil Reef	SRIFR	16	
	Johnson's Lee	SRIJL	3	3
	Northwest Talcott	SRINW	10	10
West Anacapa	Cat Rock	WAICR	4	4
	Frenchy's Cove	WAIFC	12	
Mid. Anacapa	East	MAI East	13	
	West	MAI West	14	
	Harbor Seal Arch	MAI HSA	5	5
Santa Barbara	Landing Cove	SBILC	11	
	Sea Lion Rookery	SBISLR	1	1

¹ Codes for computer data analysis (see Appendix D)

APPENDIX B. Data Sheets

ROCKY INTERTIDAL STUDY SITE MAP

DATA SHEET #1 Date _____ Page # _____

Island _____ Study Site _____

Recorder _____

MAP*

EXAMPLE

* Sketch of study site, including quadrat locations and natural landmarks

ROCKY INTERTIDAL ABALONE PLOT LOCATION DATA

DATA SHEET #2A

Date _____

Page # _____

Island _____ Study Site _____

Recorder _____

[illegible]

ROCKY INTERTIDAL PHOTOQUADRAT LOCATION DATA

DATA SHEET #2B

Date _____ Page # _____

Island _____ Study Site _____

Recorder_____

[illegible]

DATA SHEET #3

Date _____ Page # _____

Page # _____

Island _____ Study Site _____

Recorder _____

[illegible]

B - 4

ROCKY INTERTIDAL PHOTODATA LOG

DATA SHEET #4A

Date _____ Page # _____

Island _____ Film Roll # _____

Photographer _____ Recorder _____

Photo #	Study Site	Quadrat #	Shutter F-Stop	Film Speed	Comments
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

EXAMPLE

ROCKY INTERTIDAL PHOTODATA LOG

DATA SHEET #4B

Date _____ Page # _____

Island _____ Film Roll # _____

Photographer _____ Recorder _____

Photo #	Study Site	Quadrat #	Shutter F-Stop	Film Speed	Comments
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					

EXAMPLE

DATA SHEET #5

Date _____ Page # _____

Island _____ Study Site _____

Recorder _____

[illegible]

ROCKY INTERTIDAL FIELD LOG

DATA SHEET #6

Date _____ Time _____ Page # _____

Island _____ Study Site _____

Weather Description _____ Recorder _____

Temp (____C) Air _____ Water _____ Tide Level (ft.) _____

Wind: Speed (kt.) _____ Direction _____ Cloud Cover (____%)

Wave Height (ft.) _____ Surge (light, moderate, heavy) _____

Field Log (General account of intertidal work, including observations and sketches):

EXAMPLE

DATA SHEET #7 ROCKY INTERTIDAL PHOTOQUADRAT DATA

Raw Data -

Station _____ Date _____

Date Scored _____

BARNACLE ZONE

Quadrat Number						
Total Ponits						
Bare Rock						
Acorn Barnacle						
Endocladia						
Pelvetia						
Mytilus						
Red Algal Turf						
Misc. Algae						
Misc. Animals						
Tar						
Other						

ENDOCLADIA ZONE

Quadrat Number						
Total Ponits						
Bare Rock						
Acorn Barnacle						
Endocladia						
Pelvetia						
Mytilus						
Red Algal Turf						
Misc. Algae						
Misc. Animals						
Tar						
Other						

EXAMPLE

PELVETIA ZONE

Quadrat Number						
Total Ponits						
Bare Rock						
Acorn Barnacle						
Endocladia						
Pelvetia						
Mytilus						
Red Algal Turf						
Misc. Algae						
Misc. Animals						
Tar						
Other						

MYTILUS ZONE

Quadrat Number						
Total Ponits						
Bare Rock						
Acorn Barnacle						
Endocladia						
Pelvetia						
Mytilus						
Red Algal Turf						
Misc. Algae						
Misc. Animals						
Tar						
Other						

APPENDIX C. Quadrat and Plot Location Data

ROCKY INTERTIDAL PHOTOQUADRAT LOCATION DATA

DATA SHEET #2B

Date 4/1/85

Page # 1

Island San Miguel Island

Study Site Crook Pt.

Recorder C. Vandenberg

[illegible]

From Quadrat #	To Quadrat #	Distance (meters)	True Compass Heading (degrees)
382 M	383 M	1.42	330
389 E	382 M	3.16	288
389 E	390 E	3.24	344
381 M	390 E	2.51	60
390 E	upper eye bolt	8.88	152
389 E	381 M	3.59	312
148 B	upper eye bolt	1.09	65
148 B	lower eye bolt	5.10	114
148 B	137 B	5.32	140
148 B	147 B	5.63	130
148 B	150 B	6.30	153
148 B	149 B	7.40	153
136 B	150 B	1.80	192
136 B	149 B	2.70	188
147 B	149 B	3.20	202
lower eye bolt	149 B	4.88	198
147 B	390 E	3.94	164
150 B	396 P	3.88	136
147 B	396 P	4.95	166
396 P	389 E	2.37	184
396 P	397 P	5.08	120
396 P	383 P	5.92	146
382 M	383 P	1.42	152
382 M	397 P	1.69	56

A = Abalone; B = Barnacle; E = Endocladia; M = Mytilus; P = Pelvetia

ROCKY INTERTIDAL ABALONE PLOT LOCATION DATA

DATA SHEET #2A

Date 4/1/84

Page # 2

Island San Miguel Island

Study Site Crook Point

Recorder C. Vandenberg

[illegible][illegible]

UL = Upper Left; UR = Upper Right; LL = Lower Left; LR = Lower Right

ROCKY INTERTIDAL PHOTOQUADRAT LOCATION DATA

DATA SHEET #2B

Date 4/12/85

Page # 1

Island San Miguel Island

Study Site Cuyler Harbor - East

Recorder J. Engle

From Quadrat #	To Quadrat #	Distance (meters)	True Compass Heading (degrees)
Keyhole Hole *	415	13.10	280
415	420	3.84	278
415	414	1.90	238
420	414	2.05	144
414	413	3.60	160
413	419	9.31	214
419	410	3.64	252
419	418	6.69	192
410	418	5.79	160
410	408	4.00	190
409	408	1.74	164
405	408	2.75	126
405	404	3.10	214
408	404	4.05	256
408	412	2.29	150
408	418	3.09	118
418	412	1.54	252
418	417	2.68	194
412	411	3.03	236
411	404	3.86	314
411	402	4.52	286
411	403	3.94	276
404	401	4.89	208
403	401	2.33	202
417	403	7.18	276
417	401	7.98	260
407	401	7.25	276
406	407	4.12	356
416	407	4.51	308

ROCKY INTERTIDAL PHOTOQUADRAT LOCATION DATA

DATA SHEET #2B

Date 4/14/85

Page # 1Island San Miguel Island

Study Site Harris Point

Recorder H.C.

From Quadrat #	To Quadrat #	Distance (meters)	True Compass Heading (degrees)
426	436	2.23	98
426	431	5.10	55
426	422	7.01	108
436	422	4.95	112
436	437	2.03	156
437	431	5.06	12
437	423	3.24	75
421	423	0.38	45
421	422	1.04	116
423	422	0.97	147
431	423	4.55	160
422	438	11.66	104
438	424	13.68	54
438	444	9.22	128
438	441	11.21	107
424	435	3.91	28
424	439	9.39	48
435	438	5.97	62
439	427	1.81	36
427	428	0.96	48
427	425	2.09	54
428	425	1.16	64
428	440	2.78	138
440	425	2.69	340
440	432	6.76	116
440	433	7.51	94
432	433	1.91	30
432	429	2.92	90
432	434	5.27	124

[illegible]

ROCKY INTERTIDAL ABALONE PLOT LOCATION DATA

DATA SHEET #2A

Date 4/15/85

Page # 2

Island San Miguel Island

Study Site Harris Point - Abalone Plots

Recorder T. Stebbins

[illegible]

UL = upper left; UR = upper right; LL = lower left; LR = lower right

ROCKY INTERTIDAL PHOTOQUADRAT LOCATION DATA

DATA SHEET #2B

Date 3/30/85

Page # 1

Island San Miguel Island Study Site Otter Harbor

Recorder C. Vandenberg

From Quadrat #	To Quadrat #	Distance (meters)	True Compass Heading (degrees)
365 A	374 B	2.77	278
364 A	365 A	6.75	262
373 B	364 A	9.64	288
373 B	355 P	3.78	50
355 P	356 P	9.92	100
373 B	356 P	12.88	84
356 P	357 P	4.12	75
356 P	372 B	9.55	138
357 P	372 B	8.32	160
357 P	364 E	11.77	106
372 B	364 E	9.32	64
372 B	363 E	12.24	84
364 E	367 A	4.06	110
363 E	367 A	0.96	176
367 A	368 A	5.29	88
368 A	362 E	2.39	100
368 E	371 B	5.65	210
368 A	370 B	8.06	142
371 B	370 B	8.02	98
370 B	362 E	6.40	330
370 B	358 P	13.85	70
358 P	368 A	4.98	8
370 B	368 A	16.33	58
358 P	361 E	7.55	65
361 E	360 E	3.22	80
361 E	359 P	6.00	112
360 E	359 P	3.54	138
359 P	375 M	6.81	350
360 P	375 M	4.30	14

[illegible]

A = Abalone; B = Barnacle; E = Endocladia; M = Mytilus; P = Pelvetia

ROCKY INTERTIDAL PHOTOQUADRAT LOCATION DATA

DATA SHEET #2B

Date 12/15/86

Page # 1

Island Santa Rosa IslandStudy Site East Point

Recorder Davis/Stoltz

From Quadrat #	To Quadrat #	Distance (meters)	Magnetic Compass Heading (degrees)
575	576	3.5	68 (mag)
575	577	5.0	100
576	577	2.7	140
578	576	5.7	180
578	579	3.6	80
579	584	3.4	154
578	584	5.7	116
587	579	3.9	164
580	587	4.9	134
588	587	7.7	296
588	592	9.6	10
592	591	9.7	320
591	590	2.7	310
590	583	13.0	221
583	582	1.5	122
582	581	2.9	129
581	585	1.1	34
581	580	1.6	135
580	586	1.2	42
585	586	1.7	144
586	587	4.8	142
587	579	4.0	160
577	589	4.9	106
589	594	11.0	58
594	593	5.6	24
593	588	8.8	262
590 (eb)	593 (eb)	24.0	135
582	585	3.2	100
585	580	2.0	170

[illegible]

eb = eye bolt

Page # 1

Study Site Ford Point

Recorder UGA[illegible][illegible]

UL = upper left; UR = upper right; LL = lower left; LR = lower right

Page # 2

Study Site Ford Point

Recorder UGA

[illegible]

ROCKY INTERTIDAL ABALONE PLOT LOCATION DATA

DATA SHEET #2A \

Date 12/10/8-

Page # 1

Island Santa Rosa Island

Study Site Johnson's Lee

Recorder _____ Patten

[illegible]

UL = upper left; UR = upper right; LL = lower left; LR = lower right

ROCKY INTERTIDAL PHOTOQUADRAT LOCATION DATA

DATA SHEET #2B

Date 4/1/86

Page # 2

Island Santa Rosa Island

Study Site Johnson's Lee

Recorder Richards /Henderson /Parker

From Quadrat #	To Quadrat #	Distance (meters)	True Compass Heading (degrees)
510	500	6.5	12
510	511	4.23	98
511	500	7.17	332
511	501	6.01	30
500	501	6.98	108
501	512	14.85	98
502	512	6.19	164
502	513	14.32	94
505	513	3.12	194
505	514	12.57	114
503	514	6.70	230
506	514	4.09	254
503	506	3.39	198
503	507	3.54	160
503	508	4.12	133
507	508	1.60	80
508	504	16.49	80
504	509	4.98	66
506	519	2.66	145
503	519	5.44	175
512	516	6.81	122
512	518	9.19	118
512	515	3.33	200
501	515	14.59	110

[illegible]

ROCKY INTERTIDAL PHOTOQUADRAT LOCATION DATA

DATA SHEET #2B

Date 6/1/37

Page # 1Island Santa Rosa IslandStudy Site NW Talcott

Recorder.

From Quadrat #	To Quadrat #	Distance (meters)	True Compass Heading (degrees)
552	553	1.50	274
552	554	2.37	232
553	554	1.62	194
554	551	4.15	260
551	550	9.65	224
551	559	16.99	144
550	559	18.83	114
559	558	2.62	132
558	570 A	3.07	150
570 A	571 A	4.15	126
570 A	572 A	5.45	146
571 A	572 A	2.15	194
572 A	556	11.70	232
557	556	5.66	158
556	569	10.30	236
556	555	9.14	196
555	569	7.35	306
555	568	7.50	204
568	562	8.68	148
562	567	4.56	160
562	563	6.31	82
562	573 A	16.02	86
562	564	17.28	94
563	564	11.09	100
573 A	564	1.85	136
573 A	574 A	28.50	130
566	574 A	40.33	100
561	567	9.32	18
561	566	0.78	350

[illegible]

ROCKY INTERTIDAL PHOTOQUADRAT LOCATION DATA

DATA SHEET #2B

Date 3/15/88

Page # 1

Island Santa Rosa Island Study Site Southwest

Recorder Richards / Forcucci

From Quadrat #	To Quadrat #	Distance (meters)	True Compass Heading (degrees)
634	623	7.5	82
623	622	3.8	72
623	621	4.2	54
624	621	11.2	73
622	621	1.3	340
622	620	4.1	60
621	620	4.0	78
620	613	27.7	70
613	614	2.4	166
614	612	13.6	29
609	612	4.0	332
609	608	6.3	46
608	616	5.3	6
608	611	7.4	4
616	611	2.3	355
616	606	13.0	60
610	606	8.1	35
610	619	5.1	317
615	618	6.7	340
611	618	6.2	16
615	619	3.4	354
615	610	2.4	124
607	610	4.3	170
607	606	6.2	64
606	617	3.9	353
617	618	9.4	250
605	617	10.3	271
605	606	10.6	245

[illegible]

ROCKY INTERTIDAL ABALONE PLOT LOCATION DATA

DATA SHEET #2A

Date 3/4/85

Page # 2Island Anacapa

Study Site Harbor Seal Arch and Cat Rock

Recorder J. Engle

From Plot #	To Plot #	Distance (meters)	Inner Corner Angle (degrees)
300 UL	300 UR	1.02	
300 UR	300 LR	0.97	
300 LL	300 LR	1.19	
300 UL	300 LL	1.00	
301 UL	301 UR	1.75	UL 90
301 UR	301 LR	0.62	UR 60
301 LL	301 LR	1.39	LR 138
301 UL	301 LL	0.77	LL 100
302 UL	302 UR	2.14	UL 60
302 UR	302 LR	0.77	UR 96
302 LL	302 LR	1.96	LR 88
302 UL	302 LL	1.31	LL 112
303 UL	303 UR	1.31	UL 115
303 UR	303 LR	1.36	UR 75
303 LL	303 LR	1.48	LR 87
303 UL	303 LL	0.98	LL 90
304 UL	304 UR	1.55	UL 85
304 UR	304 LR	0.98	UR 90
304 LL	304 LR	1.68	LR 90
304 UL	304 LL	0.70	LL 105
305 UL	305 UR	1.47	UL 130
305 UR	305 LR	1.49	UR 140
305 LL	305 LR	2.25	LR 103
305 UL	305 LL	1.30	LL 84
306 UL	306 UR	1.75	UL 87
306 UR	306 LR	1.66	UR 106
306 LL	306 LR	1.87	LR 74
306 UL	306 LL	1.49	LL 122

[illegible]

with tag # in upper left corner, UL = upper left; UR = upper right;
LL = lower left; LR = lower right

ROCKY INTERTIDAL PHOTOQUADRAT LOCATION DATA

DATA SHEET #2B

Date 3/19/85

Page # 1

Island Santa Barbara

Study Site Landing Cove

Recorder Doyle/McCluskey

From Quadrat #	To Quadrat #	Distance (meters)	True Compass Heading (degrees)	From Quadrat #	To Quadrat #	Distance (meters)	True Compass Heading (degrees)
320	321	4.87	130				
321	314	8.28	142				
314	313	1.84	135				
313	312	1.06	135				
312	311	1.18	128				
311	310	1.29	120				
310	322	6.44	12				
310	323	6.18	60				
322	323	4.83	132				
323	324	2.68	162				
310	324	6.49	90				
315 *	316	2.47	114				
316	317	1.66	142				
317	318	3.97	140				
318	328	16.89	172				
328	319	2.87	144				
319	329	3.25	88				
315	325	3.33	62				
318	326	5.90	120				
318	327	4.67	135				
327	326	2.03	86				
331	330	6.69	56				
331	332	1.72	128				
331	334	3.77	158				
331	333	3.63	118				

* Note: tag 316 in upper right corner of quadrat

ROCKY INTERTIDAL PHOTOQUADRAT LOCATION DATA

DATA SHEET #2B

Date 3/20/85

Page # 1

Island Santa Barbara

Study Site Sea Lion Rookery

Recorder Doyle/McCluskey

[illegible]

*measurements taken from center of south end of rock channel

ROCKY INTERTIDAL ABALONE PLOT LOCATION DATA

DATA SHEET #2A

Date 3/20/85

Page # 2

Island Santa Barbara

Study Site Sea Lion Rookery

Recorder R. McCluskey

[illegible][illegible]

UL = upper left; UR = upper right; LL = lower left; LR = lower right

KEY TO TAG NUMBER CHANGES

Island	Old Quadrat Number	New Quadrat Number	Key Species	Quadrat Description -
San Miguel	148	479	Chthamalus	Crook Point
	394	498	Abalone	Crook Point
	431	446	Endocladia	Harris Point
Santa Rosa	534	blank tag	Mytilus	Ford Point
	536	499	Abalone	Ford Point
	538	540	Abalone	Ford Point
	513	541	Mytilus	Johnson's Lee
	518	542	Abalone	Johnson's Lee
West Anacapa	7	55	Pelvetia	Scrape, Cat Rock
	11	54	Endocladia	Trample, Cat Rock
	12	212	Endocladia	Scrape, Cat Rock
	15	52	Endocladia	Control, Cat Rock
	16	53	Endocladia	Control, Cat Rock
	18	51	Endocladia	Scrape, Cat Rock
	21	203	Mytilus	Control, Cat Rock
	26	56	Mytilus	Scrape, Cat Rock
	28	204	Mytilus	Trample, Cat Rock
	34	135	Chthamalus	Scrape, Cat Rock
	40	201	Mytilus	South Frenchy's Cove
	41	202	Mytilus	South Frenchy's Cove
	254	154	Endocladia	South Frenchy's Cove
	255	155	Endocladia	South Frenchy's Cove
Middle Anacapa	238	53	Pelvetia	East (Control)
	239	469	Pelvetia	East (Control)
	248	476	Mytilus	East (Control)
	247	477	Mytilus	East (Control)
	246	478	Mytilus	East (Control)
	217	447	Chthamalus	West (Test)
	218	449	Chthamalus	West (Test)
	219	448	Chthamalus	West (Test)
	220	450	Chthamalus	West (Test)
	221	451	Chthamalus	West (Test)
	222	452	Pelvetia	West (Test)
	223	453	Pelvetia	West (Test)
	224	455	Pelvetia	West (Test)
	225	454	Pelvetia	West (Test)
	225	456	Pelvetia	West (Test)
	226	456	Pelvetia	West (Test)

Key to tag number changes, continued

Island	Old Quadrat Number	New Quadrat Number	Key Species	Quadrat Description
Middle Anacapa (con't)	227	458	Endocladia	West (Test)
	228	457	Endocladia	West (Test)
	229	460	Endocladia	West (Test)
	230	459	Endocladia	West (Test)
	231	461	Endocladia	West (Test)
	232	462	Mytilus	West (Test)
	233	463	Mytilus	West (Test)
	234	464	Mytilus	West (Test)
	235	465	Mytilus	West (Test)
	236	466	Mytilus	West (Test)
Santa Barbara	323	474	Gigartina	Landing Cove

APPENDIX D. Computer Programs for Data Analysis

PHOTO.TRN

*This program translates a dBase III file, calculates percent cover for all variables, sorts by station then by year, and saves the outfile to a system file.

SET BEEP=OFF/MORE=OFF.

TRANSLATE FROM = 'C:\DBASE3\PHOTO.DBF'.

*FILE STRUCTURE IS AS FOLLOWS

STATION 2 YEAR 2 MONIH 2 ZONE 1 QUAD 3 ROCK 3 BARN 3 ENDO 3
WEED 3 MUSS 3 TURF 3 MISCAL 3 MISCAN 3 TAR 3.

VARIABLE LABELS QUAD 'QUADRAT NUMBER' /ROCK 'BARE ROCK' /BARN 'ACORN BARNACLE'
/ENDO 'TURFWEED' /WEED 'ROCKWEED' /MUSS 'MUSSEL' /TURF 'RED ALGAL TURF'
/MISCAL 'MISC. ALGAE' /MISCAN 'MISC. ANIMAL' /ZONE 'ZONE' /sand 'SAND'.

VALUE LABEL STATION 1 'SBI SEA LION ROOKERY' 2 'SRI FORD POINT'

3 'SRI JOHNSONS LEE' 4 'WAI CAT ROCK' 5 'MAI HARBOR SEAL ARCH'

6 'SMI HARRIS POINT' 7 'SMI CROOK POINT' 8 'SMI OTTER HARBOR'

9 'SRI EAST POINT' 10 'SRI NORTHWEST' 11 'SBI LANDING COVE'

12 'WAI SO. FRENCHYS COVE' 13 'MAI EAST' 14 'MAI WEST'

15 'SMI CUYLER HARBOR' 16 'SRI FOSSIL REEF'

/ZONE 1 'BARNACLE ZONE' 2 'TURFWEED ZONE' 3 'ROCKWEED ZONE' 4 'MUSSEL ZONE'
5 'RED ALGAL TURF ZONE'

/YEAR 82 '1982' 83 '1983' 84 '1984' 85 '1985' 86 '1986' 87 '1987'
88 '1988' 89 '1989' 90 '1990'

/MONIH 01 'JAN' 02 'FEB' 03 'MAR' 04 'APR' 05 'MAY' 06 'JUN'
07 'JUL' 08 'AUG' 09 'SEP' 10 'OCT' 11 'NOV' 12 'DEC'.

missing value all (999).

COMPUTE QTOT= ROCK+BARN+ENDO+WEED+MUSS+TURF+MISCAL+MISCAN+TAR.

COMPUTE MISCALT= MISCAL+TURF.

COMPUTE PROCK=(ROCK/QTOT)*100.

COMPUTE PBARN=(BARN/QTOT)*100.

COMPUTE PENDO=(ENDO/QTOT)*100.

COMPUTE PWEED=(WEED/QTOT)*100.

COMPUTE PMUSS=(MUSS/QTOT)*100.

COMPUTE PMISCALT=(MISCALT/QTOT)*100.

COMPUTE PMISCAN=(MISCAN/QTOT)*100.

COMPUTE PTAR=(TAR/QTOT)*100.

COMPUTE PSAND=(SAND/QTOT)*100.

COMPUTE PTURF=(TURF/QTOT)*100.

COMPUTE PMISCAL=(MISCAL/QTOT)*100.

VARIABLE LABELS PROCK 'BARE ROCK' /PBARN 'ACORN BARNACLE'

/PENDO 'TURFWEED' /PWEED 'ROCKWEED' /PMUSS 'MUSSEL' /PMISCALT 'MISC. ALGAE'

/PMISCAN 'MISC. ANIMAL' /PTAR 'TAR' /PSAND 'SAND' /PTURF 'RED ALGAL TURF'

/MISCALT 'MISC. ALGAE' /PMISCAL 'MISC. ALGAE' /QTOT 'TOTAL POINTS'.

SORT BY STATION.

SORT BY YEAR.

SAVE OUTFILE='PHOTO.SYS'.

PHOTO.RPT

*This program creates reports for photoquadrat means, standard deviations and total points in each zone for all years at stations selected by their quadrat numbers; the results must be edited and saved.

SET LENGTH=66/WIDTH=100/MORE=OFF/BEEP=OFF.

GET FILE='PHOTO.SYS'.

*Replace quadrat numbers at each select statement and replace table # and station name in the title.

SELECT IF (QUAD GE *** AND QUAD LE ***).

*SBILC=315-319 SBISLR=345-349

WAISF=249-253 MAIWEST=447-451 MAIEAST=243-245

SMIOH=370-374 SMIHP=436-440 SMICH=416-420 SMICP=137-150

SRINW=560-564 SRIEP=575-579 SRLJL=500-504 SRIFP=520-524 SRIFR=605-609.

REPORT FORMAT=BRKSPACE(-1)

/VARIABLES=PROCK (5) PBARN(8) (OFFSET(2)) PENDO (5) PWEED (5) PMUSS (6)

PMISCALT (5) PMISCAN (6) (OFFSET(1)) PTAR (5) QTOT 'TOTAL' 'NO.' (5) (OFFSET(2))

/BREAK YEAR MONTH (LABEL) (OFFSET (4))

/SUM=MEAN(PROCK(2) PBARN(2) PENDO(2) PWEED(2) PMUSS(2) PMISCALT(2) PMISCAN(2) PTAR(2))

/SUM=STDEV(PROCK(2) PBARN(2) PENDO(2) PWEED(2) PMUSS(2) PMISCALT(2) PMISCAN(2) PTAR(2))

/SUM=SUM (QTOT (0)) 'TOTAL POINTS'

/TITLE 'Table 1. Abundance of index species, tar and bare rock expressed as'

' percent cover at South Frenchys Cove, Anacapa Island'

'BARNACLE ZONE'.

GET FILE='PHOTO.SYS'.

*See handbook text for changes when running SBILC.

SELECT IF (QUAD GE *** AND QUAD LE ***).

*SBILC=320-324(red-algal turf) SBISLR=335-339

WAISF=254-258 MAIEAST=240-242 MAIWEST=457-461

SMIOH=360-364 SMICH=411-415 SMIHP=431-435, SMICP=386-390

SRLJL=505-509, SRIFP=525-529 SRINW=555-559 SRIEP=580-584 SRIFR=610-614.

REPORT FORMAT=BRKSPACE(-1)

/VARIABLES=PROCK (5) PBARN (OFFSET(2)) PENDO (5) PWEED (5) PMUSS (6)

PMISCALT (5) PMISCAN (6) (OFFSET(1)) PTAR (5) QTOT 'TOTAL' 'NO.' (5)

/BREAK YEAR MONTH (LABEL) (OFFSET (4))

/SUM=MEAN(PROCK(2) PBARN(2) PENDO(2) PWEED(2) PMUSS(2) PMISCALT(2) PMISCAN(2) PTAR(2))

/SUM=STDEV(PROCK(2) PBARN(2) PENDO(2) PWEED(2) PMUSS(2) PMISCALT(2) PMISCAN(2) PTAR(2))

/SUM=SUM (QTOT (0)) 'TOTAL POINTS'

/TITLE 'TURFWEED ZONE'.

```

GET FILE='PHOTO.SYS'.
SELECT IF (QUAD GE *** AND QUAD LE ***).
*SBILC=310-314 SBISLR=330-334
WAISF=259-263 MAIWEST=452-456 MAIEAST=237-239
SMIOH=355-359 SMICH=406-410 SMIHP=421-425 SMICP=396-400
SRINW=565-569 SRIEP=585-589 SRIFR=615-619.
REPORT FORMAT=BRKSPACE(-1)
/VARIABLES=PROCK (5) PBARN (OFFSET(2)) PENDO (5) PWEED (5) PMUSS (6)
PMISCALT (5) PMISCAN (6) (OFFSET(1)) PTAR (5) QTOT 'TOTAL' 'NO.' (5)
/BREAK YEAR MONTH (LABEL) (OFFSET (4))
/SUM=MEAN(PROCK(2) PBARN(2) PENDO(2) PWEED(2) PMUSS(2) PMISCALT(2) PMISCAN(2) PTAR(2))
/SUM=STDEV(PROCK(2) PBARN(2) PENDO(2) PWEED(2) PMUSS(2) PMISCALT(2) PMISCAN(2) PTAR(2))
/SUM=SUM (QTOT (0)) 'TOTAL POINTS'
/TITLE 'ROCKWEED ZONE'.

```

```

GET FILE='PHOTO.SYS'.
SELECT IF (QUAD GE *** AND QUAD LE ***).
*SBILC=325-329 SBISLR=350-354
WAISF=264-268 MAIEAST=476-478 MAIWEST=462-466
SMICH=401-405 SMIHP=426-430 SMIOH=375-380 SMICP=381-385
SRINW=550-554 SRIEP=590-594 SRIJL=510-514 SRIFF=530-534 SRIFR=620-624.
REPORT FORMAT=BRKSPACE(-1)
/VARIABLES=PROCK (5) PBARN (OFFSET(2)) PENDO (5) PWEED (5) PMUSS (6)
PMISCALT (5) PMISCAN (6) (OFFSET(1)) PTAR (5) QTOT 'TOTAL' 'NO.' (5)
/BREAK YEAR MONTH (LABEL) (OFFSET (4))
/SUM=MEAN(PROCK(2) PBARN(2) PENDO(2) PWEED(2) PMUSS(2) PMISCALT(2) PMISCAN(2) PTAR(2))
/SUM=STDEV(PROCK(2) PBARN(2) PENDO(2) PWEED(2) PMUSS(2) PMISCALT(2) PMISCAN(2) PTAR(2))
/SUM=SUM (QTOT (0)) 'TOTAL POINTS'
/TITLE 'MUSSEL ZONE'.

```

WAICR.RPT

*This file creates a report of photoquadrat means, standard deviations and total points in each zone for each treatment for all years at WAICR.

GET FILE='PHOTO.SYS'.

SELECT IF (QUAD EQ 33 OR QUAD EQ 135 OR QUAD EQ 37).

REPORT FORMAT=LENGTH(1,66) BRKSPACE(-1)

/VARIABLES=PROCK (5) PBARN (OFFSET(2)) PENDO (5) PWEED (5) PMUSS (6)

PMISCALT (5) PMISCAN (6) (OFFSET(1)) PTAR (5) QTOT 'TOTAL' 'NO.' (5)

/BREAK YEAR MONTH (LABEL) (OFFSET (4))

/SUM=MEAN(PROCK(2)PBARN(2)PENDO(2)PWEED(2)PMUSS(2)PMISCALT(2)PMISCAN(2)PTAR(2))

/SUM=STDEV(PROCK(2)PBARN(2)PENDO(2)PWEED(2)PMUSS(2)PMISCALT(2)PMISCAN(2)PTAR(2))

/SUM=SUM (QTOT (0)) 'TOTAL POINTS'

/LITTLE 'Table 4. Abundance of index species, tar and bare rock at'

'Cat Rock, West Anacapa Island ' '(Scrape Treatment)'

'BARNACLE ZONE' .

GET FILE='PHOTO.SYS'.

SELECT IF (QUAD EQ 12 OR QUAD EQ 14 OR QUAD EQ 18).

REPORT FORMAT=LENGTH(1,66) BRKSPACE(-1).

/VARIABLES=PROCK (5) PBARN (OFFSET(2)) PENDO (5) PWEED (5) PMUSS (6)

PMISCALT (5) PMISCAN (6) (OFFSET(1)) PTAR (5) QTOT 'TOTAL' 'NO.' (5)

/BREAK YEAR MONTH (LABEL) (OFFSET (4))

/SUM=MEAN(PROCK(2)PBARN(2)PENDO(2)PWEED(2)PMUSS(2)PMISCALT(2)PMISCAN(2)PTAR(2))

/SUM=STDEV(PROCK(2)PBARN(2)PENDO(2)PWEED(2)PMUSS(2)PMISCALT(2)PMISCAN(2)PTAR(2))

/SUM=SUM (QTOT (0)) 'TOTAL POINTS'

/TITLE 'TURFWEED ZONE' 'SCRAPE TREATMENT'.

GET FILE='PHOTO.SYS'.

SELECT IF (QUAD EQ 2 OR QUAD EQ 7 OR QUAD EQ 9).

REPORT FORMAT=LENGTH(1,66) BRKSPACE(-1)

/VARIABLES=PROCK (5) PBARN (OFFSET(2)) PENDO (5) PWEED (5) PMUSS (6)

PMISCALT (5) PMISCAN (6) (OFFSET(1)) PTAR (5) QTOT 'TOTAL' 'NO.' (5)

/BREAK YEAR MONTH (LABEL) (OFFSET (4))

/SUM=MEAN(PROCK(2)PBARN(2)PENDO(2)PWEED(2)PMUSS(2)PMISCALT(2)PMISCAN(2)PTAR(2))

/SUM=STDEV(PROCK(2)PBARN(2)PENDO(2)PWEED(2)PMUSS(2)PMISCALT(2)PMISCAN(2)PTAR(2))

/SUM=SUM (QTOT (0)) 'TOTAL POINTS'

/TITLE 'ROCKWEED ZONE' 'SCRAPE TREATMENT'.

GET FILE='PHOTO.SYS'.

SELECT IF (QUAD EQ 164 OR QUAD EQ 26 OR QUAD EQ 29).

REPORT FORMAT=LENGTH(1,66) BRKSPACE(-1)

/VARIABLES=PROCK (5) PBARN (OFFSET(2)) PENDO (5) PWEED (5) PMUSS (6)

PMISCALT (5) PMISCAN (6) (OFFSET(1)) PTAR (5) QTOT 'TOTAL' 'NO.' (5)

/BREAK YEAR MONTH (LABEL) (OFFSET (4))

/SUM=MEAN(PROCK(2)PBARN(2)PENDO(2)PWEED(2)PMUSS(2)PMISCALT(2)PMISCAN(2)PTAR(2))

/SUM=STDEV(PROCK(2)PBARN(2)PENDO(2)PWEED(2)PMUSS(2)PMISCALT(2)PMISCAN(2)PTAR(2))

/SUM=SUM (QTOT (0)) 'TOTAL POINTS'

/TITLE 'MUSSEL ZONE' 'SCRAPE TREATMENT'.

GET FILE='PHOTO.SYS'.

SELECT IF (QUAD EQ 31 OR QUAD EQ 35 OR QUAD EQ 38).

REPORT FORMAT=LENGTH(1,66) BRKSPACE(-1)

```

/VARIABLES=PROCK (5) PBARN (OFFSET(2)) PENDO (5) PWEED (5) PMUSS (6)
PMISCALT (5) PMISCAN (6) (OFFSET(1)) PTAR (5) QTOT 'TOTAL' 'NO.' (5)
/BREAK YEAR MONTH (LABEL) (OFFSET (4))
/SUM=MEAN(PROCK(2) PBARN(2) PENDO(2) PWEED(2) PMUSS(2) PMISCALT(2) PMISCAN(2) PTAR(2))
/SUM=STDEV(PROCK(2) PBARN(2) PENDO(2) PWEED(2) PMUSS(2) PMISCALT(2) PMISCAN(2) PTAR(2))
/SUM=SUM (QTOT (0)) 'TOTAL POINTS'
/LITTLE 'Table 3. Abundance of index species, tar, and bare rock at'
' Cat Rock, West Anacapa Island' '(Trample Treatment)'
'BARNACLE ZONE'.

```

```

GET FILE='PHOTO.SYS'.
SELECT IF (QUAD EQ 11 OR QUAD EQ 13 OR QUAD EQ 17).
REPORT FORMAT=LENGTH(1,66) BRKSPACE(-1)
/VARIABLES=PROCK (5) PBARN (OFFSET(2)) PENDO (5) PWEED (5) PMUSS (6)
PMISCALT (5) PMISCAN (6) (OFFSET(1)) PTAR (5) QTOT 'TOTAL' 'NO.' (5)
/BREAK YEAR MONTH (LABEL) (OFFSET (4))
/SUM=MEAN(PROCK(2) PBARN(2) PENDO(2) PWEED(2) PMUSS(2) PMISCALT(2) PMISCAN(2) PTAR(2))
/SUM=STDEV(PROCK(2) PBARN(2) PENDO(2) PWEED(2) PMUSS(2) PMISCALT(2) PMISCAN(2) PTAR(2))
/SUM=SUM (QTOT (0)) 'TOTAL POINTS'
/TITLE 'TURFWEED ZONE' 'TRAMPLE TREATMENT'.

```

```

GET FILE='PHOTO.SYS'.
SELECT IF (QUAD EQ 3 OR QUAD EQ 5 OR QUAD EQ 6).
REPORT FORMAT=LENGTH(1,66) BRKSPACE(-1)
/VARIABLES=PROCK (5) PBARN (OFFSET(2)) PENDO (5) PWEED (5) PMUSS (6)
PMISCALT (5) PMISCAN (6) (OFFSET(1)) PTAR (5) QTOT 'TOTAL' 'NO.' (5)
/BREAK YEAR MONTH (LABEL) (OFFSET (4))
/SUM=MEAN(PROCK(2) PBARN(2) PENDO(2) PWEED(2) PMUSS(2) PMISCALT(2) PMISCAN(2) PTAR(2))
/SUM=STDEV(PROCK(2) PBARN(2) PENDO(2) PWEED(2) PMUSS(2) PMISCALT(2) PMISCAN(2) PTAR(2))
/SUM=SUM (QTOT (0)) 'TOTAL POINTS'
/TITLE 'ROCKWEED ZONE' 'TRAMPLE TREATMENT'.

```

```

GET FILE='PHOTO.SYS'.
SELECT IF (QUAD EQ 166 OR QUAD EQ 25 OR QUAD EQ 28).
REPORT FORMAT=LENGTH(1,66) BRKSPACE(-1)
/VARIABLES=PROCK (5) PBARN (OFFSET(2)) PENDO (5) PWEED (5) PMUSS (6)
PMISCALT (5) PMISCAN (6) (OFFSET(1)) PTAR (5) QTOT 'TOTAL' 'NO.' (5)
/BREAK YEAR MONTH (LABEL) (OFFSET (4))
/SUM=MEAN(PROCK(2) PBARN(2) PENDO(2) PWEED(2) PMUSS(2) PMISCALT(2) PMISCAN(2) PTAR(2))
/SUM=STDEV(PROCK(2) PBARN(2) PENDO(2) PWEED(2) PMUSS(2) PMISCALT(2) PMISCAN(2) PTAR(2))
/SUM=SUM (QTOT (0)) 'TOTAL POINTS'
/TITLE 'MUSSEL ZONE' 'TRAMPLE TREATMENT'.

```

```

GET FILE='PHOTO.SYS'.
SELECT IF (QUAD EQ 32 OR QUAD EQ 36 OR QUAD EQ 39).
REPORT FORMAT=LENGTH(1,66) BRKSPACE(-1)
/VARIABLES=PROCK (5) PBARN (OFFSET(2)) PENDO (5) PWEED (5) PMUSS (6)
PMISCALT (5) PMISCAN (6) (OFFSET(1)) PTAR (5) QTOT 'TOTAL' 'NO.' (5)
/BREAK YEAR MONTH (LABEL) (OFFSET (4))
/SUM=MEAN(PROCK(2) PBARN(2) PENDO(2) PWEED(2) PMUSS(2) PMISCALT(2) PMISCAN(2) PTAR(2))
/SUM=STDEV(PROCK(2) PBARN(2) PENDO(2) PWEED(2) PMUSS(2) PMISCALT(2) PMISCAN(2) PTAR(2))
/SUM=SUM (QTOT (0)) 'TOTAL POINTS'
/LITTLE 'Table 2. Abundance of index species, tar, and bare rock at'
' Cat Rock, West Anacapa Island' '(Control)'

```

'BARNACLE ZONE'.

GET FILE='PHOTO.SYS'.

SELECT IF (QUAD EQ 15 OR QUAD EQ 16 OR QUAD EQ 19).

REPORT FORMAT=LENGTH(1,66) BRKSPACE(-1)

/VARIABLES=PROCK (5) PBARN (OFFSET(2)) PENDO (5) PWEED (5) PMUSS (6)
PMISCALT (5) PMISCAN (6) (OFFSET(1)) PTAR (5) QTOT 'TOTAL' 'NO.' (5)
/BREAK YEAR MONTH (LABEL) (OFFSET (4))

/SUM=MEAN(PROCK(2)PBARN(2)PENDO(2)PWEED(2)PMUSS(2)PMISCALT(2)PMISCAN(2)PTAR(2))
/SUM=STDEV(PROCK(2)PBARN(2)PENDO(2)PWEED(2)PMUSS(2)PMISCALT(2)PMISCAN(2)PTAR(2))
/SUM=SUM (QTOT (0)) 'TOTAL POINTS'
/TITLE 'TURFWEED ZONE' 'CONTROL'.

GET FILE='PHOTO.SYS'.

SELECT IF (QUAD EQ 4 OR QUAD EQ 8 OR QUAD EQ 10).

REPORT FORMAT=LENGTH(1,66) BRKSPACE(-1)

/VARIABLES=PROCK (5) PBARN (OFFSET(2)) PENDO (5) PWEED (5) PMUSS (6)
PMISCALT (5) PMISCAN (6) (OFFSET(1)) PTAR (5) QTOT 'TOTAL' 'NO.' (5)
/BREAK YEAR MONTH (LABEL) (OFFSET (4))

/SUM=MEAN(PROCK(2)PBARN(2)PENDO(2)PWEED(2)PMUSS(2)PMISCALT(2)PMISCAN(2)PTAR(2))
/SUM=STDEV(PROCK(2)PBARN(2)PENDO(2)PWEED(2)PMUSS(2)PMISCALT(2)PMISCAN(2)PTAR(2))
/SUM=SUM (QTOT (0)) 'TOTAL POINTS'
/TITLE 'ROCKWEED ZONE' 'CONTROL'.

GET FILE='PHOTO.SYS'.

SELECT IF (QUAD EQ 21 OR QUAD EQ 22 OR QUAD EQ 30)

REPORT FORMAT=LENGTH(1,66) BRKSPACE(-1)

/VARIABLES=PROCK (5) PBARN (OFFSET(2)) PENDO (5) PWEED (5) PMUSS (6)
PMISCALT (5) PMISCAN (6) (OFFSET(1)) PTAR (5) QTOT 'TOTAL' 'NO.' (5)
/BREAK YEAR MONTH (LABEL) (OFFSET (4))

/SUM=MEAN(PROCK(2)PBARN(2)PENDO(2)PWEED(2)PMUSS(2)PMISCALT(2)PMISCAN(2)PTAR(2))
/SUM=STDEV(PROCK(2)PBARN(2)PENDO(2)PWEED(2)PMUSS(2)PMISCALT(2)PMISCAN(2)PTAR(2))
/SUM=SUM (QTOT (0)) 'TOTAL POINTS'
/TITLE 'MUSSEL ZONE' 'CONTROL'.

PHOTO.TAB

```

*This program creates a table of percent cover, means, and standard deviations -
  for selected station and dates, then saves the results file to the b: drive.
SET LENGIH=66/WIDIH=100/MORE=OFF/BEEP=OFF.
GET FILE='PHOTO.SYS'.
VARIABLE LABELS ZONE '' YEAR '' MONTH ''MISCALT 'MISC. ALGAE'.
SELECT IF (year eq 86 or (year eq 87 and month le 6)).
PROCESS IF (STATION EQ 12).
*Replace station number and dates in select and process if statements;
  replace table number, title, print table number in tables and print statements.
*STATION 1 'SBI SEA LION ROOKERY' 2 'SRI FORD POINT'
  3 'SRI JOHNSONS LEE' 4 'WAI CAT ROCK' 5 'MAI HARBOR SEAL ARCH'
  6 'SMI HARRIS POINT' 7 'SMI CROOK POINT' 8 'SMI OTTER HARBOR'
  9 'SRI EAST POINT' 10 'SRI NORTHWEST' 11 'SBI LANDING COVE'
  12 'WAI SO. FRENCHYS COVE' 13 'MAI EAST' 14 'MAI WEST'
  15 'SMI CUYLER HARBOR' 16 'SRI FOSSIL REEF'.
*TABLE 1=WAISFC 2-4=WAICR 5=MAIEA 6=MAIWE 7=SMICH 8=SMIHP 9=SMIOH 10=SMICP
  11=SBILC 12=SBISLR 13=SRIJL 14=SRIFP 15=SRINW 16=SRIEP 17=SRISW.
TABLES
/PRTITLE = LEFT 'Table 1. Abundance of index species, tar and bare rock'
  'expressed as percent cover at South Frenchys Cove, West Anacapa Island'
/OBSERVATION = ROCK BARN ENDO WEED MUSS MISCALT MISCAN TAR
/FORMAT = PTSPACE(0) LENGIH(1,66) DBOX CWIDTH(14,4,10) ZERO
/TABLE = (ROCK+BARN+ENDO+WEED+MUSS+MISCALT+MISCAN+TAR)>(STATISTICS)
  BY ZONE>YEAR>MONTH
/STATISTICS = MEAN ((F2.0)) STDDEV ('StdDev'(F2.0)).
PRINT TABLES DEVICE=HPLASER/OUTPUT='B:TABLE1.RSL'.

```

ABS.RPT

*This program calls a data file, labels the plot numbers, then creates a report with mean size, minimum size, maximum size and percentages of the population in the three size classes; then saves the report to a file on the B: drive.

SET LENGTH=66/WIDTH=79/MORE=OFF/BEEP=OFF.

DATA LIST FILE='TIDEPOOL\SMIOHABS.DAT'

/STATION 1-2 MONIH 4-5 YEAR 6-7 PLOT1 9-11 PLOT2 13-15 PLOT3 17-19 PLOT4 21-23
PLOT5 25-27.

*Change filename and plot numbers.

VARIABLE LABELS PLOT1 'PLOT 365'

/PLOT2 'PLOT 366'

/PLOT3 'PLOT 367'

/PLOT4 'PLOT 368'

/PLOT5 'PLOT 369'.

*QUADRAT NUMBERS= SBISLR=340-344 SRIFF=535-539 SRIJL=515-519 WAICR=305-309

MAHSA=300-304 SMHP=441-445 SMICP=391-395 SMIOH=365-369 SRINW=570-574

SRIEP=TRANSECT.

VALUE LABEL STATION 1 'SBI SEA LION ROOKERY' 2 'SRI FORD POINT'

3 'SRI JOHNSONS LEE' 4 'WAI CAT ROCK' 5 'MAI HARBOR SEAL ARCH'

6 'SMI HARRIS POINT' 7 'SMI CROOK POINT' 8 'SMI OTTER HARBOR'

9 'SRI EAST POINT' 10 'SRI NORTHWEST'

/YEAR 82 '1982' 83 '1983' 84 '1984' 85 '1985' 86 '1986' 87 '1987'

88 '1988' 89 '1989' 90 '1990'

/MONTH 01 'JAN' 02 'FEB' 03 'MAR' 04 'APR' 05 'MAY' 06 'JUN'

07 'JUL' 08 'AUG' 09 'SEP' 10 'OCT' 11 'NOV' 12 'DEC'.

MISSING VALUE ALL (999).

SORT BY YEAR MONTH.

SAVE OUTFILE='PLOT.SYS'.

GET FILE='PLOT.SYS'.

*Change dates in select statement, table # in outfile, and table # and site name in title.

SELECT IF (YEAR EQ 87 AND MONIH GT 6 OR (YEAR EQ 88)).

REPORT FORMAT=AUTOMATIC BRKSPSACE(-1)

/OUTFILE='B:TABLE20.RSL'

/VARIABLES= PLOT1 PLOT2 PLOT3 PLOT4 PLOT5 (LABEL) (7)

SUM(DUMMY) 'STATION' 'SUMMARY' (7)

/BREAK YEAR MONTH (LABEL) (OFFSET (0)) (17)

/SUM=VALIDN

ADD(VALIDN(PLOT1)VALIDN(PLOT2)VALIDN(PLOT3)VALIDN(PLOT4)VALIDN(PLOT5))

(SUM (0))

/SUM=PCLIT(44) (0) '% Juveniles'

/SUM=PCIN(44,126) (0) '% Non-legal adult'

/SUM=PGT(126) (0) '% Legal adult'

/SUM=MEAN (0) 'MEAN SIZE (mm)'

/SUM=MIN 'MIN SIZE (mm)'

/SUM=MAX 'MAX SIZE (mm)'

/TITLE 'Table 20 Abundance and size distribution (percent) of black abalone'
'(Haliotis cracherodii) in fixed plots at Otter Harbor, San Miguel Island'.

j^e^e^e^e^e^e i*This portion of the program creates a histogram of size

frequencies for all
plots in selected years.
GET FILE='PLOT.SYS'.
SELECT IF (YEAR EQ 88).
FREQUENCIES VARIABLES=PLOT1 TO PLOT5
/FORMAT=NOTABLE
/STATISTICS=ALL
/HISTOGRAM MIN (10) INCREMENT (10).

ABSHELL.RPT

*This program translates a dbase file containing information on
abalone health and condition, saves the translation to a system file,
computes some new variables and creates a regression plot.
TRANSLATE FROM = 'C:\DBASE3\ABSHELL.DBF'.

VALUE LABEL STATION 1 'SBI SEA LION ROOKERY' 2 'SRI FORD POINT'
3 'SRI JOHNSONS LEE' 4 'WAI CAT ROCK' 5 'MAI HARBOR SEAL ARCH'
6 'SMI HARRIS POINT' 7 'SMI CROOK POINT' 8 'SMI OTTER HARBOR'
9 'SRI EAST POINT' 10 'SRI NORTHWEST'
/CONDITION 1 'SHELL' 2 'HEALTHY' 3 'MORBUND' 4 'DEAD'
/FOULING 0 'CLEAN' 1 'LIGHT' 2 'MODERATE' 3 'HEAVY'.
COMPUTE HEALTH= weight/length.
COMPUTE LGWEIGHT = lg10(weight).
COMPUTE LGLENGTH = lg10(length).
SAVE OUTFILE= 'ABSHELL.SYS'.

GET FILE= 'ABSHELL.SYS'.
SELECT IF (CONDITIO NE 1 AND CONDITIO NE 4).
SELECT IF (WEIGHT NE 0).
SELECT IF (FOULING EQ 0 OR FOULING EQ 1).
SELECT IF (STATION EQ 10).
PLOT FORMAT = REGRESSION
/TITLE='SRINW Black Abalone/Clean shells'
/PLOT =lgweight with lglength.