



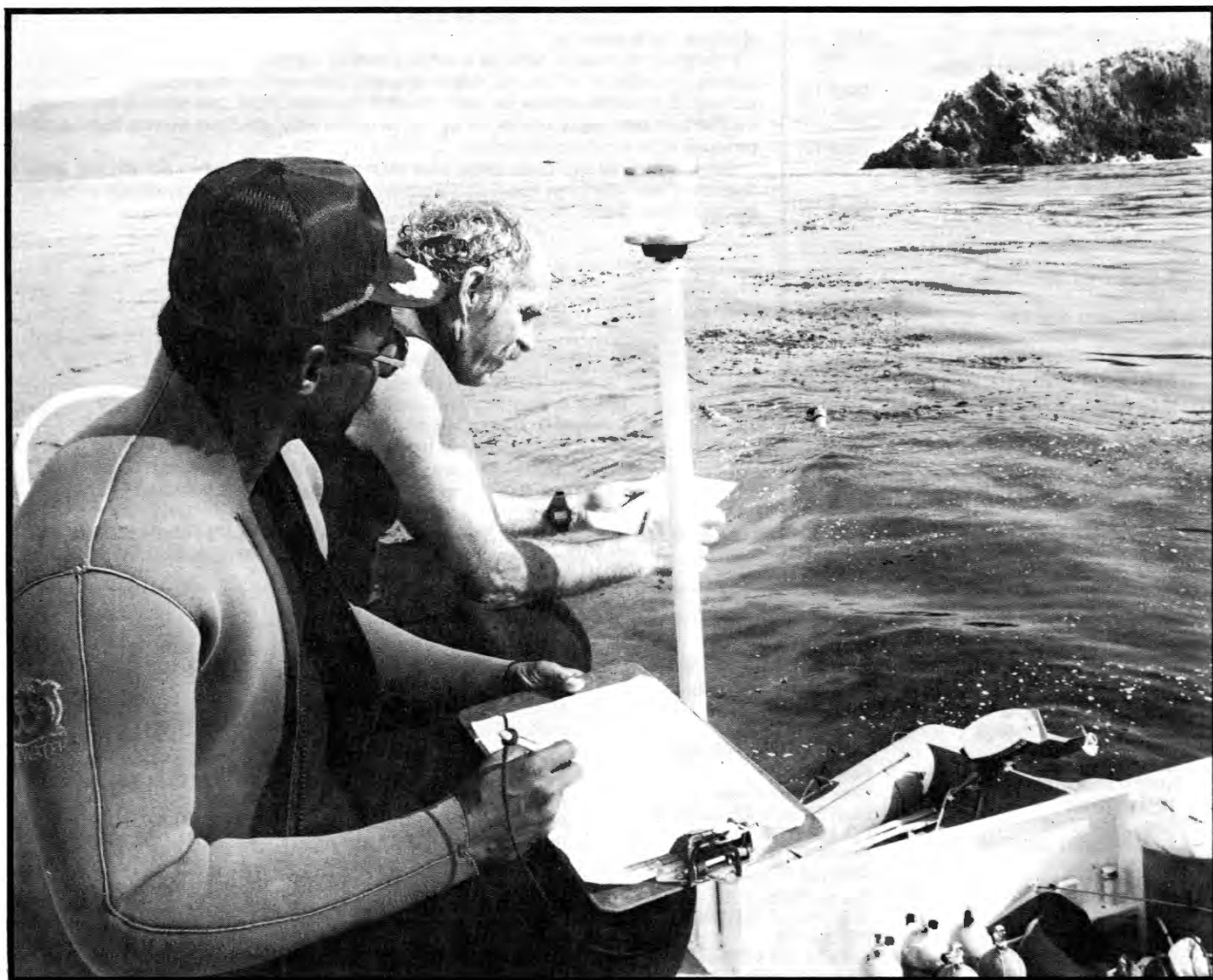
PARK SCIENCE

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Cover Photo: Park Rangers J. T. Reynolds and Craig Johnson take a turn topside as dive masters recording dive times and checking divers in and out of the water at Santa Cruz Island during the resources monitoring project at Channel Islands National Park. (Story on p. 3)

Population Dynamics Monitoring Of Living Marine Resources in Channel Islands National Park

By Gary Davis

In the summer of 1981, Channel Islands NP began an innovative resource monitoring project. Nearly two miles of underwater transect lines were laid to help research scientists and resource managers from the State of California and the National Park Service monitor the population dynamics of marine plants and animals in the park. Such research and resource monitoring in the ocean is extremely complex and costly. The broad array of required knowledge and skills range from the practical application of offshore navigation, boat operation, SCUBA diving and underwater construction to scientific expertise in marine ecology, sampling theory, and statistical analysis.

The need for accurate, up-to-date information on marine resources in Channel Islands NP is acute. Spectacular concentrations of breeding seals, sea lions, and sea birds depend on the marine food chain. Although one mile of water around each of the five islands in the park is included in the park boundary (about 125,000 acres), the living marine resources are managed by the State of California, with virtually unlimited total harvest of fish, lobster, abalone, and other marine organisms. This direct impact, plus impending threats from adjacent petroleum extraction activities, pose the potential for major human disturbance of these ecosystems. The cost of providing information to make wise decisions about these resources is high, but in line with the NPS mandate, the need is urgent.

The Channel Islands NP marine resources monitoring project is being conducted jointly by NPS and the California Department of Fish and Game (CDFG). Objectives for the first year (1981) were to select study sites and species to monitor that represent the broad array of biogeographical, ecological, and human activities found in the park. For the first field season, the specific goal was to establish 24 permanent 100-meter transects upon which long-term repetitive biological sampling will be based.

In January 1981, I sat down with an Ad Hoc committee of senior biologists from CDFG led by Herbert W. Frey and began discussions of the project. During the next six months we developed project objectives, established criteria for selection of species to monitor, selected species, and prepared a study proposal. Funding for initiation of the project in FY 1981 was approved in July, and the first field work was conducted in August and September.

Project Objectives

The Channel Islands NP enabling legislation (PL 96-199) (passed in 1980 to expand the park and give it National Park status) provides clear direction for management, stating: "the park shall be administered on a low-intensity, limited-entry basis." The law further requires detailed monitoring of the population dynamics of both terrestrial and marine species in the park, with biennial reports to the Congress for 10 years. These Resource Study Reports are also to include "recommendations as to what actions should be considered for adoption to better protect the natural resources of the park."

The first objective for the living marine resources project is to summarize the historical data on popula-

tion dynamics of selected 'indicator' species. The information summarized will include data on abundance, distribution, reproductive efforts, recruitment to the population, phenology, population age and sex compositions, growth rates, and mortality rates.

The second objective is to design and implement a sampling program to determine the population dynamics of the 'indicator' species.

The last objective is to develop and implement a data management system for storage, retrieval, and reporting of population parameters.

Indicator Species and Study Sites

In selecting marine plants and animals to monitor, a list of nearly 1,000 species compiled by Dr. John M. Engle at the University of Southern California Catalina Marine Science Center was reviewed. Five criteria were used to select species from the list: (1) legally protected species (i.e. rare or endangered), (2) species constituting critical habitat for endangered species, (3) harvested species, (4) species dominant in or characteristic of major ecosystems, (5) large showy 'heroic' species. Using these criteria, 12 plants, 37 invertebrates, and 13 fishes were selected for long-term monitoring. A list of the selected species may be obtained from me at Channel Islands NP Headquarters, 1901 Spinnaker Dr., Ventura, CA 93003.

The waters of Channel Islands NP harbor an ecologically diverse array of species assemblages. The park sits at the boundary of two major biogeographical provinces: the Oregonian province to the north and the Californian to the south. The western Park islands, San Miguel and Santa Rosa, are bathed by northern waters carried south by the California current and therefore reflect the biological assemblages of the Oregonian province. Waters around



Clean record is the boast of the diving effort. Although 643 Scuba dives were conducted during the 1981 field season, no dive related accidents of any kind occurred, thanks to Western Regional Diving Officer David McLean and the Channel Islands NP diving team who organized and carried out the operation.

the eastern park islands of Anacapa and Santa Barbara come from the south along the mainland coast and support the warm temperate biota characteristic of the Californian province. Around Santa Cruz Island, at the boundary of these two provinces, a broad



Stern deck of the Motor Vessel Pacific Ranger was the scene of intense activity as research personnel and dive team members went through their summer monitoring paces.

transition zone is characterized by a special assemblage of plant and animal species from both provinces that are capable of adapting to these unique and variable conditions.

Prevailing winds and the bathymetry of adjacent basins also greatly influence marine communities in the park. Strong north winds buffet the north sides of the islands, while the biota of the southern coasts reflect their more sheltered positions. Upwelling nutrients from 2,000 meter-deep basins to the south and west of the park produce exceptionally productive food webs and temperate regimes that differ significantly from the shallow northern sides of the islands.

Sampling sites selected for long-term population monitoring reflect the broad range of conditions and biological assemblages in the park. Twelve locations representing the north and south sides of each of the islands and the east-west transition from Californian to Oregonian provinces, were selected (see map). At each of these locations, two 100-meter-long transects were established to provide a basis for precise, repetitive measurements of plant and animal populations.

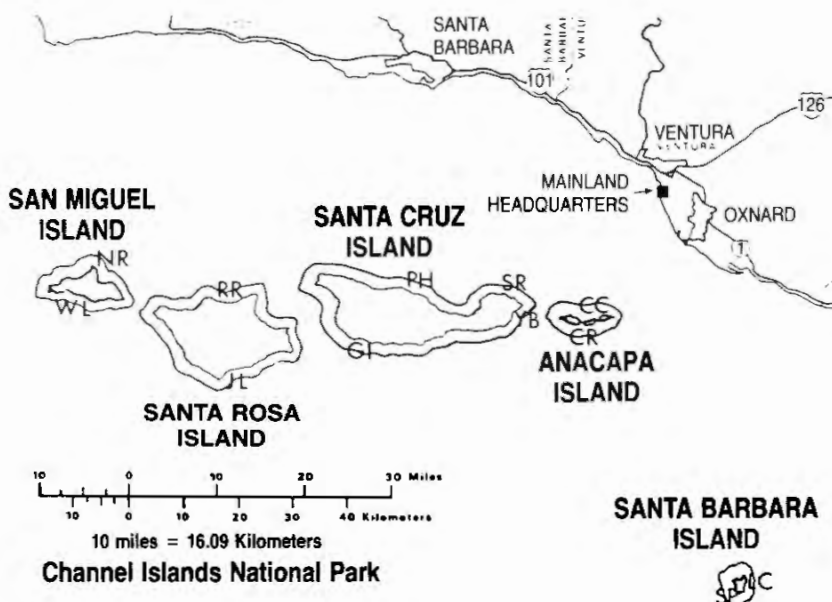
Transects Established

Using the NPS's 17 meter-long motor vehicle Pacific Ranger as a base of operation, a total of 45 SCUBA divers conducted 643 dives in locating and establishing the 24 100-meter transects in August and September, 1981. Six week-long cruises were conducted, with 8 to 10 divers on each cruise. Five CDFG diving biologists – Dan Gotshall, Ken Wilson, Dave Parker, Pete Haaker, and Kristine Henderson – assisted me in selecting and marking the transects during the first cruise, August 18-21. On the remaining cruises, 33 divers from the NPS Western Region dive team and 7 scientists from local universities and National Marine Fisheries Service established the



Stick 'em Down! At each of the 24 study sites, 11 stainless steel eyebolts were epoxied into holes drilled into the rocky bottom at 10-meter intervals along a 100-meter long transect. The epoxy was injected with a pneumatic caulking gun operated off of Deckhand David Stoltz' SCUBA tank.

Locations Selected for Long-Term Population Dynamics Monitoring in Channel Islands National Park, California



Location

Nifty Rock
Wycoff Ledge
Johnsons Lee
Rodes Reef
Gull Island
Yellow Banks
Scorpion Rock
Pelican Harbor
Cathedral Cove
Cat Rock
Landing Cove
Signal Peak

Island

San Miguel
San Miguel
Santa Rosa
Santa Rosa
Santa Cruz
Santa Cruz
Santa Cruz
Anacapa
Anacapa
Santa Barbara
Santa Barbara

Map Symbol

NR
WL
JL
RR
GI
YB
SR
PH
CC
CR
LC
SP

permanent transect lines on the sea floor . . . involving a sequence of operations, specialized equipment, and skills developed specifically for this project.

Emplacement procedures were conducted in stages by a series of divers because the time a diver can spend underwater without risk of decompression sickness (the bends) is extremely limited. Even at the relatively shallow 18-meter maximum depth of the transects, a diver can spend only two hours per day on the bottom. Each finished transect line consists of 11 stainless steel eyebolts anchored in bedrock at 10 meter intervals, connected by 10 lengths of leadcore nylon line. The advantages of this design are that the 11 eyebolts provide precise locations to which various biological sampling schemes may be referenced, loss of an entire transect line to storm or a boat anchor dragged across the line is greatly reduced, and if an entire line were lost, relocation would be much easier and quicker with several eyebolts for which to search. Complete details on the diving and emplacement operations are available upon request from me, care of the park.

Future Plans

In the second year of the project, historical data on the population dynamics of selected species will be

gathered and summarized from cruise reports, dive logs, and other unpublished materials in the CDFG library in Long Beach, Calif., as well as from the published scientific literature. These summaries will be included in the first of the five biennial Resource Study Reports to be submitted to Congress in October, 1982. During the winter and spring of 1982, sampling programs for each of the plants and animals will be designed and tested in the field. Techniques to be evaluated include photogrammetric plots, bait stations, line intercept transects, cinetransects and an experimental marine electroshocker. Some are standard applications of known methods, while others represent entirely new approaches to sampling marine organisms.

The first samples for routine monitoring will be taken in July and August, 1982, during another series of week-long cruises on the Pacific Ranger. Monitoring the health and condition of the complex marine ecosystems in Channel Islands NP is imperative and the methodology developed in the effort will be readily applicable to many parks and ecosystems.

Editor's Note: Park Science will carry accounts of the findings at Channel Islands as the monitoring proceeds.