State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME

DIABLO CANYON POWER PLANT SITE ECOLOGICAL STUDY

QUARTERLY REPORT NO. 13

July 1 - September 30, 1976

by

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Laurence L. Laurent
Fred E. Wendell

PACIFIC GAS AND ELECTRIC COMPANY
COOPERATIVE RESEARCH AGREEMENT 5-11-75

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ABSTRACT

Surveys of 39 random 30-m^2 subtidal stations and 56 random 1/4-m^2 subtidal stations in Diablo Cove and the North Control were completed.

The mean density of red abalones, *Haliotis rufescens*, in Diablo Cove was greater this year (0.02/m^2) than last year (0.005/m^2). This difference probably reflects sampling variation rather than density change.

A total of 29 sportfish catch-per-unit-of-effort stations was sampled in Diablo Cove and 12 in the North Control.

Foam observations in Diablo Cove were continued. The cooling water pumps were not in operation. The amounts of foam appeared to be about the same during certain weather conditions as those when the pumps are in operation, although not as thick.

The number of sea otters, *Enhydra lutris*, decreased substantially between Pt. Buchon and Pecho Rock. This was due to their annual migration (or "pulling back") into the more central parts of their range.

Random surveys of the intertidal areas during the upwelling period were completed.

1/ Marine Resources, Administrative Report No. 77-9 February 1977

2/ Operations Research Branch, 2201 Garden Rd., Monterey, CA. 93940.

This is the 13th quarterly report submitted in partial fulfillment of Research Contract N. 5-11-75 between the Department of Fish and Game and the Pacific Gas and Electric Company. Through this contract, the Department of Fish and Game is to conduct ecological monitoring studies to determine what changes have occurred since 1970 and 1971 in the base-line inventory of the marine biota, with special reference to fishes and abalone.

Quarterly reports will be followed by annual reports. Full tables and species lists will be included in each annual report.

Submitted to:

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INTRODUCTION

During this quarter, we worked on the 1975-76 annual report, which includes the quarterly report for April, May and June 1976, and on algae samples collected during the spring-summer series of minus tides. Also, we made weekly observations on foam conditions in Diablo Cove, completed our random subtidal surveys, and conducted sportfish catch-per-unit-of-effort surveys at most subtidal stations.

This report serves as a summary of work performed during the quarter, and does not constitute a Department of Fish and Game environmental impact report. Our quarterly reports are interim reports and usually do not contain completely analyzed data. Yearly analysis and comparisons of data are presented in our annual reports.

OPERATIONS

Permanent Subtidal Station Surveys

None of the permanent stations were surveyed during the quarter. Fall surveys will be conducted in October.

Random Subtidal Station Surveys

Methods

Surveys of random 30-m^2 subtidal stations were conducted like those of 1975: 24 locations were selected in Diablo Cove and 24 in the North Control (Figure 1). In Diablo Cove, 16 stations were selected from depths of 2.1 to 7.6 m (7 to 25 ft) and 8 from 7.9 to 18.3 m (26 to 60 ft). These stations were equally divided between north and south Diablo Cove.

North Control stations were selected from three depth strata: 12 stations from 2.1 to 6.1 m (7 to 20 ft), 8 from 6.4 to 12.2 m (21 to 40 ft), and 4 from 12.5 to 18.3 m (41 to 60 ft). Identifiable invertebrates,

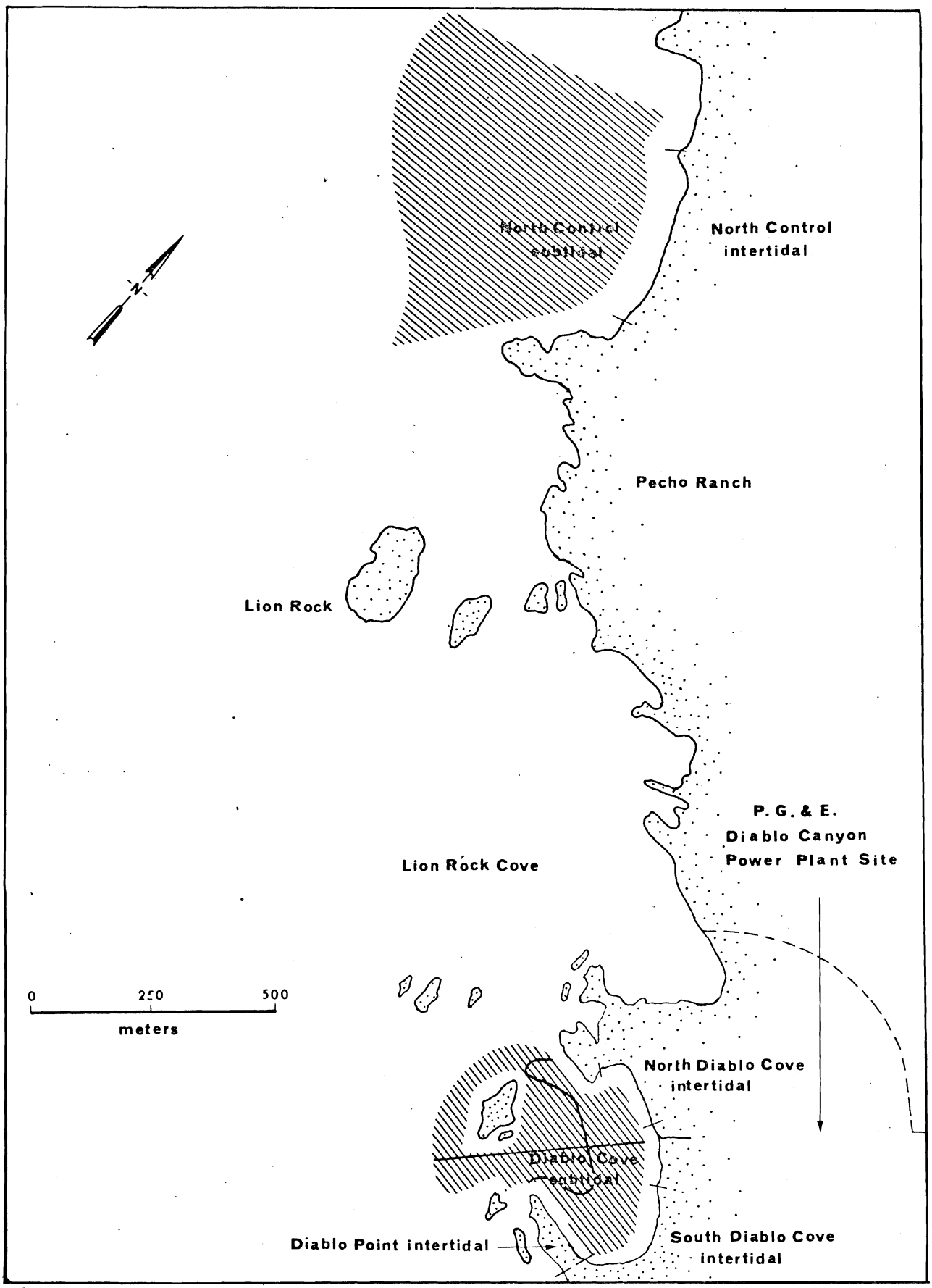

FIGURE 1. Locations of random subtidal and intertidal stations - Diablo Canyon Power Plant site.

5 cm (2 inches) and larger, and four species of brown algae were counted within each random 30-m^2 station.

A new study, undertaken in 1975, was continued. It consisted of counting all identifiable invertebrates within four 1/4 m^2 quadrats which were selected along a 30-m transect line. Some transect lines were layed parallel to shore while others were run due North from the boat's anchor at previously surveyed random 30-m^2 stations. Also, we made counts of bull kelp, *Nereocystis leutkeana*, one meter out to each side of the 30-m transect.

Results

We surveyed all random 30-m^2 stations in Diablo Cove and 15 stations in the North Control. The nine remaining stations in the latter site will be surveyed in October. Also, we surveyed 48 random 1/4-m^2 quadrats in Diablo Cove and 8 in the North Control.

Cursory examination of the data from the 30-m^2 stations indicates no major change in numbers of most invertebrates quantified. The mean density of red abalones, *Haliotis rufescens*, in Diablo Cove increased this year (0.02 per m^2) when compared to last year's survey (0.005 per m^2). This difference probably reflects sampling variation rather than density change.

The mean density of red abalones in the North Control remained the same as that of 1975 (0.01 per m^2). This estimate includes data from five stations surveyed in early October.

The mean density of giant red sea urchins, *Strongylocentrotus franciscanus*, continued to decline in Diablo Cove, dropping from 0.56 per m^2 in 1975 to 0.26 per m^2 this year. It remained the same in the North Control area (0.13 per m^2). Most giant red sea urchins observed in both study areas were juveniles and small adults.

There was evidence of sea otter foraging in Diablo Cove during the past 12 months.

The bull kelp density in Diablo Cove remained very high.

The most frequently observed invertebrates at the 1/4-m^2 quadrats in Diablo Cove were *Epiactis prolifera*, *Homalopoma luridum*, *Acmaea mitra*, *Balanophyllia elegans* and *Henricia leviuscula*. In North Control 1/4-m^2 quadrats, *Astrea gibberosa*, *Tonicella lineata* and *Epiactis prolifera* were the most frequently observed invertebrates.

Sportfish Catch-per-Unit-of-Effort

Methods

Fishing was conducted at most random subtidal stations to determine catch-per-unit-of-effort for the more common sportfishes. One or two rods were fished for 30 minutes using 4 "Wonder Jigs" per leader with strips of squid attached to most jigs.

Results

In Diablo Cove, 17.25 pole hours of effort at 29 stations yielded 10 fishes for a catch rate of 0.58 fishes per hour. This low catch rate was probably due to the dense canopy of bull kelp, which made fishing very difficult. Black-and-yellow rockfish, *Sebastes chrysomelas*, and cabezon, *Scorpaenichthys marmoratus*, were the most frequently caught species.

North Control stations produced a higher catch rate (1.20 fish per hour for 7.5 pole hours of effort at 12 stations). Blue rockfish, *Sebastes mystinus*, were the most abundant fish.

Foam Observations

Methods

We observed and took photographs of foam conditions in Diablo Cove. Also, we estimated wind speed and direction, swell height and direction, tidal stage, and foam thickness.

Results

The Pacific Gas and Electric nuclear power plant cooling system, which normally produces foam when tested, was not tested this quarter. Therefore, the foam observed was produced naturally. Foam distribution patterns were similar to those observed during testing, with foam patches concentrated in the southern portion of Diablo Cove including, on occasion, intertidal areas. Also, more foam was observed during periods of calm to moderate winds and when the tide was at flood stage.

We noted two differences in foam conditions this quarter which differed from those when the pumps are tested. The foam was much thinner this quarter; naturally produced foam was never observed over 51 mm (2 inches) thick, while the foam produced during pump testing was observed up to 200 mm (8 inches) thick. Also, there appeared to be more foam during this quarter of moderate to heavy swells than during calm to moderate swells of periods of pump testing.

Sea Otter

Method

We have no formal program to monitor sea otter activity. However,

we continued to summarize observations made by Suzanne Benech, who, under contract with P.G. & E., is conducting a sea otter survey between Point Buchon and the vicinity of Pecho Rock.

Results

Sea otter counts decreased from 66 in early July to just under 30 for the remainder of the quarter. This follows an annual pattern, observed over the past three years, of the otters moving to and north of the Pt. Buchon area during the summer and fall. Major food items consumed, apparently in equal proportions, were abalones, *Haliotis* spp.; giant red sea urchin, *Strongylocentrotus franciscanus;* and the red top shell, *Astrea gibberosa.*

The major raft location was just north of Pecho Rock.

Intertidal Surveys

Methods

During this quarter we conducted four random intertidal stations, completing our 1976 Upwelling survey. Invertebrate data from quadrats of the random stations will be detailed in the 1975-76 annual report. Algae data from this period will be detailed in the 1976-77 annual report.

APPENDIX I

MAN-DAYS SPENT AT DIABLO CANYON POWER PLANT SITE

July 1 - September 30, 1976

Intertidal surveys:	July 11, 12
Participants:	Gotshall, Laurent, Wendell, Freeman
Subtidal surveys:	July 1, 2, 12, 13, 14, 15
Participants:	Gotshall, Laurent, Wendell
	July 6, 8, 20
Participants:	Laurent, Wendell
	July 19
Participants:	Wendell, Warrick (PG&E)
	July 27 - 30
Participants:	Gotshall, Wendell, Freeman
	August 9 - 12
Participants:	Gotshall, Laurent, Wendell
	August 3 - 5, 17, 20, 23, 30, 31
Participants:	Laurent, Wendell
	August 24 - 26
Participants:	Gotshall, Wendell, Freeman
	September 1, 2, 20
Participants:	Laurent, Wendell, Freeman
	September 7 - 10
Participants:	Gotshall, Laurent, Wendell, Freeman
	September 21-22, 27
Participants:	Laurent, Wendell

Sportfish catch-per-unit-of-effort study:	July 1, 2, 6, 8, 10-15, 19, 20, 27-30
Participants:	Various
	August 3-5, 9-12, 17, 20, 23, 24-26, 30-31
Participants:	Various
	September 1, 2, 7-10, 20, 21, 22, 27
Participants:	Various

Total man-days during quarter	277
Total man-days at site*	221
Total stations surveyed	101
Travel time man-days	5
Boat time (hours)	31
Laboratory time man-days**	51

*Total time spent at Diablo Canyon by all project personnel, includes both field time as well as laboratory time.

**Time spent at Monterey office by project leader and seasonal aid.

PROJECT PERSONNEL:

Daniel W. Gotshall	Senior Marine Biologist, Project Leader
Laurence L. Laurent	Associate Marine Biologist
Fred E. Wendell	Assistant Marine Biologist
Lois E. Sloan	Stenographer
Barbara G. Freeman	Seasonal Aid
Philip R. Taylor	Seasonal Aid
Monica Farris	Seasonal Aid