State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME

DIABLO CANYON POWER PLANT SITE ECOLOGICAL STUDY
QUARTERLY REPORT NO. 18

October 1 - December 31, 1977

by

Daniel W. Gotshall
Laurence L. Laurent
and
John J. Grant

PACIFIC GAS AND ELECTRIC COMPANY
COOPERATIVE RESEARCH AGREEMENT 5-26-77

MARINE RESOURCES

Administrative Report No. 78-8

March 1978

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ABSTRACT

Large storm-generated swells prevented us from completing the random stations in the North Control.

The project has shifted to a low level of field work to allow for analysis of all data and preparation of the final report. Field work during the next year will be confined to monitoring permanent stations.

Four permanent subtidal stations were surveyed during the quarter, including a new station located at the entrance of Diablo Cove. Nine random $30m^2$ stations and 32 - $1/4m^2$ quadrats were also completed. It appears, from this year's subtidal studies, that there has been a decline in the abundance of lingcod, *Ophiodon elongatus*, and kelp greenling, *Hexagrammos decagrammus*, in the Diablo Canyon area since our studies began in 1974.

A few sea otters continue to raft and forage in Lion Rock Cove.

1/ Marine Resources Administrative Report No. 78-8, March 1978

2/ Operations Research Branch, P.O. Box 98, Avila Beach, California 93424.

This is the 18th quarterly report submitted in partial fulfillment of Research Contract No. 5-26-77 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 baseline inventory of the marine biota, with special reference to fishes and abalones.

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

Submitted To:

Nolan H. Daines, Vice President
Planning and Research Department
Pacific Gas and Electric Company
77 Beale Street
San Francisco, CA 94106

Submitted By:

John Radovich, Chief
Operations Research Branch
California Department of Fish and Game
1416 Ninth Street
Sacramento, CA 95814

INTRODUCTION

We attempted to complete surveys of random subtidal stations during the quarter, however, large storm-generated swells in late October and early November prevented us from completing all of the stations we had planned to survey.

In November, we began interim monitoring of permanent intertidal and subtidal stations. Counts of sea otters, *Enhydra lutris* were continued. Laboratory time was devoted to preparing all the remaining data for computer processing and completing the sorting and processing of intertidal and subtidal algae samples.

This report is a summary of work performed during the quarter, and does not constitute a Department of Fish and Game environmental impact report. Our annual reports contain preliminary analysis of data, and the final report of our preoperational studies, now in preparation, will contain a complete analysis of all the data collected since we began our studies in 1973.

METHODS

Permanent Subtidal Stations

Our survey methods for permanent subtidal stations are the same as presented in previous quarterly and annual reports (Gotshall et al. 1977).

Random Subtidal Stations

Our methods have been detailed in previous reports and will not be repeated here.

Permanent Intertidal Stations

Our methods remain the same as in previous reports: counts are made of all abalone one m to either side of the permanent transect, usually 30-m in length.

Sea Otters

Counts are made with binoculars once a day, weather permitting, in the Lion Rock Cove, Diablo Cove and South Cove areas.

NORTH CONTROL AND PERMANENT CONTROL STATIONS

Subtidal Activities

One permanent control station (No. 15) was surveyed before December storms prevented further diving (Figure 1).

Nine random 30-m^2 and 32 - 1/4-m^2 stations were surveyed during October and November (Figure 2). We were forced to discontinue our random surveys in late November since all of the stations remaining to be surveyed were located in shallow water (depths less than 5-m) and storm-generated swells made diving in these depths too hazardous.

Invertebrates

Results

Counts of the major invertebrates remained consistent with previous surveys.

Fish

Results

One of the more interesting observations made at both random and permanent subtidal stations this year has been the almost complete absence of lingcod, *Ophiodon elongatus*, and kelp greenling, *Hexagrammos decagrammus*. Lingcod were observed at only 4.3% of the 23 - 30-m^2 North Control stations this year. In 1974, lingcod were present at 21% of the survey stations.

Kelp greenling were observed at 36% of the 14 North Control stations in 1974; this year they were present at only 13% of the 23 survey stations.

Intertidal Activities

None of the random or permanent control stations were surveyed during

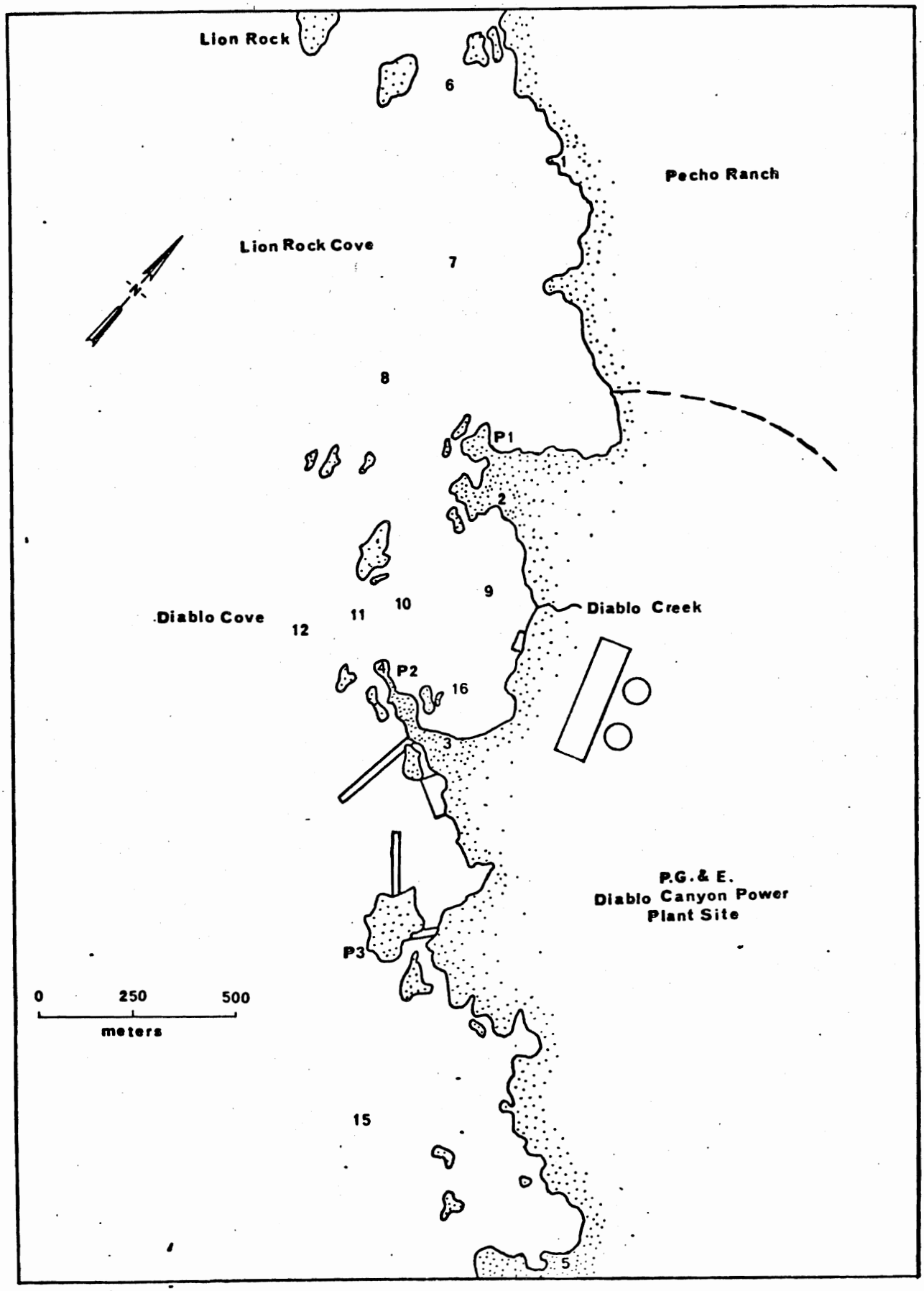

FIGURE 1. Location of Permanent Subtidal and Intertidal Stations -- Diablo Canyon Power Plant Site. (Permanent Subtidal Stations 13, 14 Abandoned; P1, P2 and P3 are New Permanent Intertidal Stations).

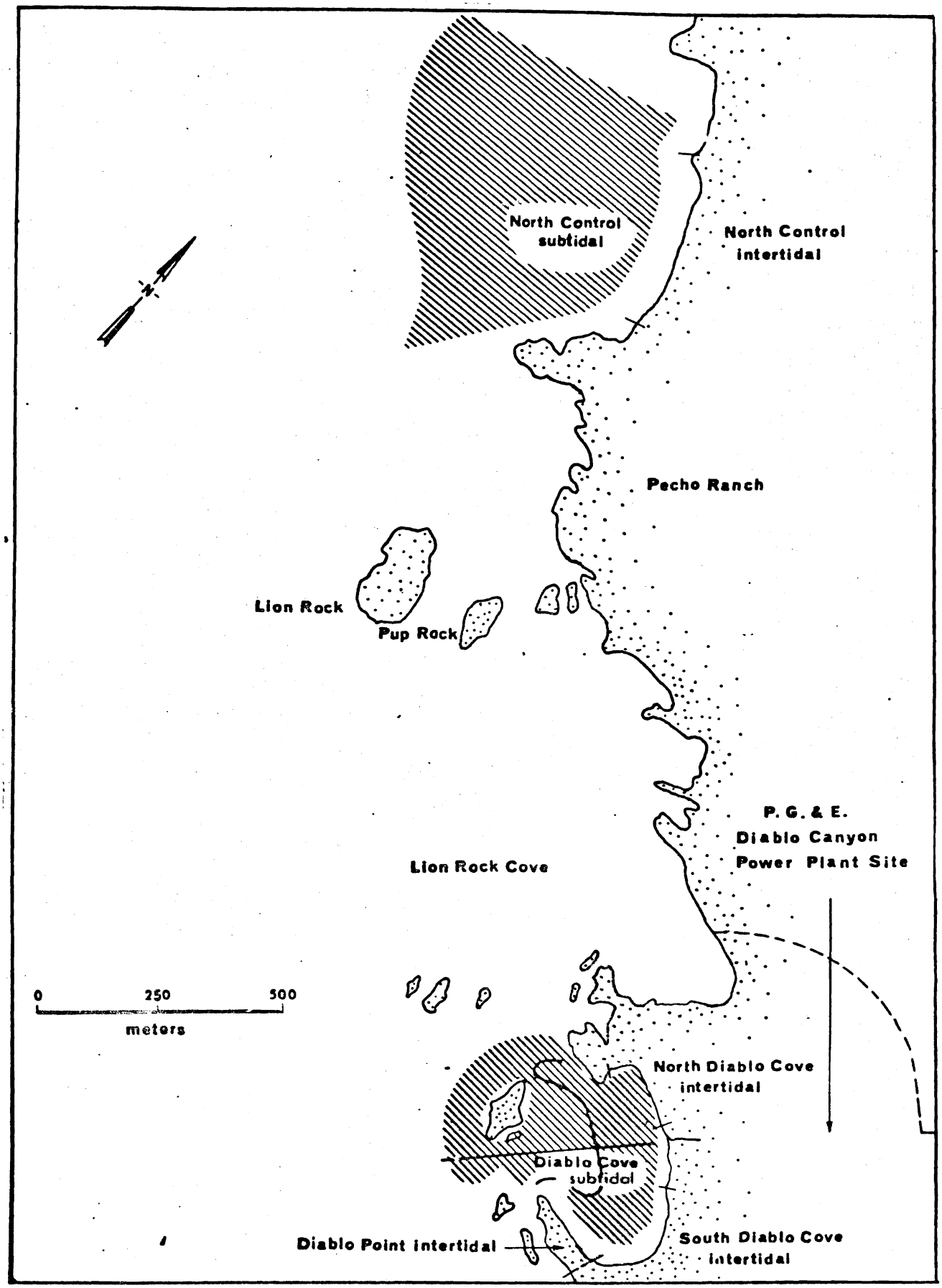

FIGURE 2. Locations of Random Subtidal and Intertidal Stations - Diablo Canyon Power Plant Site.

the quarter.

Sea Otters

Results

Sightings of sea otters were made on only three of 17 observation days during this quarter. Two of these sightings were of single animals, the third was of a mother and pup. All animals were observed in the Lion Rock area.

DIABLO COVE

Subtidal Activities

Permanent Stations 11 and 12 were surveyed before the December storms. In addition, we established a new permanent station at the entrance to Diablo Cove, on a reef adjacent to permanent station No. 12. This new station will allow us to monitor the effects of the thermal plume as it leaves Diablo Cove. In addition, the site was chosen because it still contains relatively large numbers of giant red sea urchins, *Strongylocentrotus franciscanus*, as well as a substantial number of colonies of the hydrocoral, *Allopora californica*. The area also contains a rather rich assemblage of other filter feeders and the larger species of brown algae. This reef originally attracted our attention early this past summer when we observed, for the first time since we began our studies, a small bed of bull kelp, *Nereocystis luetkeana*, that had developed on top of the reef.

Fish

Results

The relative scarcity of lingcod and kelp greenling observed at North Control stations was also evident in Diablo Cove this year. Lingcod were not observed at any of the 24 random stations. When we began our random subtidal studies in 1974, lingcod were present at 21% of the random stations.

In 1974, kelp greenling were present at 50% of the 14 Diablo Cove random stations; however, in 1977 we encountered them at only 21% of the 24 random stations.

Discussion

The apparent decline in lingcod abundance has also been reflected in the low partyboat fishery. In 1973, sport anglers averaged 0.38 lingcod per day, but in 1976, this average dropped to 0.16 lingcod per day. (L. Pinkas, Senior Marine Biologist, California Dept. Fish & Game, Long Beach, pers. commun.).

Intertidal Activities

No random sampling has been conducted at the intertidal stations during this period. By mutual agreement between our project and the Department of Engineering Research, P.G. and E., the period covering the Davidson season of 1977-78 and the Upwelling season of 1978 will be used to complete analysis of the preoperational data collected from 1974 through 1977. However, permanent stations will continue to be surveyed during this time.

Only one permanent station (3A and 3B in South Diablo Cove) was surveyed during this period (Figure 1).

Invertebrates

Results

There was no appreciable change in the black abalone numbers from previous surveys in transect 3A. But transect 3B showed an approximate 50% increase in black abalone. No red abalone were found during this survey on either transect.

Discussion

The increase in black abalone at station 3B is probably a result of removing the larger animals and thereby exposing the smaller, more cryptic abalone to our purview.

Sea Otters

Results

Although no permanent raft of otters exists in Diablo Cove, they continue to forage there. Characteristically broken sea urchin tests and abalone shells seen during dives indicate that transient otters foraged in the study area during this quarter.

A large raft of up to 100 otters was usually located at Pecho Rock, approximately 4-km south of our study site. This aggregation fluctuated in numbers daily.

APPENDIX I

MAN-DAYS SPENT AT DIABLO CANYON POWER PLANT SITE

October 1 - December 31, 1977

Intertidal Surveys:	November 9
Participants:	Gotshall, Laurent, Grant, Kelly
Subtidal Surveys:	October 3
Participants:	Wendell, Kelly
	October 5
Participants:	Gotshall, Wendell, Kelly
	October 6
Participants:	Gotshall, Laurent, Wendell, Kelly
	October 10
Participants:	Gotshall, Kelly
	October 12
Participants:	Laurent, Kelly
	October 13
Participants:	Gotshall, Laurent
	November 4, 21
Participants:	Gotshall, Kelly
	November 10
Participants:	Gotshall, Laurent, Kelly
	November 11
Participants:	Wendell, Kelly
	December 7
Participants:	Gotshall, Laurent

Total Man-Days During Quarter:	302
Total Man-Days at Site*:	229
Total Stations Surveyed:	47
Travel Time Man-Days**:	25
Boat Time (Hours):	21.8

* Excludes time off for vacation, sick leave, etc., but includes both laboratory as well as field time.

** Includes all trips away from site.

PROJECT PERSONNEL:

Daniel W. Gotshall	Senior Marine Biologist, Project Leader
Laurence L. Laurent	Associate Marine Biologist
John J. Grant	Assistant Marine Biologist
Sally A. Barker	Stenographer
James L. Kelly	Seasonal Aid
Sally J. Krenn	Seasonal Aid