

**SOUTHERN CALIFORNIA EDUCATIONAL INITIATIVE
PROGRAM YEAR 11
QUARTERLY REPORT 1**

for the period

July 1, 1999 – September 30, 1999



*A Cooperative Program
between the
University of California
and the
Minerals Management Service*

October 11, 1999

**SOUTHERN CALIFORNIA EDUCATIONAL INITIATIVE
PROGRAM YEAR 11
QUARTERLY REPORT 1**

for the period

July 1, 1999 – September 30, 1999

A Cooperative Program
between the
University of California
and the
Minerals Management Service

Russell J. Schmitt
Program Manager

Coastal Research Center
Marine Science Institute
University of California
Santa Barbara, California 93106

October 11, 1999

Program Manager's Report

for the period July 1, 1999 – September 30, 1999

This constitutes the quarterly report for the first quarter of Program Year 11 of the Southern California Educational Initiative, a cooperative research agreement between the Minerals Management Service, the state of California and the University of California.

As of this quarter, 11 projects currently are being conducted under the aegis of the Southern California Educational Initiative.

Actions Pending MMS Approval:

- We require approval of a no-cost extension of the Southern California Educational Initiative until June 2001. Several projects still have funds and are continuing research.

Major programmatic progress and actions during the quarter are summarized below for the period of July 1, 1999 – September 30, 1999.

- We now have a web site for the Southern California Educational Initiative at <http://128.111.226.115/SCEI/> - copies of final reports may be downloaded from this site;
- The Final Report for *Spatial Scale of Produced Water Impacts as Indicated by Plume Dynamics*, Washburn and MacIntyre, PIs, was completed and sent to MMS for distribution;
- The Final Report for *Environmental Degradation and Identification of Toxic Compounds of Petroleum and Associated Materials*, Higashi and Crosby, PIs, was completed and sent to MMS for distribution;
- The Final Report for *Effects of Barium and Divalent Cations Associated with Oil Production Wastes on Developing Marine Organisms*, Cherr and Fan, PIs, was completed and sent to MMS for distribution;
- The Draft Final Report for *Mitigating the Impact of Offshore Oil Development*, Woolley and Lima, PIs, was submitted to MMS for comments;
- The Draft Final Report for projects *Ecological Effects of Chronic Exposure to Produced Water: A Field Test* and *Environmental Effects of Produced Water: A BACIP Field Assessment*, Osenberg, Holbrook, Schmitt and Carr, PIs, was submitted to MMS for comments;
- The Draft Final Report for projects *Effects of Produced Water on Demographic Rates* and *Environmental Recovery Following Cessation of a Produced Water Discharge*, Schmitt and Osenberg, PIs, was submitted to MMS for comments.

Environmental Assessment: Statistical Description of Variable Effects on Fluctuating Populations
Adding Biology to BACI: Exploring the Use of Functional Groups, Trophic Relationships and
Multiple, Ecologically Similar Comparison Sites in Choosing Models and Estimating Effects
Impacts Analysis

Principal Investigator: Allan Stewart-Oaten, Department of Ecology, Evolution and Marine Biology, University of California, Santa Barbara, CA 93106, **Stephen Schroeter** Marine Science Institute, University of California, Santa Barbara Ca 93106

Major Accomplishments, July 1, 1999 – September 30, 1999

The two main aims of these programs have been:

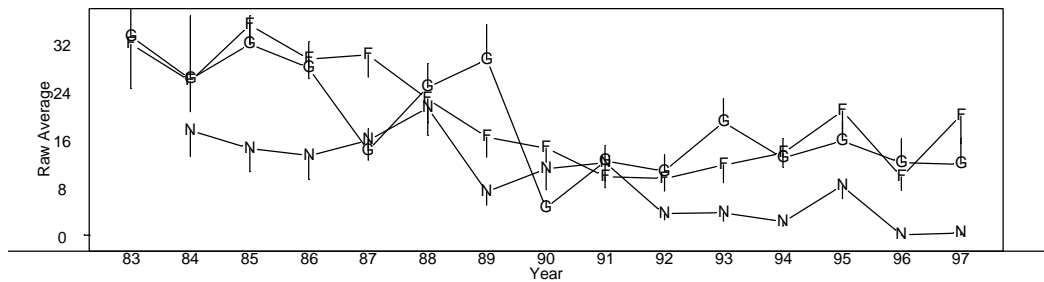
(1) to produce a method for assessing environmental impacts on fluctuating populations which uses neighboring, similar sites to reduce extraneous temporal variation and serial correlation in the data used for estimating effect sizes or for describing effects under various conditions;(2) to test this method on real data, from the annual surveys of the Channel Islands National Park Service: specifically, to see whether neighboring, similar sites can be used to predict each other's fluctuations over time, such that the temporal variation and serial correlation of the residuals from the prediction are smaller than those of the original data.

Summary of Research, June 1999 - September 1999.

(1) Since June, most of my effort has gone into the paper with Dr. Bence, "Temporal and Spatial Variation in Environmental Impact Assessment." This effort was not so much new research as explanation, needing attention to wording, notation, topics to include, tables, and figures. A final version was mailed to Ecological Monographs on Saturday, 10/23, with a copy to Fred Piltz.

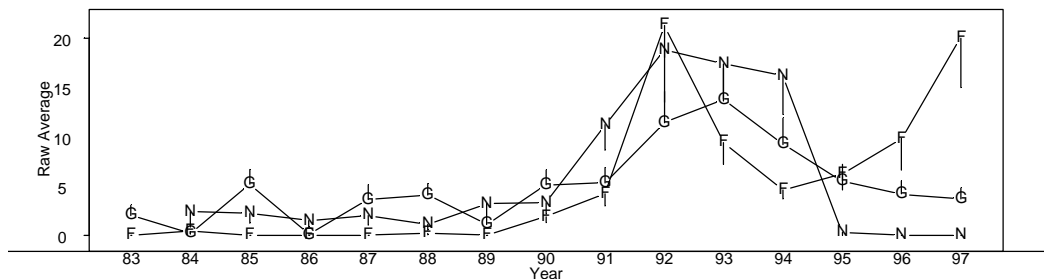
(2) During this period, Steve Schroeter continued to work on the Channel Islands data. His focus has been mainly on BACI-type analyses for actual impacts, e.g., of sea cucumber harvesting. We have discussed his results only informally so far. I think he is finding harvesting effects, but also finding that much of the data are not suitable for the simpler types of BACI analyses, because of trends or nonlinearity in the relationships between Impact and Control sites, serial correlation, etc.

Cobble (Cobble)



Sites: F=N6:AI-CC, G=N7:AI-LC, N=S6:AI-AR

Cystoseira Spp. (bladder chain kelp)



Sites: F=N6:AI-CC, G=N7:AI-LC, N=S6:AI-AR

Problems Encountered: Arriving at a manuscript that satisfied both authors was not easy, but both of us now think the final ms is better than any of the intermediates.

MMS Action Required: None.

Presentations:

"Predicting a time series at a site from series at nearby sites", UCSB Statistics Department, May 4.

"Using 'control' sites to reduce error in environmental impact assessment - with luck and good models" Biometric Society meeting, U. Washington, Seattle, June 28.

Future Plans: Funding for this MMS contract has ended, but Schroeter and I plan to continue the work. We want to publish the patterns we have found so far, but more is needed to make a coherent story with useful messages. The statistics grad student, Anna Valeva, who helped us earlier, has expressed interest in further work too.

I described much of what we have found in the Channel Islands data in my report of 6/99. In brief, there was broad evidence of tracking, in that correlation was higher within groups of neighboring sites than between them, we found evidence of tracking between some sites for some species. However, the tracking was weaker than we had hoped and was found by "data mining" which can too easily make chance patterns seem systematic. While differences between sites could have much smaller variation than the separate site values, linear predictions of the second half of the data (e.g., 1992-8) based on the first half (1984-91) were erratic.

Much more is needed on (a) which features are the best guides to whether one site will predict another - proximity, depth, substrate, exposure, current pattern, ...? (b) which species are most likely to be predictable? (c) what should the prediction relationships look like – the "difference" form of the early BACI approaches, or linear nonlinear regressions; should transformations be used; should "sine wave" seasonal effects be included? (d) when can these relationships usefully reduce temporal variation and serial correlation is effect estimate? (e) How should serial correlation be handled – by standard or special "long memory" models? Should we allow for dependence between Before and After values (to deal with "errors" whose effects last longer than the "Interim" period)?

We plan to continue work on the Channel Islands data as it comes in, and hope to find other data sets like this – preferably with several samples per year, so that seasonal variation and short-term correlation can be assessed.

Estimated Percentage of Budget Expended:

Project Year 1	100%
Project Year 2	100%
Project Year 3	100%

Effects of Biologically Degraded Oil on Marine Invertebrate and Vertebrate Embryos and Larvae

Principal Investigators: Gary N. Cherr, Bodega Marine Laboratory, University of California, Davis, CA 94923, Rick Higashi, Crocker Nuclear Laboratory, University of California, Davis, CA 95616, Frederick J. Griffin, Bodega Marine Laboratory, University of California, Davis, CA 94923.

Major Accomplishments, July 1, 1999 – September 30, 1999

The last three months have focused on developing a non-destructive screening method for assessing exposure to biologically degraded oil in a marine model system. Batstars (*Patiria*) are commonly found at or near natural oil seep sites in the Santa Barbara Channel. We have investigated the use of batstar coelomocytes for the following reasons: 1) coelomic fluid can be withdrawn from individuals repeatedly (several times over a one month period) without compromising their apparent health; 2) coelomocytes are the functional immune system in echinoderms and should be indicators of stressor exposure; 3) since the cells can be cultured *in vitro*, this system can be used for both whole animal exposures as well as small volume *in vitro* exposures; and 4) our preliminary experiments had shown that these cells in fact possess a multixenobiotic resistance (MXR) transport system. Since the latter has been shown to be inducible in organisms from sites exposed to organic pollutants, we hypothesized that the MXR transporter activity in coelomocytes could be used as an indicator of hydrocarbon exposure as well as possible hydrocarbon resistance in at least some echinoderms.

Coelomocytes from adult batstars exposed (7 days) to low concentrations of biodegraded oil showed a clear increase in dye exclusion activity (the measure of MXR activity) as well as increased labeling when probed with a monoclonal antibody to the human MDR protein. *In vitro*, it was found that there was a large degree of variability between individuals with respect to the inherent dye transporting activity in coelomocytes shortly after collection. However, when cells were allowed to remain in culture for 24 hrs. with or without degraded oil, there appeared to be a significant induction in the MDR-like protein. Although additional studies need to be completed which take into account seasonal and reproductive/sex data, it would appear that the monitoring of MDR-like presence and activity will be useful in determining its role in organisms exposed to oil constituents both naturally as well as through anthropogenic releases.

Future Plans

Work will continue in on baseline MXR activity in animals from clean sites. We will plan to collect animals from seep sites over the next two quarters.

Estimated Percentage of Budget Expended:

Project Year 1	100%
Project Year 2	100%
Project Year 3	85%

Detecting Ecological Impacts: Effects of Taxonomic Aggregation in the Before-After/Control-Impact Paired Series Design

Principal Investigators: **Sally Holbrook**, Department of Ecology, Evolution and Marine Biology, University of California, Santa Barbara, CA 93106, **Mark H. Carr**, Department of Biology, University of California, Santa Cruz, CA 95064, **Craig W. Osenberg**, Department of Zoology, University of Florida, Gainesville, FL 32611-8525.

Major Accomplishments, July 1, 1999 – September 30, 1999

We continued to focus our efforts on processing and analyzing data this past quarter. The primary tasks conducted this past quarter were:

- Further species and assemblage level comparisons of recruitment and density (fish per unit water volume) among platforms and between platforms and reefs were analyzed.
- Analyses of fish size distributions among depths and habitats (platforms vs. natural reefs) are being conducted and used for interpretation of fish movement data from the tagging study.
- Carr presented a summary of concepts developed from the CMI research, “Understanding the Ecological Consequences of Artificial Reefs in Coastal California” to the California Coastal Commission in Los Angeles, August, 1999.

Problems Encountered: We have depleted all funds in the salary category of our budget. These funds are necessary for technician support in analyzing data.

MMS Action Required: It is critical that funds be shifted from other categories (equipment, supplies) to salary support for technicians as recently requested.

Future plans: Further analysis and preparation of publications.

Estimated Percentage of Budget Expended:

Project Year 1	100%
Project Year 2	100%
Project Year 3	95%

Effects of an Oil Spill on Multispecies Interactions that Structure Intertidal Communities

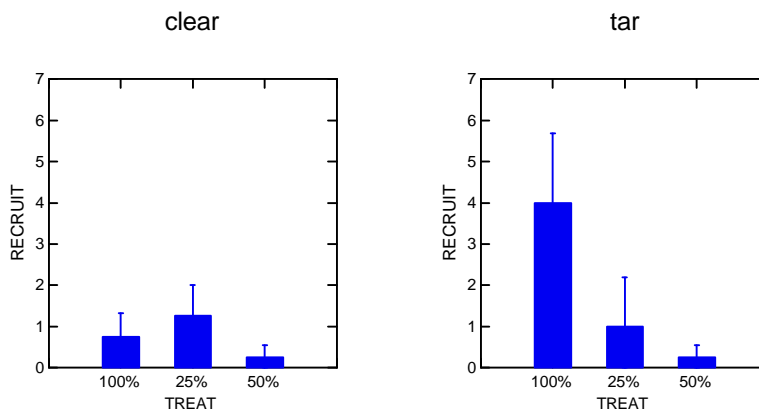
Principal Investigator: Peter Raimondi, Department of Biology, University of California, Santa Cruz, California 95460.

Major Accomplishments, July 1, 1999 – September 30, 1999

The plots established at Boathouse, on Vandenberg Airforce Base, were sampled in July. Data was collected on the number and the sizes of barnacles in the cleared plots and the tarred plots. Barnacles were present in the cleared and the tarred plots. Aside from the 100% cleared/tarred treatment, the number of recruits were about equal in the tarred and the cleared plots. There was no distinct pattern in the number of recruits as a function of percent cleared/tarred.

Samantha Forde will be submitting a paper assessing the consequences of chronic tar exposure to life history traits and population regulation of the barnacle, *Chthamalus anisopoma* to the Journal of Applied Ecology. The model assesses the trade-off between growth and reproduction under chronic, low levels of tar cover and then the loss of fitness to an individual in the event of a major oil spill. The individual model is linked to a population model which evaluates the interaction between recruitment and the probability of an oil spill to population dynamics.

Christy Roe (a new laboratory technician working on this project) has been analyzing slides from the Shoreline Inventory Program, to evaluate the length of time that tar persists. To date, she has examined all of the slides taken of the permanent quadrats at Government Point from the Spring of 92 thru the Fall of 98. This information suggests that the length of time that tar persists is variable. Variability in tar patch persistence may result from; temperature, zonation and wave exposure. These factors not only contribute to the weathering (degradation) of tar, but may have an effect on where the tar lands. The disappearance of tar may also be a function of the species assemblage upon which it landed. For example, it appears that tar persists longer on barnacles than on algae.



Personnel

Christy Roe is funded 2/3 time as a laboratory technician on the project.

Samantha Forde is funded as a graduate student research assistant.

Future plans:

The tar will be removed from the plots in November and recruitment of new individuals to the plots will be measured in March. This will allow us to investigate how the barnacle populations recover from an oil spill once the tar has degraded.

Christy Roe will continue to analyze slides from the Shoreline Inventory Program, to identify sources of variability. During the upcoming survey at Boathouse naturally occurring tar patches (covering different species assemblages, within different zones and with different wave exposure) will be located, marked and measured. These tar patches will then be sampled quarterly to quantify variability in the persistence of tar patches.

Estimated Percentage of Budget Expended:

Project Year 1 50%

Inventory of Rocky Intertidal Resources in San Luis Obispo and Northern Santa Barbara Counties

Principal Investigators: Peter Raimondi, Department of Biology, University of California Santa Cruz, CA 95064

Major Accomplishments, July 1, 1999 – September 30, 1999

The majority of the work for the Shoreline Inventory Project in San Luis Obispo and Northern Santa Barbara Counties during this quarter focused on scoring photographic slides and entering these percent cover data, along with field data collected during the previous quarter into computer files. Although no statistical analyses were performed, these data have been incorporated into graphs that allow us to observe dynamics in species abundances. Comprehensive statistical analyses are done every 3 years and results are discussed and included in a formal 3-year report to the Minerals Management Service.

On July 5th, 14th, and 15th, San Luis Obispo and Northern Santa Barbara County sites were visited in order to collect data for an ongoing barnacle recruitment study.

Currently, we are planning and preparing for the upcoming sampling trips, which will take place in November and December.

Future Plans:

In the next quarter we will sample all sites in both counties.

Estimated Percentage of Budget Expended:

Project Year 1 60%

Inventory of Rocky Intertidal Resources in Los Angeles, Ventura, and Southern Santa Barbara Counties

Principal Investigator: Dr. Richard F. Ambrose, Dept. of Environmental Health Sciences and Environmental Science and Engineering Program, University of California, Los Angeles, CA 90095-1772

Major Accomplishments, July 1, 1999 – September 30, 1999

During this quarter, the major effort involved managing data following the Spring 1999 sampling and completing the backlog of work accumulated in the absence of a full time technician. The remaining Fall 1998 slides were scored and all previously collected data were entered into the computer files. The computer files have finally been streamlined and renamed to facilitate future database and file management. The Spring 1999 slides were scored and the data were entered into the computer files. From these data new graphs were produced that were included in the recent annual report, which was also written during this quarter. The photographic slides were reorganized into plastic slide holders such that a quick analysis of specific plots could be made looking across sampling seasons. The files that contain all of the hard copies of the data from the various sampling seasons were also organized and labeled so that quick inquiries of past data could be made.

This quarter, the decision was made to establish barnacle recruitment plates and clearings at all of the sites, with the exception of Coal Oil Point (which does not have barnacle plots). We not only serviced the sites with existing barnacle plates and clearings, but also established new ones at Carpinteria, Mussel Shoals, Old Stairs, Paradise Cove, and White's Point. We are considering establishing further recruitment studies at the sites, but no concrete decisions have been made to date.

During the meeting of PI's that occurred this quarter, some decisions were made regarding video protocols and the archiving of photographic images. A revised video protocol was developed and for that we reviewed the Spring 1999 site videos and extracted site specific video protocols. Several new video reference points were established and included in the revised protocol. The decision was made to replace the video surveys with still photo surveys, and to use the Fall 1999 sample to test the new method. We received a new Nikon camera to use in the photo sampling and some time was spent learning how to use this new camera. We will be using this new camera this fall, and will develop a protocol. We received a new digital video camera this quarter, as well as a new Nikonos Strobe. (The video camera is currently in MMS' possession.) We also received a new slide scanner so that the archived photoplot images and new still photo surveys can be archived as computer files. We have set this equipment up on a new computer, and are awaiting the purchase of a new writeable CD ROM drive to begin electronic storage of these photos.

Future Plans:

Our proposed sampling schedule for Fall 1999 is included below. In addition to our normal sample sites, we plan to set up and begin monitoring a new site in Los Angeles County at Point Fermin in the Cabrillo Marine Life Refuge. This is in conjunction with the Cabrillo Marine Aquarium, who will be helping with site establishment and monitoring. We will also continue managing the data, including slide scoring, data entry, and updating the graphs.

Table 1. Proposed sampling schedule for Fall 1999.

Date	Location	Comments
October 24	Carpinteria	MMS Help
October 25	Alegria	MMS, SB County Help
October 26	Point Fermin	Site Creation with Cabrillo Marine Aquarium Help
November 7	White's Point	Cal State Dominquez Hills Help
November 8	Coal Oil Point	SB County Help
November 9	Old Stairs	No Agency Help
November 21	Paradise Cove	No Agency Help
November 22	Mussel Shoals	No Agency Help
November 23	Arroyo Hondo	SB County Help
November 24	Point Fermin	First Sampling with Cabrillo Marine Aquarium Help

Problems Encountered:

No major problems were encountered during this quarter. The only major issue continues to be the lack of funding for the LA County sites.

MMS Action Required:

None.

A Design for a Time Series Study of a NIMBY Response

Principal Investigator: Eric Smith, Department of Political Science, University of California, Santa Barbara, California 93106

Major Accomplishments, July 1, 1999 – September 30, 1999

In this period, we began to develop a survey questionnaire—focusing on questions about factual knowledge and perceptions of risks associated with oil production and distribution. We wrote an initial set of questions and began discussing them with various stakeholders.

We also began to develop and test content analysis measures for newspapers. We are developing two sets of measures. The first set is designed to assess the risk information available to the public; the second set is designed to assess the type of information the public receives about the oil and nuclear power industries (nuclear power is being used to provide a set of comparisons with oil).

Our initial examination of the risk assessment information indicates that the public is given almost no comparative risk assessment information—even in major newspapers such as the *Los Angeles Times*. That is, although newspapers carry a large number of stories about causes of death, they rarely offer their readers any information about the likelihood of dying from various causes. Readers, therefore, have no basis for estimating how dangerous various hazards are (for example, how dangerous it is to live near an oil refinery). Because a good deal of previous risk perception research assumes that this information is available and that the public can make informed estimates, we will pursue this finding in the expectation that our results are publishable.

Problems Encountered: None

MMS Action Required: None

Future Plans: In the next three months, we will continue to develop the survey questionnaire. In particular, we will design surveys both for the mass public and for activist groups. We will also continue to develop the content analysis protocols. We expect to draft an article presenting our findings about available comparative risk assessment information in newspapers.

In addition, we will develop a zip-code based coding scheme to measure the proximity of potential survey respondents in the San Luis Obispo, Santa Barbara, and Ventura counties to oil drilling or refining facilities, and a similar measure of whether oil drilling or refining facilities are in the viewshed of potential respondents. This coding scheme will be designed to work in geographical information systems (GIS) software.

Estimated Percentage of Budget Expended:

Project Year 1	83%
----------------	-----

The Political Economy of the Rigs-to-Reef Option for Decommissioning of Offshore Oil and Gas Structures

Principal Investigators: **Michael McGinnis**, Marine Science Institute, University of California, Santa Barbara, California 93106; **Linda Fernandez**, Donald Bren School of Environmental Science and Management, University of California, Santa Barbara, California 93106; **Caroline Pomeroy**, Institute of Marine Science, University of California, Santa Cruz, California 95064

Major Accomplishments, July 1, 1999 – September 30, 1999

Drs. McGinnis and Fernandez met bi-weekly during this quarter to discuss research on the costs and benefits of different alternatives or options for decommissioning of OCS oil and gas structures. Both PIs attended several meetings sponsored by Santa Barbara County, the Minerals Management Service and other agencies on the subject of decommissioning.

Fernandez and her graduate student researcher conducted a document search at the Minerals Management Services Camarillo Office, and made copies of several important reports and documents on the subject.

During this quarter, Dr. Fernandez completed her analysis of the costs and benefits of different decommissioning alternatives ranging from complete removal to converting the existing oil platforms to artificial reefs in their current locations. This analysis was completed with assistance from a graduate student researcher.

Dr. McGinnis has begun a document search for materials and information of the Gulf of Mexico state rigs-to-reef programs and other federal laws and programs that support these state programs.

Building on this analysis, Drs. McGinnis and Fernandez submitted another grant proposal to the University of California's California Policy Research Center to evaluate the relevant policy tools that California resource managers can use to develop and implement decommissioning policy. This proposed study will build on the current one and would provide information critical to the evaluation of the rigs-to-reefs option for California.

Future plans: Work will proceed as scheduled.

Estimated Percentage of Budget Expended:

Project Year 1	23%
----------------	-----

Early Development of Fouling Communities on Offshore Oil Platforms

Principal Investigators: H. Mark Page and Jenifer Dugan, Marine Science Institute, University of California, Santa Barbara, California 93106

Major Accomplishments, July 1, 1999 – September 30, 1999

During the reporting period, spatial and temporal patterns in fouling community development were measured at depths of 6, 12, and 18 m on Platform Houchin using two types of settlement surfaces attached to frames and by vacuum sampling on conductor pipes. Tuffys were retrieved monthly at all depths. Tiles were retrieved after a two and four month exposure time at all depths. Selected platform members were also scraped clean by divers in July at the three depths. Permanently marked 20 cm x 20 cm quadrats on the scraped platform surfaces at Houchin were photographed in July and September. Vacuum samples from randomly selected 20 cm x 20 cm quadrats were collected at all depths 2 months after cleaning (in September). Removal experiments using the anemone, *Anthopleura elegantissima*, were also initiated at Platform Houchin at a depth of 9 m. Circumference measurements and photoplots were taken at Platform Hogan at depths from 6-12 m.

Processing was initiated on the tuffys and tiles and a plankton splitter was obtained for use in subsampling invertebrates from the tuffys. Subsamples of different sizes were analysed to determine the appropriate subsample size to use in processing the major taxa occurring on the tuffies.

After 2 months, the total percent cover of invertebrates on the tiles ranged from 20- 98%; After 4 months, percent cover had increased, ranging from 78 to 100%. Taxa present on the majority of the tiles processed to date from all depths included hydroids, bryozoans, tunicates, amphipods and acorn barnacles. Tunicates and bryozoans occupied the majority of the space on the tile surfaces at all depths and in both time treatments. Amphipods were more prevalent at 6 m than at other depths. Acorn barnacles, *Megabalanus californicus*, occurred on tiles from both the 2 and 4 month treatments at all depths. Abundance and individual size of barnacles were larger at 6 m than at the other depths in the 4 month treatment.

Problems Encountered:

Additional clearing of the remnant fouling community at all depths was required prior to the initiation of the study at Platform Houchin. This clearing resulted in a number of extra dives and several additional trips to the platform during this quarter.

Future plans:

Deployment and retrieval of settlement surfaces, and photoplot and vacuum sampling of the platform structure as described above will continue, including treatments which are exposed for longer periods of time (6 month, 12 month tiles and scraped surfaces). Traps to collect faunal litterfall will be deployed in October. Mussel removal experiments will be initiated in November.

Estimated Percentage of Budget Expended:

Project Year 1	20%
----------------	-----

Application of Genetic Techniques for use Restoration of Surfgrass (Phyllospadix torreyi)

Principal Investigators: **Scott Hodges**, Department of Ecology, Evolution and Marine Biology, University of California, Santa Barbara, California 93106; **Douglas Bush**, Marine Science Institute, University of California, Santa Barbara, California 93106; **Daniel Reed**, Marine Science Institute, University of California, Santa Barbara, California 93106

Major Accomplishments, July 1, 1999 – September 30, 1999

During this quarter we have made a great deal of progress on our project. We have finished isolating DNA from all of our samples. In addition, we have completed the digestion/ligation reactions necessary for the production of AFLP fingerprints on all of these samples. Because the initial restriction-enzyme digestions are critical to the production of true differences among individuals, we have spent a great deal of time determining that the procedures we have used produce reliable AFLP fingerprints. We have made replicate DNA isolations from many different individuals and shown that AFLP patterns from these samples are essentially identical.

We have now been focusing our efforts on our analysis of genetic diversity within and among populations of surfgrass. We have completed AFLP fingerprints, using three different primer pairs, on all of these samples. We have nearly completed analyzing three additional primer pairs on all of these samples. So far, we are finding about 30 variable bands among samples across populations and therefore we expect to have nearly 200 variable bands to determine population differentiation. Thus far we have found genetic evidence for clonality on a limited scale. Clones appear to occur on a spatial scale on the order of a few meters at most. We have also begun to analyze our samples to determine the mating system of surfgrass. We have analyzed one population to date and found that all seeds were produced through sexual reproduction and not apomixis.

Problems Encountered:

We found that extracting DNA from surfgrass is relatively difficult. We have tried a number of different techniques for DNA isolation and found that Qiagen DNeasy kits, with each sample processed twice, produces the largest quantity and highest quality DNA for AFLP analysis. Using this procedure we are now obtaining highly reproducible AFLP fingerprints

Future plans:

Work will proceed as proposed.

Estimated Percentage of Budget Expended:

Project Year 1 30%