SOUTHERN CALIFORNIA EDUCATIONAL INITIATIVE

PROGRAM YEAR 11

QUARTERLY REPORT 3

for the period

January 1, 2000 – March 31, 2000

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

April 14, 2000

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Russell J. Schmitt
Program Manager

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

April 14, 2000

Program Manager's Report

for the period January 1, 2000 – March 31, 2000

This constitutes the quarterly report for the third 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, 9 projects currently are being conducted under the aegis of the Southern California Educational Initiative.

Actions Pending MMS Approval:

- We are waiting for MMS comments on the Draft Final Report for *Mitigating the Impact of Offshore Oil Development*, Woolley and Lima, PIs.

Major programmatic progress and actions during the quarter are summarized below for the period of January 1 – March 31, 2000.

- The Final Report for project *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, will be submitted to MMS next quarter in hard copy and PDF formats;
- The Final Report for project *Effects of Produced Water on Demographic Rates* and *Environmental Recovery Following Cessation of a Produced Water Discharge*, Schmitt and Osenberg, PIs, will be submitted to MMS next quarter in hard copy and PDF formats;
- The Final Report for project *Inventory of Rocky Intertidal Resources in San Diego County*, Engle, PI, will be submitted to MMS next quarter in hard copy and PDF formats.

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, January 1, 2000 - March 31, 2000

Studies on the toxic effects of BWSF to marine invertebrate larvae are continuing. Three major model species remain the focus of our investigations; these are, *Crassostrea gigas*(pacific oyster), *Lytechinus anamesus* (white urchin) and *Urechis caupo*(innkeeper worm). A major emphasis is to complete our characterization of the developmental bases for differences in susceptibility to BWSF. In all three species, preliminary results suggested that the larval endpoint of continuously exposed embryos is an accurate predictor of effect at stages corresponding to or following gastrulation. Effects are less readily observed prior to formation of the blastula larvae. Thus,we are testing the hypothesis that BWSF is most toxic to embryos during the period of initiation of genomic expression (i.e. gastrulation). It is also likely that early cytotoxicity of BWSF may also contribute to effects only observed after gastrulation. Moreover, we hypothesize that the magnitude of difference in response between BWSF susceptible (sea urchin) and resistant (oyster and worm) larvae is similar at developmental endpoints at or following gastrulation.

We are also attempting to link these developmental predictors of response to our functional observations of the multi xenobiotic response (MXR) in these embryos. We have collected larval samples from multiple batches of control and BWSF exposed embryos, along a standard developmental timecourse, in order to determine if and when MXR protein levels are developmentally regulated. All samples will be run using standard immunoblotting techniques previously used to determine the level of the MXR transporter in the three species. In addition we intend to correlate these findings to functional assays of MXR protein activity. We have recently developed a new method of measuring MXR dependent dye efflux in batches of whole larvae using the fluorescent probe calcein-AM. This probe has the advantage of being trapped inside larvae once the lipid soluble AM group is cleaved by intracellular esterases. This results in maintenance of a high inwardly driven gradient of calcein- AM even at very low extracellular concentrations. Preliminary results corroborate our findings with rhodamine dye efflux and suggest that BWSF is a substrate for MXR and a potentially potent competitive inhibitor of normal MXR function. Consequently we suspect that BWSF may be exerting an additional toxic effect by preventing the normal efflux of endogenously produced toxins and byproducts of metabolism.

Future Plans:

We are in the final stages of preparing a manuscript on the work described above. In addition, we are conducting final exposures of adult starfish for quantitation of MXR protein in coelomocytes. Finally, we plan to investigate cells/tissues of animals collected at seep sites later this spring.

Estimated Percentage of Budget Expended:

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

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, January 1, 2000 - March 31, 2000

- While some files are still being formatted to facilitate data analysis, data analysis continues at Osenberg's lab.

- Processing of bivalve and crustacean samples for size-frequency analysis continues in Carr's lab at UCSC with the image analysis system. At present, bivalve samples from Gaviota have been imaged and processing of Carpinteria samples continues.

- Carr presented an invited symposium paper in the Marine Reserves Symposium at the 80th Annual Western Society of Naturalists meeting that discussed the application of the BACIPS approach to evaluate the effectiveness of marine reserves: "Marine Reserve Effectiveness: Approaches to Evaluation and Need for Adaptive Management". Mark Carr, Pete Raimondi and Craig Syms. Monterey, CA, December, 1999.

Future plans:

- We expect to continue most of the analyses through years 4 and 5. All other samples designated for size frequency analysis are being shipped to UCSC. We are making arrangements to have all samples not designated for size frequency analysis to be archived at the Los Angeles County Museum. Osenberg's lab will continue analysis of the MRC data and begin analysis of the Gaviota and Carpinteria databases. Carr's lab will continue to process size-frequency samples.

Estimated Percentage of Budget Expended:

Project Year 1 100%
Project Year 2 100%
Project Year 3 97%

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, January 1, 2000 - March 31, 2000

The plots established at Boathouse, on Vandenberg Airforce Base, were sampled in March 2000. Data was collected on the number and the sizes of barnacles in the cleared plots and the tarred-degraded plots (plots in which ½ of the tar was removed in the fall of 1999 to emulate tar degradation). Barnacles were present in the cleared and the tarred-degraded plots. Barnacles recruited next to tar patches on the bare rock. Thus, the results of this research so far point toward little effect of tar cover on barnacle recruitment.

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 also have an effect on where the tar is deposited. Christy has been utilizing a tide program to make predictions regarding variability in tar patch accumulation and persistence as a function of tidal height and exposure. While this information is useful, it does not explain the patterns we see entirely. Thus, over the last three months, we have been designing some experiments to measure variability in tar patch persistence as a function of species assemblage. We know that tar accumulates and persists in the barnacle zone longer than any other zone, this may be due to its longer exposure period (the tar has a chance to stick, it may also result in part form the texture of barnacles). In contrast, tar does not accumulate and persist in the algal zones, this may be due to a shorter exposure period (the tar may not heat up enough to stick, it may also be biological in nature since many alga produce mucilage that may inhibit tar from sticking). To test these ideas, Christy plans to put barnacle casts in the intertidal at each of her three sites (from north to south: Point Sierra Nevada, Shell Beach and Boathouse). She plans to put the casts in the barnacle zone (control), *Endocladia, Pelvetia* and mussel zones. Also to try and elucidate the effects of temperature, she plans to try and set up half the plates with northern exposure and half the plates with a southern exposure (this may be difficult due to site dependence). Christy has researched the literature and experimented with different materials to make good barnacle casts/mimics. She has tested the casts, in the intertidal at Hopkins Marine Reserve in Pacific Grove to insure that they will hold up in the intertidal environment. She has also tested the materials to insure that tar will stick to them. Now that we know the materials can withstand the intertidal environment and that tar will stick to them, we plan to put them out at each of the three sites in April.

Future Plans:

We will now begin to investigate the effects of tar cover on barnacle growth and survival, using the same plots in which we tested for the effects of tar cover on barnacle recruitment. We will allow barnacles to recruit into the cleared and the tar-degraded plots and follow growth and survivorship.

We will continue to monitor both the number and size of tar patches, as well as the percent tar cover in the marked plots on a biannual basis. In addition, we will be putting the Barnacle casts out at each of our three sites this coming April and plan to monitor them for tar accumulation (initially) on a bimonthly basis.

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.

Estimated Percentage of Budget Expended:

Project Year 1 60%

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, January 1, 2000 - March 31, 2000

During this quarter 9 of the 10 study sites in San Luis Obispo (SLO) and Northern Santa Barbara Counties (SBC) were sampled. Sampling occurred during March 1-4 (SLO sites), and March 5, 14th, and 15th (northern SBC sites). One of the northern SBC sites, Government Point, could not be sampled during this period because access by land was not granted until just recently. This site will be sampled in the upcoming quarter to complete the spring sampling.

Black abalone numbers appear to have stopped declining at Stairs (SBC), while numbers continue to decline at Purisima Pt., just north of Stairs. Declines at these sites are due to the fatal disease termed withering syndrome. Nearly all of abalone plot 1 at Piedras Blancas (SLO) was lost due to rock breakout. A few abalone still remain in the plot, but a new plot was established in order to better monitor the abalone population at the site. Monitoring black abalone at this site is essential, as this will be the next big abalone population to be decimated by withering syndrome if the disease continues its northerly progression up the coast. To date, no evidence of withering syndrome has been detected at Piedras Blancas.

For all sites sampled this quarter, photographic slides for photoplot species (mussels, barnacles, anemones, and several species of algae) were scored for percent cover.

Future Plans:

In the next quarter Government Point will be sampled. In addition, percent cover data from the photographic slides will be entered along with field data into computer files.

Problems Encountered:

Lottia gigantea (owl limpet) plots were not accessible at Hazards (SLO) because the swell was especially large on the day that this site was sampled. We are planning to return to the site in April to get counts and size measurements for these limpets within our plots.

Estimated Percentage of Budget Expended:

95%

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, January 1, 2000 - March 31, 2000

During this quarter, effort was divided between completing tasks relating to the Fall 1999 sampling and the planning and executing the Spring 2000 sampling. Throughout the early portion of this quarter, the remaining Fall 1999 data were input into the computer database files and the corresponding graphs were updated. We also continued the process of archiving the photoplot slides for the LA and Ventura sites back to the first sampling season (Fall 1994). One set of images from the current Fall 1999 season's still photo survey per site was also included here. These images were saved to compact disk media, and copies were distributed to the relevant institutions. In addition, the U.C. Santa Cruz group sent us sets of their still photo surveys from the Fall 1999 sampling season to scan into the computer with our bulk loader. These images were saved to a CD, which was returned to the UCSC group. In January, the quarterly report for the preceding quarter was written. Then in February, a considerable amount of time was spent revising the overdue inventory report that was due in early 1998.

Sampling for the Spring 2000 sampling season for LA, Ventura, and southern Santa Barbara Counties was performed throughout the month of March (see table below). White's Point was originally planned for March 31, but was rescheduled for April 14 for logistical reasons. While there were many available minus tide days this spring, heavy swells happened to coincide with the primary sampling period (March 14 through March 20), hindering our work and preventing us from completing several of the sites on the original sampling day. At Old Stairs, for example, which can normally be completed during a –0.3 tide, the anemone plots were impossible to access. We had to revisit this site later, after we completed the nearby Paradise Cove site. Coal Oil Point was completed during a single visit and was not affected by the swell. However, a film-winding problem occurred that destroyed the images of the anemone plots; these photoplot slides were retaken following the Arroyo Hondo sampling. We were unable to sample the surfgrass transects at Point Fermin on March 20th, due to marginal tides and heavy swell. This site should be sampled on a –0.5 tide or lower, and we have scheduled a second visit on April 14th. We will also be able to sample White's Point on that day because of the proximity of these two sites.

The slides for all of the completed sites have been developed, labeled, and cataloged, but have not yet been scored. The slides will be scored in the next couple of weeks. After that, the data will be entered into the computer, and the graphs will be updated.

Sampling this spring was done primarily by UCLA personnel, but with additional help from Sean Morton at Santa Barbara County. MMS personnel were not able to help during this period. Point Fermin was sampled again this spring with the help of Cabrillo Marine Aquarium personnel. The goal of the sampling effort at Point Fermin was to train the aquarium personnel so that they would be able to sample the site independently, and send the slides and information to UCLA for data management. As of this spring, they have not yet purchased the equipment, and are otherwise not prepared to sample independently. We will have to join them again for the Fall 2000 sampling period.

Table 1. Sampling schedule for Fall 1999

Date	Location	Personnel	Comments
March 6	Old Stairs	Steven Lee, Barbara Hajduczek, Ernest Ramirez	No MMS Help This Year Big Swell – could not finish
March 14	Coal Oil Point	S.Lee, S.Morton, B. Hajduczek	SB County Help, Slide film damaged – had to re-shoot
March 15	Alegria	S.Lee, S. Morton, B. Hajduczek, S. Bergquist	SB County Help
March 16	Carpinteria	S.Lee, S. Morton, S. Bergquist, B. Hajduczek	SB County Help
March 17	Paradise Cove	S.Lee, S. Bergquist, B. Hajduczek, Shelley Luce	No Agency Help
March 17	Old Stairs	S.Lee, S. Luce, S. Bergquist, B. Hajduczek	Second Visit – completed site
March 18	Mussel Shoals	S.Lee, S. Bergquist, Jay Smith, B. Hajduczek	No Agency Help
March 19	Arroyo Hondo	S.Lee, S. Anghera, M. Anghera, S. Morton, B. Hajduczek, J. Smith	SB County Help
March 19	Coal Oil Point	S.Lee, B. Hajduczek, J. Smith	Second Visit – completed site
March 20	Point Fermin	S.Lee, S.Lawrenz-Miller, E. Mastro, B. Hajduczek	Cabrillo Aquarium Help; Big Swell – could not finish
April 14	White's Point	S. Lee, B. Hajduczek	Planned Sampling
April 14	Point Fermin	S.Lee, S.Lawrenz-Miller, E. Mastro, B. Hajduczek	Planned completion of site; Cabrillo Aquarium Help

During this Spring 2000 sampling season, we continued to substitute still photo surveys in the place of video camera surveys. The photographic images that we obtained last spring, which were taken at all of the old video reference points, seemed to provide a representation of our sites that was equal to, or better than, the corresponding video footage. The 360º pans we obtained were scanned into a computer, and select pans were enhanced to determine the degree of resolution that could be achieved. In general, the type of data that could be extracted from these images will vary with the taxon under investigation. However, for many of the more conspicuous species, such as mussels and seagrass, these images would be adequate for determining percent cover. For other species such as barnacles, or other small and isolated taxa, these images may not provide accurate percent cover data. The UCSC group is experimenting with other, more site-specific protocols for obtaining these still photo images. For now, we will continue with our current methods, which we believe to be a good compromise for gathering useful photo survey information in a quick and effective way at the sites.

Future Plans:

Throughout the present quarter, we will continue with data management including slide scoring, data entry, graphing, and analysis of the Spring 2000 sampling season. We will also continue the process of scanning and archiving the current photoplot and photo survey slides for LA, Ventura, and So. Santa Barbara Counties. There is still some discussion about repeating the one time survey protocols again at all the sites, and we will continue to consider these changes.

Problems Encountered:

Other than heavy swells and film errors, no major problems were encountered during this quarter. Sites that were not finished on the initial visit have now been completed. The only major issue continues to be the lack of funding for the LA County sites.

MMS Action Required:

We are still awaiting the return of our new video camera, which is in the possession of MMS. It was originally sent to UCLA, but was borrowed by MMS to inspect.

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, January 1, 2000 - March 31, 2000

In this period, we used a March 1998 public opinion survey to test a model of how people form opinions toward potentially risky environmental technologies such as offshore oil drilling and nuclear power. The model, which combines the insights of Mary Douglas and Aaron Wildavsky's cultural theory and John Zaller's Receive-Accept-Sample model of public opinion formation, is at the core of this research project. It performed quite well, explaining opinions substantially better than any of the competing theories in the literature. The results of this analysis will be reported in "The Role of Knowledge in Attitudes toward Risky Environmental Technologies," a paper which will be presented at the Annual Meeting of the World Association of Public Opinion Research. Portland, Oregon, May 17-19. A copy of this paper has been forwarded to MMS for review and comment.

We continued to work to improve the survey. Using the March 1998 data, we discovered that the individualism index, one of the central measures of cultural theory, has a relatively low reliability level (Cronbach's alpha = 0.54). We are exploring alternative measures of the individualism concept.

We continued 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).

Finally, we worked on the 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 refinining facilities are in the viewshed of potential respondents. This coding scheme will be designed to work in geographical information systems (GIS) software. This work progressed slowly because of difficulties obtaining the proper GIS software. We now have the software and we expect to move ahead more rapidly in the next quarter.

Problems Encountered: None

MMS Action Required: None

Future Plans: In the next three months, we hope to finalize the survey questionnaire and to complete the paper presenting our findings about available comparative risk assessment information in newspapers. We also hope to revise the "Role of Knowledge" paper in light of comments from MMS and scholars at the WAPOR meeting and to submit the paper for publication.

Estimated Percentage of Budget Expended:

Project Year 1 82%

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, January 1, 2000 - March 31, 2000

Fernandez prepared the results in graphical and spreadsheet form and wrote a synthesis of the results to compile with the political science analysis of decommissioning alternatives. Fernandez will complete the economic analysis by the end of April, 2000.

McGinnis is working with his research assistant, Carla Navaro, to complete a write-up and analysis of Gulf state rigs-to-reef programs and the relevant artificial reef programs. The analysis will include both a profile of the history of artificial reef programs, the role of the federal government in the development of state rigs-to-reef programs in the Gulf region, and the administrative operation of state artificial reef program implementation. The analysis will include a policy analysis, using the model developed by John Kingdon, of how the rigs-to-reef programs of the Gulf region politically developed. Interviews of Gulf state resource agency personnel will be conducted in early May. McGinnis analysis will be completed by mid-May, 2000 of the Gulf artificial reef/rigs-to-reef programs.

McGinnis completed the write-up of two sections of the final report to MMS, including a section on the ecological context of California OCS oil and gas development and decommissioning and a section on the current status of leasing, development and future decommissioning of CA OCS oil and gas activities.

Pomeroy has been focusing her attention on study of the California Artificial Reef Program, SB 241 (Alpert): " Decommissioned oil platforms and production facilities: California Endowment for Marine Preservation," and the UC Marine Council's "Blue Ribbon Panel on Decommissioning," and the relationships among these entities. In February, she hired a research assistant, Doug Reese, to develop and maintain a contact database, and to assist in data collection and synthesis. This work has included archival research and telephone interviews with California Department of Fish and Game and Coastal Commission personnel knowledgeable of the state's artificial reef program, infrastructure and processes. We have a good understanding of the Program, its history and operation in State waters, and some interesting insights into its implications for the rig-to-reef decommissioning option in waters off California. We are now focusing on several questions regarding the interaction between state and federal jurisdictions outside California state waters (i.e., beyond 3-miles) thorugh further archival research and interviews. Pomeroy and Reese will continue this work for the next several weeks, then write up their results in early May.

Pomeroy has continued to track SB 241 and the activities of UCMC's Decommissioning Panel. She has interviewed UCMC chair Griggs and Panel member Mark Carr, attended the UCMC's January meeting (where the legislation, the Panel and the relationship between the two were discussed), and has collected and analyzed pertinent archival materials. Although SB 241 passed the Senate on January 31, but has been held at the Assembly desk since February 3. Meanwhile, however, the Decommissioning Panel has continued its work. Over the next few weeks, Pomeroy will continue to monitor SB 241 and

Panel activities, and pursue additional sources of information identified through these activities. The results of this work also will be written up in May. McGinnis and Pomeroy will then meet to integrate their findings into a report on this section of the project.

Future plans: Work will proceed as scheduled.

Estimated Percentage of Budget Expended:

Project Year 1	75%

Early Development of Fouling Communities on Offshore Oil Platforms

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

Major Accomplishments, January 1, 2000 - March 31, 2000

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 2, 4, or 6-month exposure time at all depths. Permanently marked 20 cm x 20 cm quadrats on conductor pipes at Houchin, scraped at intervals of 2, 4, 6, and 12 months, were photographed in January and March. Vacuum samples from the 2, 4, and 6-month treatments were collected at all depths. Removal experiments using the anemone, *Anthopleura elegantissima,* and the mussel, *Mytilus californianus,* were monitored at a depth of 9 m in January and March. Circumference measurements and video photoplots were taken at Platform Hogan at depths of 6-18 m. Faunal litterfall traps, deployed at a depth of 18 m, were monitored monthly at Hogan. Development of methods for planktonic larval collection and for clod card deployment was initiated.

For the tiles and vacuum samples, biomass varied significantly among exposure times and depths. For the 2-month, 4-month and 6-month exposure periods on the tiles, mean dry biomass increased with exposure time and decreased with depth (2 month: 6 m= 2.7 g, 12 m= 1.7 g, 18 m= 0.7 g, 4 month: 6 m= 16.8 g, 12 m= 4.5 g, 18 m= 3.1 g, 6 month: 6 m= 58.1 g, 12 m= 15.1 g, 18 m= 11.4 g). For the 2-month, 4-month, and 6-month exposure periods on the vacuum samples, mean dry biomass also increased with exposure time and decreased with depth (2 month: 6 m= 9.9 g, 12 m= 5.6 g, 18 m= 2.9 g, 4 month: 6 m=10.9 g, 12 m= 5.8 g, 18 m= 4.5 g, 6 month: 6 m= 21.4 g, 12 m= 14.1 g, 18 m= 7.0 g).

On average, 200 g of animal biomass was collected monthly from each faunal litterfall trap. Mussels, (*Mytilus galloprovincialis)* comprised most of the faunal litterfall by weight.

Upcoming work:

Deployment and retrieval of settlement surfaces, photography of permanent plots, and vacuum sampling will continue as described above. We will continue to take circumference measurements and monitor the removal experiment plots. The faunal litterfall from the traps will be collected monthly. Planktonic larval collection and clod card deployment will be initiated in April.

Estimated Percentage of Budget Expended:

Project Year 1 38%

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, January 1, 2000 - March 31, 2000

We have been focusing our efforts on our analysis of genetic diversity within and among populations of surfgrass. We have completed AFLP fingerprints, using six different primer pairs, on all of these samples. Currently, we are scoring these gels and have begun some preliminary analyses. We have found 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 1-2 meters at most. In addition, we have found a great deal of variation within and among populations of surfgrass. Preliminary analyses based on a subset of our data indicate that populations are genetically differentiated from one another on the spatial scale of about 50 km. 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.

We have also been conducting genetic analyses to identify molecular markers for gender. So far we have screened approximately 70 Randomly Amplified Polymorphic DNA (RAPD) primers for sets of males and females. From these analyses we have identified one possible marker for gender. This marker has only been found in males thus far and never in females. However, not all males possess this marker making it of limited value for our purposes. We plan to determine if these patterns occur in larger samples and if so, we will then try several techniques to convert this marker into a consistent marker for gender.

Problems Encountered:

As reported earlier, we have 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	66%