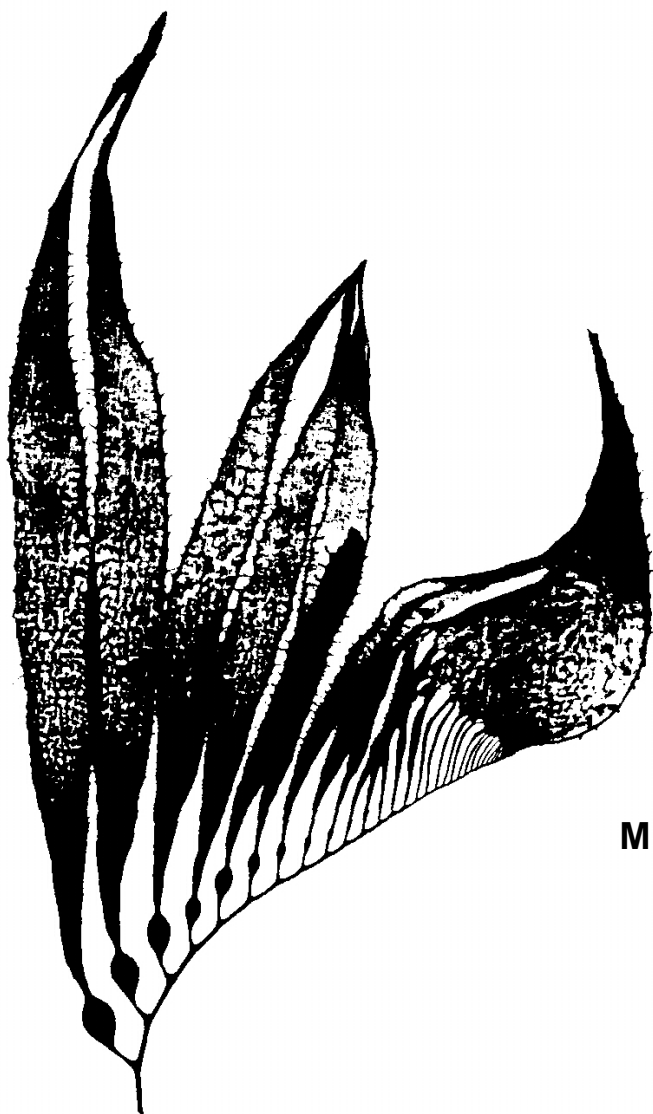


**COASTAL MARINE INSTITUTE
PROGRAM YEAR 7
QUARTERLY REPORT 2**

for the period

October 1, 2000 – December 31, 2000



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

January 24, 2001

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Russell J. Schmitt
Program Manager

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

January 24, 2001

Program Manager's Report

for the period October 1, 2000 – December 31, 2000

This constitutes the quarterly report for the second quarter for Program Year 7 of the Coastal Marine Institute, 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 Coastal Marine Institute.

Actions Pending MMS Approval:

- Task 12387: *Ecological Consequences of Alternative Abandonment Strategies for POCS Offshore Facilities and Implications for Policy Development*, desperately requires approval of a no-cost extension;
- We are waiting for the requisition order for the Clark et al. task, *Simulation of a Subsurface Oil Spill*, that was to begin October 1, 2000;
- We are awaiting comments from MMS on the draft final report for Task 13293: *Aerial Surveys of Marine Birds and Mammals in Santa Barbara Channel and the Santa Maria Basin*.

Major Programmatic Progress and Actions during the Quarter:

- We issued a Request for Preproposals in October. We received 14 preproposals in December. We are awaiting feedback from MMS to decide which projects warrant requesting a full proposal;
- Our Office of Research is processing the awards for the off-campus tasks that were funded in September;
- The Final Report for Task 13096: *Utilization of Sandy Beaches by Shorebirds: Relationships to Population Characteristics of Macrofauna Prey Species and Beach Morphodynamics*, has been completed. It will be submitted to MMS as soon as the manuscript containing the data has been submitted for publication;
- Task 15116: *Wave Prediction in the Santa Barbara Channel*, has been completed and the draft final study report will be submitted to MMS next quarter;
- Task 15117: *Assessing Toxic Effects on Population Dynamics Using Individual-Based Energy Budget Models*, has been completed and the draft final study report will be submitted to MMS next quarter;
- Task 13094: Application of Coastal Ocean Dynamics Radars for Observation of Near-Surface Currents off the South-Central California Coast, has been completed and the draft final study report will be submitted to MMS next quarter.

Task 12387: *Ecological Consequences of Alternative Abandonment Strategies for POCS Offshore Facilities and Implications for Policy Development*

Principal Investigators: **Mark H. Carr**, Department of Biology, University of California, Santa Cruz, CA 95064, **Graham E. Forrester**, Dept. of Biology, University of Rhode Island, Providence, RI, and **Michael V. McGinnis**, Coastal Research Center and Ocean and Coastal Policy Center, Marine Science Institute, University of California, Santa Barbara, CA 93106

Major Accomplishments, October 1, 2000 - December 31, 2000

We continued to focus our efforts on writing the final report and associated publications this past quarter. The primary tasks conducted this past quarter were:

- Preparing text, tables and figures for the final report and publications.
- Further analyses of fish abundance and size distributions among depths and habitats (platforms vs. natural reefs).

Problems Encountered: We still have not received the no-cost extension requested from MMS several months ago and this has constrained the amount of time our technicians can devote to data analysis for the past two quarters. Little work can be continued on this project until this is sorted out.

MMS Action Required: Please follow-up on the status of this no-cost extension request.

Future plans: Further analysis and preparation of final report and publications when the no-cost extension allows us to re-hire the technical assistance necessary for this effort.

Estimated Percentage of Budget Expended:

Project Year 1	100%
Project Year 2	100%
Project Year 3	70%

Task 14181: *Population Trends and Trophic Dynamics in Pacific OCS Ecosystems: What Can Monitoring Data Tell Us?*

Principal Investigators: **Russell J. Schmitt**, Department of Ecology, Evolution and Marine Biology, University of California, Santa Barbara, CA 93106 and **Andrew J. Brooks**, Coastal Research Center, Marine Science Institute, University of California, Santa Barbara, CA 93106

Progress to Date:

A number of entities (including MMS) have devoted considerable effort and resources to the long-term monitoring of various components of the coastal marine ecosystems in the Southern California outer-continental shelf (OCS) region. The primary goals of such monitoring are to estimate the current state of the biota and to identify long-term trends in population demographics. Data from such studies are vital to resource and regulatory agencies as they provide critical baseline information needed for accurate assessment of potential effects arising from such particular activities as offshore oil and gas production. The fundamental need for such information is evidenced by the growing number of coastal marine monitoring programs that have been implemented in Southern California.

The behavior of the California Current System plays a critical role in determining the conditions of the nearshore marine environment off Southern California. The typically high productivity of this system is attributed to coastal upwelling which brings deeper, nutrient-rich water to the surface near shore. This high supply rate of nutrients enhances primary productivity, which in turn increases secondary productivity of the nearshore pelagic and benthic food webs. Time series studies of the California Current System conducted by the California Cooperative Fisheries Oceanic Investigations since the 1940's have revealed distinct seasonality within a year, and periodic wholesale change during El Niño Southern Oscillation (ENSO) events that have relatively brief (1-2 years) durations. There is abundant evidence that the California Current System has undergone a longer, interdecadal length change since the late 1970's and early 1980's. One manifestation off Southern California of this apparent regime shift was a rapid, large, and persistent increase in seawater temperature. Between 1976-1977, mean annual surface temperatures in the Southern California Bight rose an average of 1°C or more above the mean for the previous two decades. Associated with this warming event were a number of changes in other physical processes and events that can influence marine biota. Among the more important manifestations in Southern California of these altered physical conditions was a decrease in productivity in surface waters near shore. Although the exact physical explanation is still under study, it appears reasonably certain that the amount of nutrients upwelled into surface waters has declined during this recent period of elevated seawater temperature. There is compelling evidence that the abundances of many coastal species off Southern California have undergone dramatic declines over the past 1-2 decades in response to falling productivity in near shore, surface waters.

The vast amount of long-term data on nearshore biota collected by a large number of separate monitoring programs in the Southern California OCS region represents a relatively untapped "gold mine" of information for environmental managers. The occurrence of a regime shift in the ocean climate in the North Pacific in the past two decades provides a unique opportunity to determine whether and how various components of the biota respond to this source of

perturbation. Data from long-term monitoring programs not only indicate the current state and recent history of the biota, they can reveal much about the ecological structure of various coastal ecosystems, including the dynamical behavior and regulation of different food webs. Such knowledge provides managers with better understanding and enhanced predictive ability regarding the potential impacts to these ecosystems from other potential sources of disturbance. Further, analyses of existing data sets can expose whether and how our ability to estimate or interpret responses of the biota may be constrained by present monitoring practices.

Our MMS-UC CMI funded research encompasses two separate objectives: (1) the analysis and synthesis of existing long-term monitoring data and (2) the continued annual surveys of subtidal reef communities at Santa Cruz Island.

(1) The analysis and synthesis of existing long-term monitoring data.

To date we have analyzed 8 separate datasets collected in three different ecological systems; subtidal rocky reef, kelp bed, and open ocean pelagic. Trends in population abundances show consistent declines in all three systems over the last 10-15 years. Most interesting, within each system examined, trends for each component trophic level show approximately the same degree of decline. This pattern holds across spatial scales ranging from a single island within the northern Channel Islands group to the entire Southern California Bight. Also interesting is the fact that data collected using extremely different methodologies, e.g. coastal power plant impingement studies versus diver visual surveys, provide similar estimates of the magnitudes of these declines. We are in the process of updating our datasets through 1999. Our next step involves searching for possible correlations in the timing of the declines for the various trophic levels present within each of our component datasets.

(2) The continued annual surveys of subtidal reef communities at Santa Cruz Island.

We are finishing the process of identifying epifaunal invertebrate samples collected during our 1999 surveys. We also have continued with our monitoring of the abundances of surfperches, their invertebrate prey, and the algal cover present in benthic microhabitats at 11 permanent study sites on the south coast of Santa Cruz Island. Sampling of fish (via visual counts along permanent band transects) and algal cover (via random point contact methods) were accomplished in the manner described in our proposal. Epifaunal invertebrates collected from three of these sites have been rough sorted and preserved for later taxonomic identification. We were able to complete sampling at all of our study sites in 2000.

Publications and Presentations:

Brooks has submitted an abstract to discuss work resulting from this project at the 6th Indo-Pacific Fish Conference in May, 2001. We are currently preparing two companion papers to this talk for publication.

List of all personal associated with the project this quarter

PIs: Dr. Russell J. Schmitt, Dr. Andrew J. Brooks

Post-graduate researchers: Keith Seydel, Bryn Evans

Undergraduate researchers: Andrea DeMent, Pam Porteous

Estimated Percentage of Budget Expended:

Project Year 1 100%

Project Year 2 64%

Task 15115: *Effects of Temporal and Spatial Separation of Samples on Estimation of Impacts*

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

Major Accomplishments, October 1, 2000 - December 31, 2000

The project is continuing as planned and, although progress has been slow, there have been no major barriers to its success.

Below are the three main questions proposed by the project and progress to date.

Question 1: What are the spatial and temporal patterns in the structure of the monitored communities at all 25 monitored sites?

These patterns have now been documented.

Question 2: Should there be any modification to the sampling regime employed at the various sites?

The detailed and complex statistical analyses continue. Addressing this question awaits the outcome of all analyses, which are still in progress.

Question 3: Can the collected data be used to predict the structure of communities at previously unsampled sites?

We are planning to address this question with preliminary sampling this spring.

Personnel:

No changes.

Major Accomplishments:

No major accomplishments in this quarter. Statistical analysis continue as planned.

Problems Encountered:

With the change in personnel, there have minor delays in progress.

Future plans:

1. Continue statistical analyses.
2. Design and preliminary sampling of field component of project to address Question 3.

Task 15117: *Assessing Toxic Effects on Population Dynamics Using Individual-Based Energy Budget Models*

Principal Investigators: **Roger M. Nisbet**, Department of Ecology, Evolution and Marine Biology, University of California, Santa Barbara, CA 93106 and **Erik B. Muller**, Marine Science Institute, University of California, Santa Barbara, CA 93106

Major Accomplishments, October 1, 2000 - December 31, 2000

We have developed validation methodology to test our toxicity model describing the sublethal effects of toxicants against competing models. Toxicants may affect the value of various parameters in our growth model, and different toxicants may affect different parameters. However, on the level of vital rates, those differences mostly disappear, and our aim is therefore to develop a generic model for sublethal toxic effects. We are testing this generic model with methods based on maximum likelihood ratio testing and use parameter estimation methods based on nonlinear least squares with normally distributed error with variable variance ("weighted least squares").

We used published experimental data describing the feeding and respiration rate of marine mussels in the presence of toluene, PCP and TBT, and found that our generic toxicity model describes the toxicity of those compounds well, and we conclude that there is no need to identify the parameter(s) at which the toxicant operates. We also used experimental observations on *Daphnia*, since this organism is routinely used for toxicity tests. Because of the abundance and variety of data obtained with this organism, we can test our model in a thorough way that can not be done with organisms from marine environments only. With tetradifon as toxicant, our model describes growth, cumulative reproduction and the delay in the first clutch well using the same generic toxicity function for all three processes.

Future Plans:

Prepare Final Report.

Estimated Percentage of Budget Expended:

Project Year 1 100%
Project Year 2 100%

Task 15118: *An Experimental Evaluation of Methods of Surfgrass (Phyllospadix torreyi) Restoration Using Early Life History Stages*

Principal Investigators: **Daniel C. Reed**, Marine Science Institute, University of California, Santa Barbara, CA 93106 and **Sally J. Holbrook**, Department of Ecology, Evolution and Marine Biology, University of California, Santa Barbara, CA 93106

Major Accomplishments, October 1, 2000 - December 31, 2000

The vast majority of our effort during this quarter of research was spent sampling our many ongoing experiments that are testing the efficacy of various methods of surfgrass restoration. These experiments are being conducted in both intertidal and subtidal habitats and involve monitoring the survivorship and growth of naturally recruited seedlings, laboratory-reared seedlings outplanted to the field, and apical meristems and rhizome clumps that were collected from natural populations and transplanted to experimental sites. Factors that are being explicitly tested in these experiments include: (1) the effects of seedling density (three levels), algal cover (two levels) and outplant technique (three levels) on seedling survivorship and growth in both intertidal and subtidal habitats (2) the effect of transplant size on survivorship and expansion rate of transplanted surfgrass and (3) the effect of clump size on the recovery rate of the bare patches created by collecting clumps of surfgrass for transplanting. We are also continuing to follow the survivorship and growth of three cohorts of seedlings at our intertidal site at More Mesa. We anticipate completing all field work by June 2001.

Future Plans: Work will proceed as scheduled.

Estimated Percentage of Budget Expended:

Project Year 1	100%
Project Year 2	100%
Project Year 3	28%

Task 17601: *Habitat Value of Shell Mounds to Ecologically and Commercially Important Benthic Species*

Principal Investigators: **Mark Page**, Marine Science Institute, **Jenifer Dugan**, Marine Science Institute, and **James Childress**, Department of Ecology, Evolution and Marine Biology, University of California, Santa Barbara, CA 93106

Major Accomplishments, October 1, 2000 - December 31, 2000

During the reporting period, crab traps were deployed twice in November and twice in December to sample fish and benthic invertebrates at two sites at each of four habitat types: deep shell mound (39-41 m), shallow shell mound (30-32 m), natural reef (33-39 m), and soft bottom (30 m). Muscle tissue from selected captured organisms was frozen for the future determination of RNA/DNA ratios. Development of methods for estimating short-term growth rate using tissue RNA/DNA ratio was initiated.

Four species of crabs, *Cancer antennarius*, *C. anthonyi*, *C. productus*, and *Loxorhynchus grandis*, were captured, and sex and carapace width (carapace length for *L. grandis*) were recorded. *C. antennarius* was more abundant at the shell mounds (6-7 crabs per trap at both deep and shallow mounds) than at reef or soft bottom (1-2 crabs per trap). *C. anthonyi* was most abundant on deep mounds (13 crabs per trap). The abundance of *C. anthonyi* was similar at reef and soft bottom (5-6 crabs per trap), and about 3 crabs per trap were caught at shallow mound sites. *L. grandis* was more abundant on reef and soft bottom habitats (3-4 crabs per trap) than at mounds (less than one crab per trap at shallow mounds and one crab per trap at deep mounds). Catch of *C. productus* was negligible – four individuals were trapped during the sampling period. Of the 7 fish species found, brown rockfish (*Sebastes auriculatus*) was most common.

Problems Encountered:

No problems were encountered during this quarter

Future plans:

Frozen tissue samples will be assayed for RNA/DNA ratios. Trapping methods targeting small fish will be developed and initiated. Sampling of shallow shell mounds by photographic transects will begin in February. Crab trap deployment will resume in August.

Estimated Percentage of Budget Expended:

Project Year 1 32%

Task 17606: *Population genetics of surfgrass (Phyllospadix torreyi) for use in restoration.*

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

Major Accomplishments, October 1, 2000 - December 31, 2000

The first major goal of our project is to define the genetic boundaries of populations. During this quarter we finished collecting samples along the Santa Barbara County coastline. Thus, we now have collected 49 samples (7 individuals from each of 7 sites) from each of three replicate areas for a total of 147 samples. The sites where we collected within an area were arranged so that distances among them range from approximately 0.5 to 25 km. We have also now isolated DNA from 98 of these samples. From 49 samples, we have already conducted AFLP analyses and all of the methods are working as planned.

Problems Encountered:

No problems were encountered during this quarter

Future plans:

Work will proceed as proposed.

Estimated Percentage of Budget Expended:

Project Year 1 1%

Task 17608: *Observing the Surface Circulation Along the South-Central California Coast
Using High Frequency Radar: Consequences for Larval and Pollutant
Dispersal*

Principal Investigators: Libe Washburn, Department of Geography, and Stephen Gaines,
Department of Ecology, Evolution and Marine Biology, University of California, Santa
Barbara, CA 93106

Major Accomplishments, October 1, 2000 - December 31, 2000

During the past quarter we just began work on the new project so we do not have a lot to report. We continued operation of a network of five high frequency (HF) radars along the northern coastline of the Santa Barbara Channel and the central coast north of Pt. Conception, California. As part of the Partnership for Interdisciplinary Studies of the Coastal Ocean (PISCO) project, recruitment time series were continued along the northern coast of the Santa Barbara Channel (and points north and south) and on Santa Cruz Island. Washburn made two presentations at the Fall AGU Meeting in San Francisco discussing results from previous MMS-funded research. Gaines and Washburn also made presentations at the PISCO-Mellon Workshop in Corvallis, OR dealing with the effects of coastal circulation on the transport and dispersal of marine larvae in upwelling systems.

Problems Encountered:

No problems were encountered during this quarter

Future plans:

Work will proceed as proposed.

Estimated Percentage of Budget Expended:

Project Year 1 17%

Task 17609: *Advancing Marine Biotechnology: Use of OCS Oil Platforms as Sustainable Sources of Marine Natural Products*

Principal Investigators: **Russell J. Schmitt**, Department of Ecology, Evolution and Marine Biology, **Jenifer Dugan**, Marine Science Institute, **Scott Hodges**, Department of Ecology, Evolution and Marine Biology, **Robert Jacobs**, Department of Ecology, Evolution and Marine Biology, **Mark Page**, Marine Science Institute, **Leslie Wilson**, Department of Molecular, Cellular and Developmental Biology, and **Stephen Gaines**, Department of Ecology, Evolution and Marine Biology, University of California, Santa Barbara, CA 93106

Major Accomplishments, October 1, 2000 - December 31, 2000

COMMUNITY AND POPULATION ECOLOGY:

During November and December, we initiated a field experiment to identify platforms with the most rapid growing populations of suspension-feeding invertebrates. Four PVC frames supporting a mesh cage containing mussels and two settlement surfaces (tiles) were deployed at seven platforms; Gail, Gilda, Gina, Grace, Hogan, Holly and Houchin. The PVC frames were attached to lines between the conductor pipes, with two frames placed on the outside row of pipes and two on the inside. Growth of the mussels, *Mytilus galloprovincialis*, will be compared among platform locations after 6 months. In addition, we will evaluate settlement and growth of invertebrates on the settlement plates.

PHARMACOLOGY:

- 1) We have completed the upgrade of the Hitachi HPLC equipment and installed all of the software. Hitachi will send their applications technician here in March to teach operations, and applications. We are already using the equipment.
- 2) We have installed a refractive index detector on the Waters HPLC. This system will be used to prepare crude extracts.
- 3) Graduate Students Cliff Ross, Lory Santiago and Claudia Moya have made two trips to platform Holly to begin to assess the collecting strategy. It appears that we will be able to collect one species of sponge, one species of algae and hopefully unique protists concentrating in the area.
- 4) We made tentative enquiries with LSU to investigate the availability of Dasycladales on Gulf of Mexico platforms.
- 5) Graduate student Hamta Madari has received extensive training from Dr. Wilson in methods of studying drug effects on microtubule dynamics as part of the anti cancer work.
- 6) Graduate student Claudia Moya is training an undergraduate work study student to culture ciliates, particularly Tetrahymena. This model will be the front line model used to detect bio-activity.

Future plans: The experimental apparatus will be checked and cleaned at each platform approximately every 6 – 8 weeks. At that time, mussels will also be collected and used to develop RNA:DNA methodology for growth analyses. In addition, we will begin photo surveys and collections of species that may contain promising natural products (e.g., sponges, bryozoans). Once useful species are identified we will develop experimental methods for

estimating/comparing growth rates in the field. To further develop the collaboration between the LSU and UCSB CMI's, we are exploring the possibility of participating directly in invertebrate surveys of oil platforms in the Gulf of Mexico. This would be in addition to collaborating on collections as proposed by Drs. Jacobs and Wilson.

Problems Encountered:

We have been unable to get to Platform Hermosa due to hazardous sea conditions. We plan to gain information on growth and settlement of invertebrates during the second phase of our growth experiments in the summer and fall.

Estimated Percentage of Budget Expended:

Project Year 1 11%

Task 17610: *Joint UCSB-MMS Pacific OCS Student Internship and Trainee Program*

Principal Investigators: **Jenifer Dugan**, Coastal Research Center, Marine Science Institute, University California, California. 93106, and **Edward A. Keller**, Environmental Studies Program, University of California, Santa Barbara, California, 93106

Major Accomplishments, October 1, 2000 - December 31, 2000

During the past quarter, we hired two new student interns who are working at MMS. Kevin Buchanan is working with Michael McCrary at MMS, USGS-BRD personnel and NPS personnel entering data from aerial surveys and monitoring of seabirds in the Santa Barbara Channel. Mr. Jason Chau is supporting the MMS marine archeology program by digitizing maps, organizing and archiving archeological information into an existing database, and creating narratives and website information on archeological resources from the region. Mr. Chau is mentored by Dr. Jim Lima of MMS. The three interns assisting with the MARINE rocky intertidal monitoring network mentored by Ms. Mary Elaine Dunaway of MMS continued to work through Fall quarter. The rocky intertidal interns assisted with data collection, data entry, and databases, coordination of intertidal monitoring efforts among different agencies and universities and in the field on the mainland and the Channel Islands. We are working with Jim Lima and others to arrange additional internship opportunities for MMS/CMI projects during Winter 2000.

No Information Transfer Seminars were presented by CMI/SCEI PI's this past quarter. We are working with Jim Lima and others to determine which projects will present talks in the future and to develop a seminar schedule.

Future plans:

New interns will be hired as needs are identified.

Estimated Percentage of Budget Expended:

Project Year 1: 11%