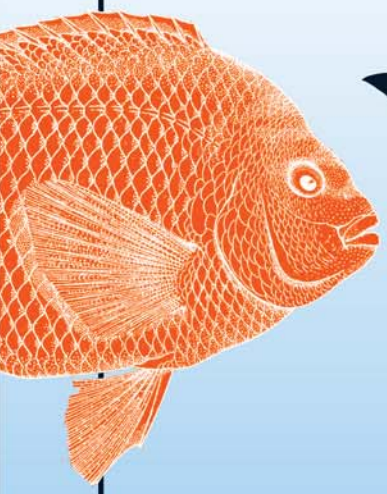
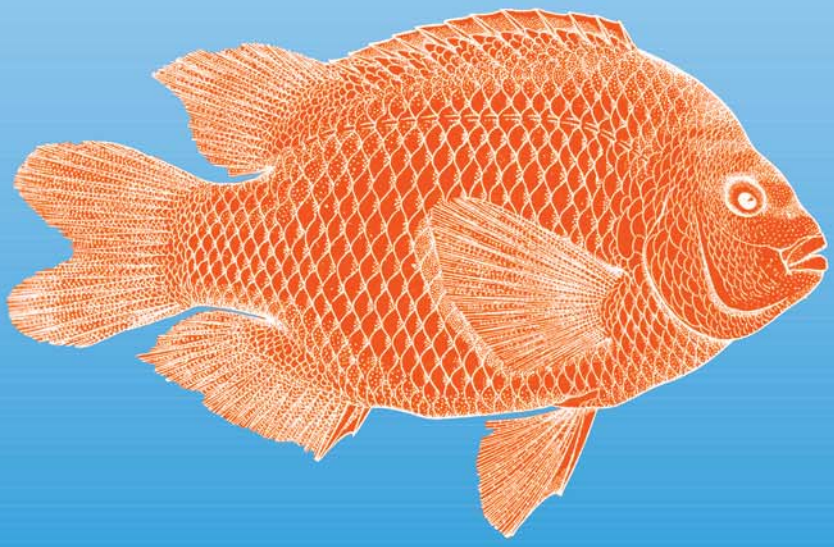
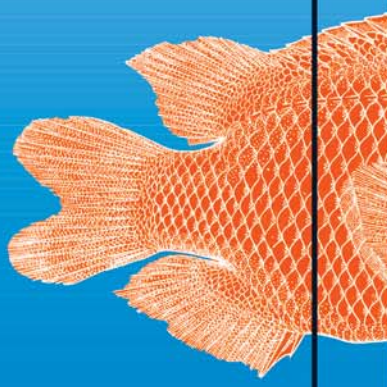


California Sea Grant College Program 1998–2003





Sea Grant
California

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Sea Grant is a unique partnership of public and private sectors, combining research, education, and outreach for public service. It is a national network of universities meeting changing environmental and economic needs of people in our coastal, ocean, and Great Lakes regions. A searchable database of publications from Sea Grant programs is available at the National Sea Grant Library: http://nsgl.gso.uri.edu.

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U.S. DEPARTMENT OF COMMERCE

CALIFORNIA

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★ University of California
• Calif State University
Δ Private Universities

Please see listing of UC and CSU campuses next page

UNIVERSITY OF CALIFORNIA CAMPUSES

University of California, Berkeley (UCB)
University of California, Davis (UCD)
University of California, Irvine (UCI)
University of California, Los Angeles (UCLA)
University of California, Merced (UCM)
University of California, Riverside (UCR)
University of California, San Diego (UCSD)
University of California, San Francisco (UCSF)
University of California, Santa Barbara (UCSB)
University of California, Santa Cruz (UCSC)

CALIFORNIA STATE UNIVERSITY CAMPUSES

California State University Bakersfield (CSUB)
California State University Channel Islands CSUCI)
California State University Chico (CSUC)
California State University Dominguez Hills (CSUDH)
California State University Fresno (CSU Fresno)
California State University Fullerton (CSU Fullerton)
California State University Hayward (CSUH)
Humboldt State University (HSU)
California State University Long Beach (CSULB)
California State University Los Angeles (CSULA)
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California State University Monterey Bay (CSUMB)
California State University Northridge (CSUN)
California State Polytechnic University, Pomona (CalPoly, Pomona)
California State University Sacramento (CSUS)
California State University San Bernardino (CSUSB)
San Diego State University (SDSU)
San Francosco State University (SFSU)
San Jose State University (SJSU)
California Polytechnic State University, San Luis Obispo
California State University San Marcos
Sonoma State University
California State University Stanislaus

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- Implementation Plan 2004–2005
- CD with Briefing Book & Supporting Documents

Program Overview

Welcome to California Sea Grant (CSG). The pages that follow contain an overview of the organization and management of the program, brief descriptions of program components, information regarding planning activities, benchmark data on program attributes, information on finances and a sampling of portfolios. All of this material is oriented toward the past five years, March 1998 through February 2003.

California occupies approximately two-thirds of the West Coast of the contiguous continental United States. The state stretches more than 1750 km from the Mexican border to the 42nd Parallel. The California coastal environment is remarkably diverse and encompasses two distinct marine zones. In the northern part of the state, the coast is characterized by cold water swept south from Alaska by the California Current, high-energy rocky coastlines and northern and transition zone marine flora and fauna. South of Point Conception (near Santa Barbara), the coast has warmer water fed by the California Counter Current, lower energy coasts with sandy beaches, and marine flora and fauna common to more temperate and subtropical waters. The continental shelf is quite narrow, ranging from less than 3 km to no more than 16 km. Against this backdrop is a rich coastal marine flora and fauna with more than 525 species of fish, kelp forests, large populations of marine mammals and shorebirds, and high rates of productivity.

This diversity and richness of California's coastal environment is challenged by human encroachment. Over 80 percent of California's 34 million residents live in coastal counties. The coastal environment has historically been rich in fisheries and mineral resources. Entire California coastal communities were founded on fisheries such as sardines and tuna. Oil drilling platforms still characterize the Santa Barbara Channel. Two enormous commercial seaports are found in Long Beach-Los Angeles and Oakland-San Francisco, and a large military port in San Diego. Tourism is a major industry with Huntington Beach drawing almost as many visitors per year as all the beaches in Delaware. Tens of thousands of surfers enjoy the waves along the southern coasts. However, major problems exist from coastal water pollution, depletion of fisheries, loss of wetlands, urbanization of the coastline and introductions of exotic species. The challenges to managing and preserving this environment are extensive.

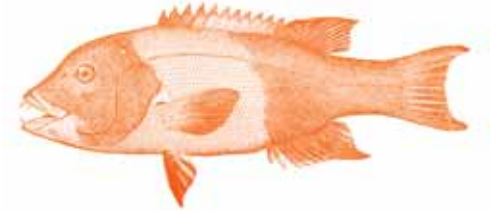
Against this backdrop, CSG has developed a program that encompasses a wide diversity of issues in research, education and outreach. Major foci for the program are coastal sciences, coastal fisheries, aquaculture, and marine biotechnology, with smaller efforts in marine policy and law, and marine engineering.

California Sea Grant is the largest of the thirty Sea Grant Programs nationwide. The annual budget of the program is approximately $8 million from all sources, including matching funds. From its beginning, the program has been characterized by excellence in research and graduate education. In California an extraordinary pool of academic talent has driven research in marine sciences, and many high-caliber students are associated with those researchers. CSG typically supports forty-five to fifty concurrent research projects at up to $100,000 per year for a maximum of three years. In addition to the research funds for each project, additional support for one or two graduate students called "Sea Grant trainees" is provided.

Until recently, the outreach portion of CSG was tailored primarily to reflect the research effort. The six marine advisors and two specialists have had a research component in their position descriptions that was matched to one of the six program foci. In a similar vein, the communications effort of CSG was almost exclusively focused on technical publications such as proceedings of symposia, resource books and peer-reviewed publications.

In the past few years, CSG has undergone a transition, particularly in outreach. While continuing to support approximately the same number of research projects and graduate students, the program has sought to diversify and broaden its outreach activities. This is driven by a desire to reach a larger constituency and a conscious effort to better integrate all aspects of the program into a research-outreach continuum. Examples of this continuum include: results of research routinely recast into a style and format readily used by the news media, placement of research feature articles in popular media, technical workshops organized for specific user groups, and conferences and symposia that bring together researchers and outreach staff.

Following is a broad-brush view of CSG. The reader is encouraged to request additional materials for any item(s) that pique their interest.



Redfish (male), *Pimelometopon pulcher* (Ayers). San Diego. (1882)

1998 Pat Recommendations & Response

Since the 1998 Program Assessment Team (PAT) visit, CSG and the University of California (UC) have directly addressed the fourteen recommendations. A key milestone for CSG was the arrival of a new Director in September 2000. While not an explicit PAT recommendation, a change in leadership brings about a change in program practices. Five staff members have joined the program since 2000, bringing many new ideas and talents to bear. Many changes were underway when the new Director arrived, and together with this change in leadership there has been a substantial evolution in program practices over the past five years. The fourteen recommendations were addressed in the following manner:

1. Reporting of California Sea Grant: The Director now reports directly to the UC Vice Provost for research located in the UC Office of the President, Oakland, California, on matters of policy; and to the Vice Chancellor for marine sciences/Director of Scripps Institution of Oceanography (SIO) on administrative and local campus issues.

2. Independent policy board: In cooperation with the UC Vice Provost for research, CSG created an independent advisory board designated as the California Sea Grant Advisory Board. One of three permanent advisory bodies, this board has a wide range of expertise from within and external to the UC system.

3. Strengthen leadership of CSG extension: The program leader for extension is now an Associate Director of CSG and a member of the management team.

4. Integrate extension with the rest of the program: Enormous steps have been taken in this regard including much more engagement of the marine advisors and specialists in all aspects of program function.

5. State support for CSG: While the level of state support briefly reached new heights in 2000, the California financial crisis has taken a devastating toll on state support for CSG in the past twenty-four months.

6. Reconstitute the California Sea Grant Committee: The committee has been totally restructured with all new members since 1998. Every effort is taken to eliminate conflicts of interest by committee members.

7. Recruit researchers to follow strategic plan: Every call for preliminary proposals is tied directly to the California Sea Grant 2001-2005 Strategic Plan. In addition, the 2004-2005 Implementation Plan provides further guidance to the researchers.

8. Use electronic media to enhance communications within program: CSG now relies substantially on the use of its website for intra-program communications, announcements, calls for proposals, and many similar activities. Most potential investigators now approach the program in this manner.

9. Leadership and management practices for better program integration: CSG now uses a management team approach that has representation from all aspects of the program.

10. Undertake efforts to provide more UC support for program staffing: This was very successful up until 2001 when the California budget crisis forced a major retreat in support for the program.

11-14. Revise the long-range plan, incorporate all program elements into the plan, use stakeholders to develop the plan, and adjust priorities in view of the Advisory Board: These were achieved with great success with the publication of the 2001-2005 Strategic Plan and the 2004-2005 Implementation Plan (see enclosed documents). These plans include all aspects of the program and made great use of external stakeholders in their formation. In particular, the California Sea Grant Advisory Board commented extensively on the current Implementation Plan and expressed a desire to contribute toward the next Strategic Plan.

Program Accomplishments & Impacts

I. ORGANIZATION & MANAGEMENT

Leadership of California Sea Grant

California Sea Grant uses a management team style for all key program decisions. The team is comprised of: Director, Deputy Director, Associate Director for Extension, Research and Education Program Manager, Communications Director and Fiscal Officer. More often than not, one or more staff persons join management team meetings, which are held approximately once per month, usually in the La Jolla office. Topics of meetings including issues such as decisions on funding, allocation of program resources, key decisions on outreach activities, and requests for program development and rapid response funds. All of the members of the management team have 100 percent FTEs devoted to CSG. See Appendix A for an organizational chart of CSG.

In addition to members of the management team, staff associated with CSG management include: two assistants to the fiscal officer, one computer/web specialist, one proposal coordinator, and one program assistant. Each of these five staff members has a 100 percent appointment to CSG. There is also a half-time specialist assisting the Deputy Director with special projects.

One key aspect of management is the process of program self-evaluation and improvement. Recognizing that a weakness for CSG was overall program integration, beginning in 2001 a series of three program-wide retreats were held for program evaluation and strategic planning. The first of these retreats held in March 2001 was facilitated by Dr. Harvey Liss, an expert in strategic planning. In aggregate, the three retreats focused on the task of working more as a single program and planning for the future. Between these retreats, extension staff meetings are held three times a year. The Director and other members of the administration and communications staff often join these meetings.

California Sea Grant uses a model with three advisory bodies (see Appendix B for a complete list). The principal one is the California Sea Grant Advisory Board. This twenty-one member board advises the UC Vice Provost for research. Approximate membership is one representative from eight UC campuses, one representative from the California State University (CSU) system, one representative of Cooperative Extension, one additional academic representative, and ten nonacademic members representing a broad spectrum of external stakeholders. The Advisory Board meets approximately twice per year and considers a broad range of topics such as recommendations on strategic and implementation plans, suggestions on proposal review protocols, advice on interacting with universities and California state agencies, and guidance on the intellectual thrust of the program. Member terms are three years with option for renewal.

The second advisory body is the California Sea Grant Committee. This is a standing committee that serves the specific function of review and recommendations on preliminary and full proposals. There are eight members of this committee, coming mostly, but not exclusively, from academic institutions. In the past two years, the membership of this committee was greatly changed to ensure there is no conflict of interest during proposal review. As a result, all but one of the eight members come from outside of California. The lone Californian is from the National Marine Fisheries Service (NMFS) Southwest Fisheries Science Center in La Jolla and does not have academic institutional conflicts. Ad hoc members are added to the California Sea Grant Committee as needed to round out the subject matter expertise of the committee to ensure all topics are covered during the review phase. Each member serves a three-year term.

The third advisory body is the Resources Agency Sea Grant Advisory Panel (RASGAP) and is comprised mostly of representatives from state agencies. The panel meets annually to allocate general fund money and provide input and recommendations from a state agency perspective on preliminary proposals submitted to CSG and University of Southern California (USC) Sea Grant. There is one representative from the UC system, one from the CSU system, one from USC, and several members from marine industries. Panel member terms are indefinite in length.

California Sea Grant Retreat, 2001. (L to R) Marsha Gear, Gretchen Frederick, and marine advisors, Rick Starr and Susan McBride.

Old Director's House, SIO, home of California Sea Grant Program administration. (Photo G. Ratcliffe)

Institutional Setting

California Sea Grant is administratively assigned to the UC Vice Provost for research, which is located in the UC Office of the President in Oakland. California Sea Grant is considered a Multi-campus Research Unit (MRU), one of many such units within the UC system.

California Sea Grant has two main campus locations. All of the program administration and communications staff members are located on the campus of SIO, UCSD. All staff members are UCSD employees and offices occupy approximately 3,100 square feet in two buildings at SIO. Because the CSG Director reports to the Vice Provost for research in Oakland on matters of policy, Dr. Charles Kennel has been assigned as the local supervisor for the CSG Director on administrative issues. Kennel is the Vice Chancellor for marine sciences and Director of SIO. A total of 13.5 FTEs are housed for CSG at SIO. In addition to the administrative staff, all communicators are located in La Jolla. These inlcude a Communications Director, Science Writer, Publications and Marketing Coordinator, and an Editorial and Publishing Coordinator.

The other campus location is at UC Davis (UCD), which houses the extension administration. All six marine advisors are employed through UC Cooperative Extension (UCCE) via UCD. Each of the two specialists has UCD departmental affiliations – one in the Wildlife, Fisheries, and Conservation Biology Department and the other in the Department of Environmental Science and Policy. One specialist is located on campus in Davis and the other at the UCD Bodega Marine Laboratory. A 0.75 FTE staff person also at UCD handles much of the administration for the extension program. Many but not all of the marine advisors are located in UCCE county extension offices. In aggregate, the advisors and specialists are supported by 3.34 FTEs for administrative assistants. Reporting from marine advisors is through the UCCE system and for specialists through the departments. Annual reviews, merit and promotion reviews, and hiring decisions are all made with substantial consultation with one or more members of the CSG management team.

Project Selection and the Review Process

California Sea Grant solicits proposals for a variety of funding opportunities. In addition to the omnibus competition, the program administers National Sea Grant College competitions that include a variety of fellowships, National Strategic Investments, and special one-time funding opportunities. Each year, a call for preliminary project proposals is widely distributed throughout California. The RFP is designed by the management team and relies heavily on the Implementation Plan and on input received throughout the year from the entire California network. On average, of the nearly 100 preliminary proposals received annually, 40 percent advance to the full proposal stage, of which one third are approved for funding (see Appendix C).

The Resources Agency Sea Grant Advisory Panel (RASGAP) conducts the first review of preliminary proposals. Input from RASGAP is directed toward identifying and meeting priorities for allocation of state general fund monies according to state needs. A subcommittee of the California Sea Grant Advisory Board made up of stakeholders and user groups, as well as the California Sea Grant marine advisors, review the preliminary proposals for potential application to California's problems and opportunities in coastal/ marine science, education, and outreach.

The California Sea Grant Committee, comprised of academic scientists with expertise in the areas funded by the program, conducts the second review of preliminary proposals. At this stage, screening is based on the project's innovative approach, uniqueness of the idea, importance and appropriateness to Sea Grant. Each proposal is considered on its own merits without regard for campus or institutional affiliation. Full proposals

are requested on those topics that rate highly on these criteria.

Full proposals are mailed to external merit reviewers. Each proposal is reviewed by three to six reviewers, carefully screened for conflicts of interest. The California Sea Grant Committee meets a second time to evaluate full proposals with the benefit of the written merit reviews. Criteria for selection at this step include: (1) rationale; (2) scientific merit and impact or outreach quality; (3) innovativeness; (4) programmatic justification; (5) practical impact and user relationships; (6) relationship to Sea Grant priorities; and (7) qualifications and past record of investigators or past record of program components. Merit reviews, user collaboration, expected impact (scientific and practical), and letters of support from potential users help determine whether these criteria are met.

When all the input from the external merit reviewers, the California Sea Grant Committee, and RASGAP is received, the CSG management team makes the final decisions regarding approval of proposals for funding. The National Sea Grant Office is then notified of those decisions. The institutional proposal, called the California Sea Grant College Program Omnibus, is submitted to the National Sea Grant College Program for funding and implementation on March 1 of the following year.

Declined proposals may be appealed in writing to the chair of the Appeals Committee at both the preliminary and formal proposal stages. Full proposals honored as a result of the appeals process may be funded the following year because of funding limitations. Throughout the process, investigators are provided detailed feedback on all aspects of their submissions and encouraged to respond to the feedback provided to them. This process takes place formally through correspondence and by informal consultations throughout the year.

Recruiting and Focusing the Best Talent

To recruit the best research talent, CSG relies on a variety of mechanisms to reach prospective investigators. Each January, a call for preliminary proposals is released. This call is posted on the CSG website, 1,300 flyers are sent to numerous academic institutions, and an electronic message is sent via email to those who have provided an email address to CSG. Flyers are mailed to research administrators, department chairs, laboratory directors, university grants offices and individual faculty. Perhaps the biggest challenge is to reach new faculty that may not be anticipating the call for preliminary proposals. While the flyers reach some of these new faculty, another approach that has been used with success is campus visits. In 2001, the Director visited every major marine research campus in California. He was accompanied on each visit by one or more of the following: Deputy Director, Associate Director for Extension, Research and Education Program Manager, and Communications Director. Each of these visits lasted from one-half day to a full day with dozens of faculty contacted. Since 2001, campus visits continue but not necessarily to every campus every year. At each visit, faculty members are encouraged to contact members of the CSG management team to discuss developing research ideas.

Submission of a preliminary proposal is not the conclusion of recruitment. In some instances, two or more preliminary proposal authors are encouraged to work together on a single submission. In some cases where a preliminary proposal is declined, authors are encouraged to either resubmit the next year with an additional collaborator, or to develop a small program development proposal. All of these steps are intended to promote a broad-based approach to competing for CSG research funds with the desire to give as many new faculty as possible an awareness of the opportunities (see Appendix D).

California Sea Grant takes great pride in its educational programs that encompass a broad range of opportunities. Similar to the announcements for research opportunities, flyers, web postings and campus visits are used as tools to recruit students into fellowship, scholarship and trainee opportunities. In the past three years, CSG has made good use of flyers and a new mailing list to greatly increase the number of applications from students. This has resulted in an excellent pool of applicants that broadly reflect the gender and ethnic composition found in California's higher educational systems.

Integrated Program Components

INTEGRATION OF OUTREACH AND RESEARCH

One aspect of CSG that clearly needed strengthening was the integration of research, extension, education, communications and program management. Research is an integral part of extension programming and CSG is one of the few Sea Grant programs with a required research component in the position description of each marine advisor and specialist. This component is taken very seriously and is a key criterion in the advancement of these extension personnel.

A series of activities was enjoined to facilitate better intra-program communications and coordination. These included three all-staff planning retreats in 2001 and 2002; routine attendance at extension staff meetings (three per year) by

administration staff, including the Director; the Director spending a day with each of the advisors and specialists in 2001 and 2002; implementation of monthly "bullets" as a means of keeping all program staff informed of one another's activities; inviting marine advisors and specialists to management team meetings to update all staff on program activities; and sponsorship of several research-outreach meetings that bring together Sea Grant supported researchers, graduate students and extension personnel. Additionally, all extension staff members are encouraged to review research preliminary and full proposals and provide input as part of the review process. To foster collaborations between research and extension personnel throughout the UC's ten campuses, extension staff are all members of the Coastal and Marine Resources Workgroup, a formal UC workgroup designed to promote system-wide integration of outreach and research. The net result of all of these ambitious activities since early 2001 has been a much better degree of integration within all parts of CSG.

As mentioned previously, CSG's marine advisors and specialists are actively involved in research and collaborate with other scientists and extension personnel throughout the state and greater Pacific region. This includes scientists and resource managers in National Marine Fisheries Service, the California Department of Fish and Game, the National Marine Sanctuaries Program and Estuarine Research Reserves, the CSU system, and other research institutions. Extension specialists and three of six marine advisors are housed at UC Davis, UC Santa Barbara, Bodega Marine Laboratory and Moss Landing Marine Laboratories. These assignments further strengthen the links between research and extension.

Marine Advisor Leigh Taylor Johnson and Bill Kraus, RAM Protective Coatings, at the Alternative Antifouling Conference, 2000. (Photo F. Greaves)

CORE FEDERAL AND MATCHING FUNDS (LAST 8 YEARS) AND DISTRIBUTION AMONG PROGRAM ELEMENTS

California Sea Grant receives approximately 60–65% of its funds from federal sources, less than 10% from state matching funds, and the remainder from other non-federal sources. Appendix E shows the distribution of Sea Grant core federal and matching funds among program elements and contributions from university and state sources. The overall distribution percentages over the last eight years are as follows: Research 47%, Extension 18%, Education 12%, Communications 7%, Program Development 5%, and Administration 11%.

LEVERAGED FUNDING FROM PARTNERS

In the last five years, CSG has obtained leveraged funds of more than $3 million from a variety of sources. Leveraged funding from partners and additional program funding obtained through grants, contracts, and development activities are included in Appendix E. This table includes only the information for California Sea Grant's administrative and outreach components, and does not reflect leveraged funding obtained by CSG-funded researchers.

NATIONAL COMPETITION FUNDING

California Sea Grant researchers have an enviable success rate in the National Sea Grant competitions. Appendix E summarizes the national competition funding awarded to CSG over the last eight years. Included in this table are National Strategic Investments, pass-through proposals, Knauss fellowships, industry fellowships, Sea Grant-NMFS fisheries fellowships, and fisheries extension enhancement proposals.

II. CONNECTING WITH USERS

California Sea Grant initiates and maintains mutually beneficial relationships with a wide variety of stakeholders to ensure its research, education and outreach projects focus on priority user needs.

Engagement with Appropriate User Communities

CSG personnel serve in leadership positions on a wide variety of public service organization boards and committees. These high-profile interactions contribute to the visibility of Sea Grant and provide benefits to society while improving management of natural resources (see Appendix F).

Partnerships

From 1998 through 2003, CSG research, extension and management personnel worked in collaboration with many local, regional and national organizations on a wide range of projects. See Appendix F for a list of cooperators and Appendix E for a list of leveraged funding.

Fisheries working meeting, 1999. (Photo G. Ratcliffe)

III. LONG-RANGE PLANNING

Strategic Planning Process

The planning process at CSG is continuous, although punctuated by specific events such as publication of strategic or implementation plans. At the conclusion of the 1998 PAT visit, CSG was encouraged to embark on strategic planning. Interim Director Clinton Winant began this process in 1999, which culminated in the publication of the California Sea Grant Strategic Plan 2001-2005. That plan provides strategic guidance in the six foci areas plus extension, communications and management. External stakeholders were extensively consulted in the development of the Strategic Plan; twenty-four academics throughout California provided critical input to the plan. The resulting October 1999 publication provides a strategic road map for CSG until 2005 (document enclosed).

A further refinement in planning was the development of Implementation Plans. Two such plans have been developed in the past four years, one for 2002-2003 and the most recent for 2004-2005. In the case of the latter document, again extensive engagement of external stakeholders and involvement of all Sea Grant Program components was key to the creation of the plan. The 2004-2005 Implementation Plan began by taking a subset of issues and ideas from the Strategic Plan. Working with Sea Grant extension staff, that subset was reduced to a manageable suite of ideas. Those ideas were refined and focused and then presented to the California Sea Grant Advisory Board on three successive occasions. On each occasion the Board provided suggestions on how to refine and focus the plan on a reasonable set of expectations for two years. Approximately twenty external stakeholders contributed to the creation of the 2004-2005 Implementation Plan (document enclosed – please note that this document was originally produced in electronic form).

Plan Implementation

Execution of the strategic and implementation plans is achieved by continual reference to the plans. Whenever feasible, adjustments are made in program activities to meet plan objectives. Examples include decisions on research funding based on plan priorities, adjustment of advisor and specialist programs in line with plan priorities, developing communications products that serve to promote plan priorities, and sunset of activities that are no longer a program priority.

Interested parties are referred to the strategic and implementation plans through a variety of mechanisms. Both plans are maintained as PDF files on the CSG website. As investigators prepare preliminary proposals, they are encouraged to consult these plans. A copy of the executive summary of the Implementation Plan is included with the documents for preparing a preliminary proposal. That same summary is provided to the California Sea Grant Committee as they embark on their review and evaluation of preliminary and full proposals. Perhaps most importantly, the management team makes adjustments in allocation of program resources to achieve plan objectives.

IV. PRODUCING SIGNIFICANT RESULTS

Contributions to Science and Technology

A complete list of research projects and principal investigators can be found in Appendix G.

NUMBER OF PUBLICATIONS

CSG-funded research projects resulted in 445 publications from 1998-2002 (see Appendix G).

From 1998 – 2002, CSG researchers, extension staff and management made 873 presentations at conferences, workshops and meetings (researchers 361, extension 444, and management 67).

INVENTION DISCLOSURE AND PATENTS

From 1998-2003, CSG researchers were awarded eighteen patents for products and processes resulting from their Sea Grant research, which are listed in Appendix G.

Contributions to Education and Outreach

EDUCATION

In order to promote the future wise use of our coastal resources, California Sea Grant invests in the next generation by providing education, training, and informal learning opportunities for students from elementary through graduate school (see Appendix H).

MARINE POLICY FELLOWSHIPS

Sea Grant's fellowship programs offer unique opportunities for graduate students to participate in problem solving, policy development and implementation, and to acquire the sociopolitical skills needed by today's resource managers. In turn, fellows benefit the legislative committees and government agencies they serve by supplying scientific knowledge of ocean and coastal resources. CSG has been highly successful in recruiting and placing talented fellows in the National Sea Grant competitions. It also has a vibrant State Fellows Program, modeled after the Knauss Fellowships, which places graduate students with "hosts" in the California state legislature or in state agencies for a nine-month paid fellowship in Sacramento (see Appendix H).

GRADUATE TRAINEESHIPS

CSG research projects typically include at least one graduate student trainee, who receives a stipend to assist the project leader. The research done by trainees is often the basis for their thesis (see Appendix H). Hundreds of trainees have been supported since 1968, and a survey of former trainees shows that 45% currently hold faculty or research positions at academic institutions; 26% work in federal, state, or local government programs; 18% in private industry; 7% are pursuing postdoctoral degrees; and 4% are in the legal and secondary teaching professions. A partial list of former trainees and where they are now is attached in Appendix H.

SEA GRANT GRADUATE RESEARCH SYMPOSIUM

To highlight and reward trainees' scientific discoveries, CSG and USC Sea Grant hosted a special Sea Grant Graduate Researcher Symposium and Poster Presentation at the California and the World Oceans 2002 conference, where twenty-four trainees shared their research accomplishments. California Sea Grant presented $500 awards to the best oral and poster presentations and smaller sums for second- and third-place winners.

Director Russ Moll and World Oceans '02 poster presentation winner. (Photo G. Ratcliffe)

CALFED POSTDOCTORAL AND GRADUATE FELLOWSHIP

The CALFED Bay-Delta Program is a cooperative, interagency effort of eighteen state and federal agencies that manage the water resources of the San Francisco Bay-Sacramento-San Joaquin Delta. California Sea Grant, on behalf of the CALFED Science Program, has initiated a graduate and postdoc fellowship program for those interested in riverine and estuarine systems. Fellows will analyze existing environmental data held by CALFED agencies. This new partnership strengthens California Sea Grant's programmatic objectives in education and research. Six fellowships will be awarded to begin in the fall of 2003 in the following disciplines: hydrology and hydrodynamics, geomorphology, fish ecology, aquatic ecology, and biogeochemistry.

HIGH SCHOOL SCHOLARSHIP

CSG established the John D. Isaacs Memorial Scholarship in 1981 to recognize scholastic excellence and outstanding research conducted by high school students, and to encourage interest in marine science. Each year California high school juniors or seniors who present outstanding marine science projects at the California State Science Fair compete for a scholarship to study at a California college or university. The $12,000 award is paid in annual installments to the recipient's institution. A cash award of $500 is also awarded to the teacher identified by the winner as having been especially supportive of his/her interest in marine science or in developing the science fair project.

To date, twenty-one students from high schools throughout California have earned scholarships. Recipients during this PAT review period include:

1998-02 Ayeh Bandeh-Ahmadi (Cal Tech)

1999-03 Sarah Reiver (UCSD)

2000-04 Brian Fulkerson (UCSD)

2001-05 Hannah Gray (UCSC)

2002-06 Shara Cohn (Stanford)

SPONSORSHIP OF EDUCATION PROGRAMS & TARGET AUDIENCES

CSG also sponsors a number of informal educational opportunities for students in K-12 (see Appendix H).

OUTREACH

Extension: The CSG Extension Program's two specialists and six advisors contribute to education and outreach by creating and distributing educational materials that provide information and insights to better manage coastal and marine resources and resolve user conflicts. Examples include workshops, surveys, brochures, posters, CDs, video, television programming, directories and newsletters on such topics as alternative nontoxic hull paints for boats; the threats posed by the introduction of nonindigenous species and how to prevent their spread; California's fisheries and their historical development; marine protected areas in the state and the history of their creation; and the development of fishery management plans that explore alternate management options. These materials are widely distributed to interested clientele, state management agencies and National Oceanic Atmospheric Administration (NOAA) partner agencies.

Communications: CSG communications disseminates the results of funded research, education, and outreach projects, and seeks to educate a variety of stakeholders about coastal resource issues.

NUMBER AND DIVERSITY OF OUTREACH PRODUCTS

Communications uses the spectrum of print and web publications, CDs, video and audio technologies. Staff advertise the availability of these products via email, the CSG newsletter (print and web), the National Sea Grant Library, and Sea Grant Abstracts. CSG publications are also made available at conferences, workshops and public events. From 1998-2002, CSG published more than 270 outreach publications (see Appendix H). One new format, the CSG Project Profile, was developed in response to legislators' need to have concise information; it summarizes the results of research and outreach projects in a one-page document made available on our website and used for visits to stakeholders. Communications produced thirty-two of these in 2002.

Technology: Since 1998, communications has strategically increased its use of websites and other electronic media. To minimize costs and increase distribution, communications produced several CD publications, including

Shara Cohn, winner of the 2002 Isaacs Scholarship. (Photo F. Greaves)

the omnibus proposal, conference proceedings, and the results of a special Marine Ecological Reserves Research Program (MERRP) administered for the California Department of Fish and Game (CDFG).

Our seafood specialist produced a CD on the quality and color characteristics of California market squid to aid in the export of this highly valued California fishery product to Japan, where aesthetic qualities of food are as important as nutrition and safety. Our seafood program manager maintains a website at http://seafood.ucdavis.edu/ that is a clearinghouse of information on seafood research, marketing, product development and industry news that receives more than 6,000 hits a month from forty countries. Our marine fisheries specialist contributes regularly to a West Coast regional website managed by Oregon Sea Grant for the fishing industry called Heads Up! (http://www.heads-up.net/). Three of our marine advisors have collaborated on videos to promote particular projects.

Communications also maximizes resources by buying into print runs of publications (generally other Sea Grant program products) that have pertinence to California. Communications also provides story ideas to a communications radio specialist in the UC Division of Agriculture and

Natural Resources who produces short radio interviews on newsworthy Sea Grant topics, one of which won an award in 2002.

CSG writes news and feature articles about Sea Grant projects for external publications and websites of general interest that contribute significantly to NOAA's goal of public education and increasing environmental literacy. Our science writer contributes articles regularly to the tip sheets of Sea Grant's National Media Relations Program that get wide distribution and has resulted in placement of news stories in national and international media. Staff write items for NOAA's website and for the NSGO's biennial report. Sea Grant projects also frequently result in news and feature stories initiated by external media. CSG principal investigators are asked to report media placements annually.

Communications is investigating the use of a commercial on-line survey tool that could be targeted to specific stakeholders to solicit feedback on the usefulness and quality of specific CSG publications and outreach activities. It would also serve as a marketing tool in drawing people's attention to specific products.

A testimony to the quality of CSG outreach efforts is the list of sixty-six awards received by CSG staff and researchers from 1998 to 2003, listed in Appendix H.

INTERNAL EVALUATION

Proposals for new communications projects are carefully researched and evaluated in terms of the staff time and hard costs that will be involved, other conflicting projects and deadlines, the need for the publication, and competing products in the marketplace. Book proposals receive external peer reviews. This information is then presented to the program management team, and an informed decision is made on whether to invest in the project.

EXTENSION RESEARCH

Marine advisors and specialists conduct original research that contributes to the knowledge base necessary to better manage coastal and marine resources. This information is disseminated via peer-reviewed publications and other formats discussed previously in the Outreach section. Information on numbers of publications and extension products delivered to clientele serve to demonstrate their need and utilization by resource users and management agencies. In addition, extension staff have significant involvement in the review of fishery management plans, the development of regional watershed management plans, and the organization of conferences and workshops to provide educational and outreach opportunities. The success of these activities is gauged by the adoption and implementation of these management plans by coastal communities and marine resource management agencies.

CSG extension staff are also engaged in monitoring and restoring habitat for threatened and endangered salmon and steelhead. Data from long-term monitoring of salmon populations has been used in the design and location of transportation infrastructure and in the valuation of large tracts of land in Northern California. Educational outreach providing information on salmon habitat restoration has been provided to over 360 people, and forty-four restoration projects have been completed. Photographic point source monitoring is being conducted to evaluate the success of these restoration projects, and long-term fish population monitoring is being implemented to document the success of enhancement programs.

A good indicator of program success is the ability to consistently generate grant support to enable programs. California's marine advisors and specialists are very adept at identifying needs to better manage, protect and restore coastal and marine resources, and then securing funding to address these needs (see Appendix E). A wide diversity of program efforts are supported through extramural funding, and these include improving coastal water quality, preventing the introduction and spread of nonindigenous species, restoration of threatened and endangered fish habitats, research to describe fish habitat utilization and provide a science base to Marine Protected Area design, and the development and review of fishery management plans. The success of these program efforts is demonstrated by the ability to secure competitive grant support to implement them, and by the benefits that accrue to coastal and marine resources from their implementation.

V. PROGRAM NARRATIVES

Highlights of CSG research and outreach project impacts during the last five years are provided in the following eight subject area portfolios on coastal processes and water quality, conservation biology, fisheries, aquaculture, aquatic nuisance species, marine biotechnology, seafood technology, and education.

Project Profiles, one-page summaries of research or outreach projects, are referred to throughout the program narratives. An index of Project Profiles is listed in Appendix H. Please see the accompanying CD for the complete Project Profiles.

Nearshore Circulation, Erosion and Sediment Transport

The bulk of CSG's research budget supports what is broadly defined as coastal ocean research. Many projects funded within this category are discussed in other sections of this briefing book, given the overlap between studying ocean physics and the fundamental implications of physical processes to fisheries, conservation and policy. Here we concentrate on projects more classically representative of the physical sciences and engineering. Their importance cannot be overstated. It is these physical processes – upwelling, gyres, winds, waves and mixing – that drive this region's biological productivity and ultimately define its physiogeography.

SEA CLIFF EROSION IN SAN DIEGO COUNTY

Coastal erosion threatens to damage about 87,000 homes along the nation's shoreline. In California, the high seismic activity, geology and demographics heighten concerns about erosion.

Reliable estimates of erosion are a first line of defense for protecting people and property. With Sea Grant support, earth sciences professor Gary Griggs of UC Santa Cruz digitized a large set of historical aerial photos of the shoreline and then projected these onto a standard map. Erosion was estimated by measuring changes in the position of the shoreline over time. These estimates were incorporated into a 2000 report to the Federal Emergency Management Agency, which is re-evaluating how it appropriates emergency funds for coastal property losses (see project R/CZ-157).

Sea Grant is currently funding Scott Ashford at UC San Diego's engineering school to evaluate the technical merit, cost and environmental impacts of a variety of common erosion-control and bluff-stabilization strategies. The techniques employed by Ashford draw heavily on those developed by Griggs. Ashford's findings will be finalized into a set of recommendations for municipalities that have serious sea cliff erosion problems.

NEW SURF-ZONE DRIFTER FOR STUDYING RIP CURRENTS

Coastal oceanography professor Robert Guza of Scripps Institution of Oceanography (SIO) and CSG trainee Wilford Schmidt built and tested a satellite-tracked drifter capable of withstanding the pounding force of breaking waves. This first-of-a-kind drifter follows the movements of water parcels through the surf zone, providing a much-needed Lagrangian framework for studying the basic principles of wave theory and fluid mechanics. Data gathered by the drifter can also be used to validate computer simulations.

The drifter has already proved useful in describing the velocity structure of rip currents, which are narrow seaward jets. Drifter data show that water velocities are highest near the surf's edge, and they quickly slow once past breaking waves. The findings have applications for swimmer and boater safety and also for understanding the transport of pollutants, nutrients and plankton (see project R/CZ-166).

Technicians preparing to launch surf-zone drifters. (Photo G. Ratcliffe)

WAVE FORECASTING

More than a decade ago, Sea Grant provided seed money for Richard Seymour of SIO to develop a primitive wave data collection system accessible by regular telephone lines. This pioneering research and subsequent field-testing (also supported, in part, by Sea Grant) laid the foundation for what has become the Coastal Data Information Program (CDIP) at the University of California. CDIP is a comprehensive wave-forecasting center that today maintains monitoring stations in 100 locations along the coasts of California, Oregon, Washington, Hawaii, Georgia, Minnesota, Virginia and North Carolina. It is now funded by the U.S. Army Corps of Engineers and the California Department of Boating and Waterways. CDIP provides boaters, fishermen and surfers with accurate forecasts of wave heights. The U.S. Navy recently selected Southern California as a test-bed for studying wave generation and propagation as a tactical tool, largely because of Seymour's program. Since 1996, the program's surf forecast maps, posted on the web and updated throughout the day, have received nearly 61 million "hits."

Water Quality and Clean Beaches

Beaches are serious stuff in Southern California–not just because they are the core of the region's lifestyle, but also because they are a major economic engine. Beaches, through tourism, for example, generated about $17 billion in direct revenues in 1998, eclipsing other marine-related industries such as commercial fishing and aquaculture. The following projects focus on beach water quality – a major issue in California both because of new regulations on beach monitoring and because of a series of highly publicized beach closures in Orange County in 1999 and 2000.

MODELING WATER QUALITY AND POLLUTION TRANSPORT

By modifying a regional ocean circulation model for the U.S. West Coast, Keith Stolzenbach and James McWilliams of UCLA created a high-resolution coastal circulation model for Santa Monica Bay. This Sea Grant-funded model resolves water movements on a 1-kilometer scale, making it possible to answer fundamental and detailed questions about pollution and sediment transport. The scientists learned that the residence time of pollutants is closely linked to the action of giant eddies shed from larger currents offshore. When an eddy sweeps through the bay, the entire bay is flushed. In the absence of eddies, pollutants stagnate. The findings have implications for how to best handle and control municipal waste and runoff. Currently, the model is being programmed to simulate the dispersion of runoff; the dispersion, deposition and re-suspension of sediments; and the origin and evolution of toxic algal blooms (see project R/CZ-171).

IDENTIFYING SOURCES OF BACTERIAL CONTAMINATION

In this Sea Grant project, Cliff Brunk of UCLA developed a set of DNA markers that make it possible to track sources of fecal bacterial contamination, e.g., whether bacteria are from storm drains, sewage effluent or animal and bird feces. This is important because current water-quality tests are based on measurements of "indicator" bacteria, which provide no information on the origins of potentially harmful bacteria. Hopefully, municipalities will use the markers to track bacterial pollution along the coast to its upstream sources.

The Orange County Water District has already used the markers to help it identify the sources of problematic films on the local water filtration system (see projects R/CZ-153 & 167).

MEASURING VIRAL LOADS IN COASTAL WATERS

Waterborne viruses pose a well-recognized health risk. Viral contamination, however, is not monitored because of the difficulty in measuring very low concentrations of these pathogens. In this Sea Grant project, Sunny Jiang of UC Irvine developed a method for detecting the presence of the human adenovirus, a cousin of the hepatitis A virus. The method was used to show that human viruses frequently contaminate coastal waters near river mouths in Southern California. These areas often have normal bacterial levels. The absence of a correlation between bacterial and viral contamination highlights the limitations of current bacteria-based health standards. The Public Facilities and Resources Department in Orange County has used Jiang's method to help it find the sources of contamination in the highly polluted Aliso Creek watershed (see project R/C-46PD).

SUBLETHAL EFFECTS OF COPPER ON MARINE SPECIES

In this project, toxicologist Ronald Tjeerdema of UC Davis exposed abalone to low levels of copper and wood preservative to study the effects of chronic pollution. The experiments required designing nuclear magnetic resonance (NMR) instrumentation suitable for imaging animals that need to be kept in water. Contaminants were shown to reduce adenosine triphosphate production in an

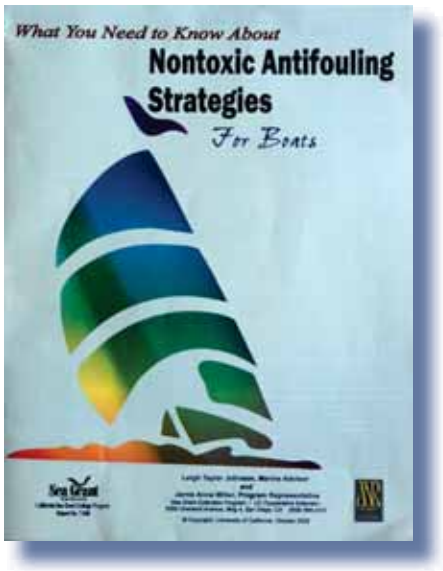
abalone's foot muscle, significant since most toxicology tests, and hence pollution standards, focus on the lethal dose of a contaminant. The California Department of Fish and Game, the State Water Resources Control Board and the Department of Health Services have expressed interest in using the NMR instrumentation developed in this project to more fully investigate the effects of nonlethal toxins on aquatic animals. Previous research by this investigator has resulted in new regulations on pesticide runoff from agriculture (see project R/CZ-142).

MEASURING TOXICITY OF HEAVY METAL CONTAMINATION

Different chemical forms of metallic compounds have very different levels of toxicity. Although it is not yet possible to speciate metal complexes in real seawater samples, Janet Hering of California Institute of Technology has been able to quantify organic complexes of copper and nickel in concocted laboratory water samples, using chromatography coupled with mass spectrometry. This Sea Grant research lays the foundation for building instruments that can measure the bioavailable component of heavy metal contamination. This is the technological step needed to refine existing regulations on metal pollution and to help coastal communities, ports and marinas prioritize clean-up efforts (see project R/CZ-146).

ALTERNATIVES TO TOXIC HULL PAINTS

Copper leached from antifouling hull paints is a major source of heavy metal pollution in marinas in California. Because copper can be harmful to marine life, its levels are regulated under the Clean Water Act. California Sea Grant marine advisor Leigh Taylor Johnson is educating stakeholders about alternatives to toxic paints. She has published a free brochure, "What You Need to Know About Nontoxic Antifouling Paints," convened a conference on alternative antifouling strategies, and is leading a demonstration of three different kinds of nontoxic hull paints. One of these paints appears to be much more durable than traditional copper-based



coatings, a finding that may give boaters an economic incentive for considering alternatives. Johnson also collaborated on research led by economist Richard Carson of UC San Diego that showed it would cost recreational boat owners in San Diego Bay $20 million to convert to non-toxic hull paints over the course of seven years, but only $1 million if the transition was stretched over fifteen years. This economic data will be brought into discussions on how to clean up the bay.

Marina at Shelter Island, San Diego. (Photo F. Greaves)

Marine Protected Areas

Less than one percent of the world's oceans and less than .01 percent of U.S. waters are protected from fishing, mining and other potentially destructive human activities. There is, however, a growing body of scientific evidence – and a groundswell of political will – in support of establishing more underwater parks (marine reserves) to protect marine life and their habitats. The following highlight Sea Grant's efforts to gather scientific data for use in managing marine reserves.

Marine Ecological Reserves Research Program

CSG's most significant early involvement in marine reserve science began in 1996, when the California Department of Fish and Game (CDFG) asked CSG to design and administer a $1.1 million marine research program known as the Marine Ecological Reserves Research Program (MERRP). Seven projects, led by scientists at CDFG, the National Marine Fisheries Service and universities in California, were selected to cohesively address basic reserve science and management issues at four, small no-take reserves.

In 2002, Sea Grant published a final report on MERRP findings on a CD so that extensive Geographical Information Systems (GIS) information could be included. Researchers also presented their findings at a special session organized by Sea Grant at the annual California Cooperative Oceanic Fisheries Investigations (Cal-COFI) Conference. In addition, Sea Grant communications wrote an award-winning feature story on MERRP for CDFG's *Outdoor California* magazine to share the science with a statewide audience.

Impacts of MERRP

MERRP showed that reserves, even newly established ones, do support a high abundance and diversity of marine species. Reserves can also serve as rearing grounds for species and can protect essential fish habitats.

Because of MERRP, CDFG is better able to map bottom habitats, quantify species abundances and evaluate the suitability of candidate reserve sites.

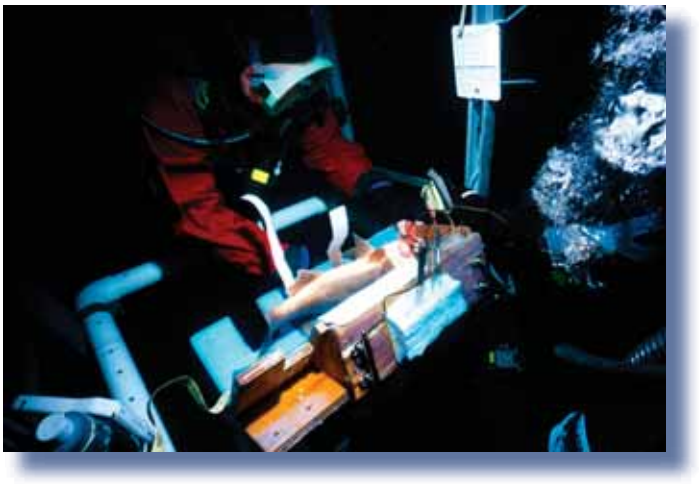
In 1999, the legislature passed the Marine Life Protection Act, which calls for the creation of a statewide network of reserves. The information gathered during MERRP establishes a foundation for understanding how to design, survey and monitor reserves to determine whether they are providing intended conservation and fishery benefits.

Other Research on Marine Reserves

Economist Jim Wilen and biologist Louis Botsford of UC Davis have developed a computer model of the sea urchin fishery that simulates the socioeconomic effects of various management options – marine reserves, individual transferable quotas or rotating harvest zones. The simulations have validated fishers' concerns that no-take areas exacerbate "congestion" in open areas. Intensified fishing in open areas was shown to reduce anticipated conservation benefits of reserves. The finding has direct relevance for how (or whether) to use reserves as a fisheries management tool (see project R/F-179).

Michael Dalton of CSU Monterey Bay, and Stephen Ralston of NOAA Southwest Fisheries Science Center are currently being funded to model the effects of marine reserves on the region's beleaguered groundfish trawl fleet. Their socioeconomic model is now able to predict "vessel crowding" and landings reductions associated with a hypothetical no-fishing reserve. The model can be used to predict and minimize impacts of reserves on the fishing industry.

Phil Hastings of Scripps Institution of Oceanography is conducting fish surveys at a small, thirty-year-old reserve off La Jolla. These have shown that there are four times as many kelp bass at this reserve, per unit area, than in comparable areas currently fished – a finding that is relevant because of ongoing debates on whether reserves "work." His research has led to the development of standardized survey techniques that can be used along the entire coast.



Rick Starr's underwater surgery center for tagging rockfish. (Photo R. Starr)

Marine advisor Rick Starr conducted a review of all scientific information on four no-take reserves in NOAA's Monterey Bay National Marine Sanctuary and Channel Islands National Marine Sanctuary. Based on his analysis, Starr concluded that fish abundance, size, and species composition were modestly greater inside these reserves than in comparable adjacent areas with similar habitats. The review adds credence to the now widespread belief among scientists that marine reserves can be effective conservation tools.

Channel Islands Reserve Process

Sea Grant marine advisor Deborah McArdle was one of seventeen members of the Marine Reserves Working Group, coordinated jointly by NOAA's Channel Islands National Marine Sanctuary and CDFG. The working group was formed to involve stakeholders in the process of creating marine reserves in state waters of the sanctuary. Based in part on recommendations from the group, the Fish and Game Commission in 2002 voted to establish thirteen marine reserves encompassing 132 square nautical miles, making it the third largest marine reserve in the nation and the first to be situated near a major metropolitan center.

With a grant from the Packard Foundation, McArdle produced a twenty-four page booklet, "California Marine Protected Areas, Past and Present," co-sponsored by the UC division of Agriculture and Natural Resources and Sea Grant. McArdle also recently published a highly popular four-page "California Marine Protected Area Update," which includes maps of the newly designated state reserves around the Channel Islands in the Santa Barbara area. Sea Grant communications has distributed it to more than 600 stakeholders, including California commercial and recreational fishermen, government agencies, industry, and educational institutions.

Salmon and Watershed Restoration

California is home to twenty-six populations of endangered or threatened species of Pacific salmon and steelhead. Habitat loss, hydroelectric dams, irrigation and fishing all contribute to their imperiled status. The CSG extension program is actively involved in community-based efforts to restore watersheds that support these and other key fishes. Two are described here.

ANNUAL SALMON COUNTS IN MILL CREEK WATERSHED

For the last twenty-three years, Sea Grant marine advisor Jim Waldvogel has conducted annual counts of spawning chinook in Mill Creek, a major tributary of the Smith River and the most pristine undammed river left in the state. This unusually long count – the longest on record in the area – has made it possible to correlate fluctuations in salmon counts with ocean processes such as El Niños.

An effort to relocate coastal Highway 101 through undeveloped areas of Mill Creek was prevented largely because the area's importance to spawning salmon had been rigorously documented. The project would have cost taxpayers $30 million.

The conservation group Save-the-Redwoods League recently raised $60 million to secure the transfer of 25,000 acres of former timberland to the state parks department. Almost $20 million of the land's value was attributed to the presence of the salmon, as documented by Sea Grant.

GRASS-ROOTS CONSERVATION: SPRING-RUN CHINOOK WORKGROUP

More than half of the nation's produce is grown in California's naturally arid Central Valley. This cropland is irrigated with water diverted from streams that would otherwise be full of spawning salmon.

Sea Grant marine fisheries specialist Christopher Dewees and former Pacific Coast Federation of Fishermen's Associations Habitat Director, the late Nate Bingham, established the "Spring-Run Chinook Salmon Workgroup," a non-advocacy, grassroots, educational forum for discussing highly charged issues surrounding water diversion and conservation in Sacramento Valley watersheds. The group was formed in 1993, several years prior to the listing of the spring-run chinook under the Endangered Species Act. It continues to meet eight to ten times a year, drawing consistent participation from fishermen, farmers, resource managers and conservationists. Project leaders Dewees and Cooperative Extension anadromous fisheries specialist Lisa Thompson continue to work with the group's facilitator, Mitch Farro, on topics such as habitat restoration and anadromous fish research.

Since its inception, members of the group have raised about $2 million. With this money, small dams have been removed on creeks, sensitive riparian areas have been fenced off to protect vegetation from grazing cows, and screens have been put on water diversion systems to prevent fish from becoming entrained. Salmon populations in the tributaries of the Sacramento River in the Central Valley are no longer in decline. In recent years, as many as 20,000 spawning salmon were counted in Butte Creek, a significant increase from a few thousand a decade ago.

Helping the State with New Legislative Mandates

The Marine Life Management Act (MLMA) of 1998 ushered in a new era of fisheries management. Among the many changes was the requirement that fishery management plans be reviewed by outside, independent scientists. CSG marine fisheries specialist Christopher Dewees and extension personnel Kristen Sortais and Bill Leet organized this peer-review process for every draft plan put forth by the California Department of Fish and Game (CDFG) to date. Reviews have resulted in substantial changes to proposed regulations. The management plan for the state's squid fishery, for example, has been revised so as to more fully incorporate the principles of precautionary management; and, the state's new Nearshore Fisheries Management Plan adopted a regional management system because reviewers believed that doing otherwise would cause stock depletions.

At the request of CDFG, Dewees was also a primary editor of *California's Living Marine Resources: A Status Report*, published in 2002. The 592-page report, mandated by the MLMA, highlights links between the ecological health of California's marine resources and their contribution to the economy. Among its findings are: the commercial fishing industry generates approximately $550 million in total income and provides nearly 17,000 jobs; recreational fisheries generate $5 billion in personal income and account for more than 150,000 jobs; and the California squid fishery is worth as much as $40 million annually, making it one of the largest and most valuable fisheries in the state. The online version of the report received 24,000 "hits" in 2002.

Research Related to Fisheries Management

Research supported by Sea Grant has helped the state address important scientific questions on how to improve fisheries management.

In the case of key nearshore species, Peter Collins of UC Santa Barbara is studying the time evolution of embryo development in rockfish and using this to document effects of environmental conditions – available food, water temperature and pollution – on oocyte development and pregnancy. What is being learned is offering valuable insights into rockfish fecundity and origins of variability in recruitment. Such information greatly improves the ability to identify essential rockfish habitats and to predict consequences of environmental changes on reproduction. It is also of relevance to the crafting of nearshore fisheries management plans.

In other related research, Christopher Lowe and Kevin Kelley of CSU Long Beach discovered that catch-and-release practices do not lower survivorship rates of sheephead, one of the nineteen species covered under the Nearshore Fishery Management Plan. CDFG, which is co-sponsoring the research, has used the finding to back its decision to impose minimum-size restrictions on sheephead. Prior to the study, anglers believed that size restrictions were meaningless, since released fish, they believed, would die anyway.

Nearshore Rockfish (Photo R. Starr)

Essential Fish Habitat

The following projects are helping National Marine Fisheries Service and CDFG identify and protect essential fish habitats.

Gary Greene of Moss Landing Marine Laboratories was funded to convert previously proprietary seafloor data, collected by oil and telecommunications companies, into fish habitat maps. These maps have greatly expanded knowledge about distributions of fish habitats within thousands of square kilometers of state and federal waters off California. In this same project, Sea Grant also funded Rikk Kvitek of the Seafloor Mapping Laboratory at CSU Monterey Bay to survey bathymetry in and around Santa Monica Bay, La Jolla Canyon, Santa Barbara and Catalina Islands, Bodega Bay and Point Lobos. Participants of a 2000 workshop of the California Marine Habitat Task Force identified these sites as "high priority" areas for such survey work (see project R/F-181).

The National Marine Fisheries Service is using the maps to identify high-relief areas that may be inhabited by remnant populations of white abalone.

CDFG has used the maps, all of which have been digitized for compatibility with GIS packages, to guide transect lines of fish surveys. The maps will likely be included in the state's Habitat Maps Series, a comprehensive inventory of essential fish habitats, and may also be used to rank habitat quality of candidate marine reserves.

Sardines (Photo CSG)

Viral Disease Found in Sardines

In 2002, Australia's biosecurity office banned the importation of California sardines after fish were found to be contaminated with a virus that causes viral hemorrhagic septicemia. The ban threatened to destroy California's sardine industry, worth about $12 million annually. (The imported sardines are fed to farmed bluefin tuna.) Sea Grant responded by funding fish pathologist Ron Hedrick of UC Davis to examine some basic questions about the virus' virulence and the effects of commercial freezing on viral loads. Genetic tests suggest that the virus in California sardines is of a variety that could cause mass fish kills. Commercial freezing of sardines, he found, reduces but does not eliminate viral contamination. Hedrick presented his preliminary findings at the 2003 Trinational Sardine Conference, started by Sea Grant three years ago. Australia's biosecurity office is waiting for final reports from Hedrick's lab before it makes a final ruling on whether to reinstate a ban on the importation of California sardines.

Sea Urchin

Harvested for their gonads, sea urchins are one of state's most valuable fisheries. At the fishery's peak in 1991, urchins were worth about $33.7 million. Due to reductions in landings and a weak yen, the fishery in 2001 was worth substantially less, about $11 million. The state and industry are now exploring management options to ensure the fishery's sustainability. To help in this effort, Sea Grant supported major conferences and workshops on the fishery in 1999 and 2002 and has long supported basic research on urchin biology. Some of our strongest and most recent research has been conducted by population geneticist Ron Burton of Scripps Institution of Oceanography, a former member of the state's Sea Urchin Advisory Committee. His Sea Grant research suggests that sea urchin populations are genetically heterogeneous, meaning that young urchins are the progeny of adults from many discrete sources, not from a single, well-mixed larval pool as once thought. The finding means that many urchin populations must be healthy to resupply beds with the next generation of harvestable product. This finding has myriad implications for how to best manage the fishery. For example, Burton's work strongly suggests that many small no-take reserves would more effectively resupply larvae in harvested areas than a few large ones (see project R/F-170).

Abalone

California's commercial abalone fisheries were closed in 1997 due to severe depletions of all harvested species. In 2001, California's native white abalone, once prized by commercial divers, became the first marine invertebrate to be listed under the federal Endangered Species Act. Culturing techniques developed by Dan Morse of UC Santa Barbara in the 1980s, which make it possible to rear young abalone for release into the wild, are today being used by National Marine Fisheries Service to help prevent the white abalone's extinction. The pioneering techniques may prove useful in helping restore populations of another native abalone species, the black abalone, now a candidate for listing.

Marine Advisor Paul Olin and a fellow abalone researcher. (Photo ANR)

Aquaculture

The Department of Commerce wants to quintuple the value of the U.S. aquaculture industry from $1 billion to $5 billion by 2025 to meet the growing public demand for seafood and to offset the nation's staggering $7 billion annual seafood trade deficit. California's aquaculture industry, which was worth about $83 million in 1999, faces greater challenges than others in this ambitious growth objective. These challenges include higher costs of doing business, political will and tougher environmental standards. CSG projects are enhancing the growth of aquaculture without compromising marine ecosystem health. Note that most of the species under study are native to California. This emphasis has dual benefits by reducing environmental issues associated with fish farming and increasing the likelihood that technologies and information developed for industry will be applied to wildlife management and conservation.

Urchin Aquaculture – An Emerging Industry

In a feasibility study of urchin farming led by CSG extension, researchers were able to control gonad growth rates by manipulating the urchins' diet – a major success given that urchins are harvested for their reproductive organs.

What was learned in this project was applied to a second feasibility study in which divers transplanted some 15,000 urchins and then manipulated their food intake to stagger harvests for optimal market value. These successes demonstrate that basic husbandry techniques for urchin farming are in place. Soon, it may be commercially feasible to "grow" a steady supply of this luxury sushi item, which, for more than a decade, was the state's most valuable fishery product.

Sea urchin research includes projects with large and small purple sea urchins, *Strongylocentrotus purpuratus*, and red sea urchins, *Strongylocentrotus franciscanus*. *(Photo S. McBride)*

Using Bovine Growth Hormone

Research supported by both California and Hawaii Sea Grant and the Monsanto Corporation has shown that the chemical company's recombinant bovine growth hormone (rBGH) accelerates weight gain in tilapia. Scientists are now developing a method for administering the hormone to tilapia fry. Continuing experiments in Hawaii will establish whether rBGH has practical commercial value (see project R/A-111).

The abalone specimen on the left has withering disease. Note the severe atrophy – or withering – of its foot muscle. The specimen on the right is healthy. (Photo CDFG)

Finding a Cure for Withering Syndrome

In collaboration with The Abalone Farm in Central California, the state's largest abalone producer, CSG researcher Carolyn Friedman developed an oral antibiotic treatment that protects farmed abalone from withering syndrome – a "wasting" disease that ruined $1.5 million worth of product during the 1997-1998 El Niño. The antibiotic therapy, added to feed and based on FDA-approved oxytetracycline, will prevent such catastrophic losses in the future. The treatment has already proved to be of greater value than originally anticipated, since the bacterium that causes withering syndrome appears to be spreading in the wild, a finding that was also made with Sea Grant support (see project R/F-43PD).

Building a Sustainable Caviar Industry

In collaboration with Stolt Sea Farm in Sacramento, one of the country's largest producers of farmed caviar, geneticist Bernard May of UC Davis mapped the pedigree structure of the company's broodstock. The farm has used the pedigree to confirm the sustainability of its breeding program, which no longer relies on capturing wild sturgeon to ensure genetic diversity among its brood members.

Beluga Sturgeon. (Photo R. Stevens, USFWS)

The pedigree is also being used to investigate whether sturgeon can be selectively bred for superior caviar weight, grade, color, firmness and yield. If so, the industry's value would stand to rise significantly, particularly given the status of wild sturgeon populations and severe caviar shortages from the Caspian Sea region. These conditions, and sky-high prices for specialty caviars like beluga, are fostering greater consumer acceptance of cultured products (see project R/A-109).

Genetic Ramifications of Stock Enhancement

With many fisheries in decline, state resource agencies are considering stocking as a way to replenish depleted populations. There are, however, concerns that this practice could reduce genetic variability, and hence the fitness of wild fish. Sea Grant funded geneticist Dennis Hedgecock of UC Davis to calculate the "effective size" of the broodstock at the state's white seabass hatchery, which releases tens of thousands of fish each year.

Hedgecock's analyses suggest that stocking, when used as a fishery management tool, is highly likely to erode genetic diversity of supplemented populations, particularly if it is successful at substantially increasing fish abundance. Somewhat paradoxically, however, hatchery releases can actually boost the genetic variability of small remnant populations, such as endangered salmon. Based on his findings, Hedgecock has recommended that, as a matter of course, hatcheries should tag all fish and document their parentage before releasing them so that their interactions with wild fish can be evaluated through time.

Strange Disease at Hatchery Explained

With Sea Grant funding, fish pathologist Ronald Hedrick of UC Davis was able to determine the cause of a disease at the state's white seabass hatchery that led to the destruction of thousands of fish: a rickettsial pathogen called *Piscirickettsia salmonis*, infamous for plaguing salmon farms. Before this Sea Grant research, the consensus within the scientific community was that *P. salmonis* could infect only salmon, hence the pathogen's Latin name.

Subsequent Sea Grant-funded experiments by Hedrick have shown that *P. salmonis* can indeed be transmitted between salmon and white seabass. Among other things, this finding highlights the potential for farms to infect wild fish and vice versa. Because of Hedrick's research, the hatchery now tests juvenile seabass for *P. salmonis* before releasing them, a procedure that dramatically reduces the chances of spreading disease.

The molecular tools advanced in this project, including the development of an early detection test, can easily be adapted for large-scale commercial use. A vaccine for the disease is currently under development, and Hedrick's work has received widespread media attention.

Migrating California Salmon (Photo USFWS)

Stemming the Tide of Invasions

Many species living along the coast are not native to California. They have hitchhiked in ballast tanks, on ships' hulls, and by other means from distant lands. Although most of these introduced species quickly die, a distressing fact is that many thrive. The accelerating pace of introductions – and failure to control their spread – is cause for great concern. Nationwide, billions of dollars are spent each year trying to prevent new introductions and to remove established invaders. The San Francisco Bay-Delta holds the dubious distinction of being "America's most invaded estuary," receiving (by some estimates) a new species every fourteen weeks.

Ballast Water Outreach Project

To help the shipping industry find economically feasible and safe solutions for controlling the influx of new species, California Sea Grant in 1999 began the West Coast Ballast Outreach Project. The project is led by marine advisor Jodi Cassell and co-sponsored by the CALFED Bay-Delta Program and the National Sea Grant College Program. A main goal of the program is to educate industry about the ecological gravity of exotic species. This has been achieved by publishing the newsletter *Ballast Exchange*, creating an educational website, coordinating workshops and by working closely with the Pacific Ballast Water Group and the Pacific States Marine Fisheries Commission. To date, nearly 30,000 copies of Cassell's award-winning ballast water poster and related brochure have been distributed to ships entering state waters and worldwide. These are being voluntarily distributed by the U.S. Coast Guard, the California State Lands Commission, the Port of Long Beach and the San Francisco Bar Pilots Association.

Cordgrasses

Aquatic nuisance species not only displace native species, they can alter entire landscapes. This fact has become painfully evident in south San Francisco Bay, where every restored wetland is plagued by hybrid cordgrasses – crosses between the East Coast smooth cordgrass, *Spartina alterniflora*, and native cordgrass, *S. foliosa*. The hybrids convert tidal mud flats to salt marsh.

In a series of projects spanning several years, Sea Grant funded biologist Dr. Donald Strong of UC Davis to develop science-based strategies for controlling these grasses. As a starting point, Strong developed a set of nuclear DNA markers that made it possible to map the extent and severity of the invasion. Further analyses showed that 98 percent of the invasion was due to the spread of hybrids, not to the proliferation of the pure invasive strain itself.

This finding revamped eradication strategies and was a major impetus for establishing the San Francisco Estuary Invasive *Spartina* Project, a multi-agency task force now in charge of coordinating a regional eradication plan. The task force continues to send specimens to Strong's lab for DNA testing. Without this testing, it would be impossible to continue monitoring the invasion or the effectiveness of herbicide applications and manual plant removal.

Salt marsh habitat in Humboldt Bay with extensive channels and introduced *Spartina alterniflora* (Photo S. McBride)

In his most recent Sea Grant work, Strong discovered that hybrids release vastly more pollen than pure strains, effectively drowning out the reproductive contribution from competitors. With this knowledge, biologists now remove upwind sources of pollen before attempting to eradicate downwind cordgrass patches, a tactic that has obvious benefits in saving time and money, and in improving the likelihood of successfully eradicating unwanted plants. Strong's findings have been incorporated into the state's official eradication plan.

Strong believes that native *S. foliosa* should be protected under the Endangered Species Act. The rapid and aggressive hybridization processes that he documented could easily push native cordgrass into extinction.

Rapid Response to the First Caulerpa *Invasion in North America*

Another highlight of CSG's aquatic nuisance species program has been our involvement combating the first documented infestations of *Caulerpa taxifolia* in North America. The rapid response to the discovery, along with concerted efforts by state, federal and local entities, has been key in preventing the seaweed from spreading to the open ocean – a major victory given the disastrous spread of *Caulerpa* in the Mediterranean.

Sea Grant funded Susan Williams, Director of the Bodega Marine Laboratory of UC Davis, to map the potential geographic range of *Caulerpa* based on available light, salinity and water temperature. Although *Caulerpa* is native to the tropics, her research showed that the invasive strain in Southern California is capable of spreading as far north as Washington – a sobering discovery that underscored the urgent need for containment.

In other Sea Grant-funded work, Steven Murray of CSU Fullerton and Sea Grant trainee Susan Frisch surveyed local aquarium stores to document the seaweed's commercial availability. Half of the stores were selling seaweeds of the genus *Caulerpa*, including *C. taxifolia*. The California legislature has since banned the importation, possession and intrastate sale of nine *Caulerpa* species. The new law, it is hoped, will significantly reduce the chances of new introductions. The first introductions were likely caused by the dumping of home aquaria into nearby waterways.

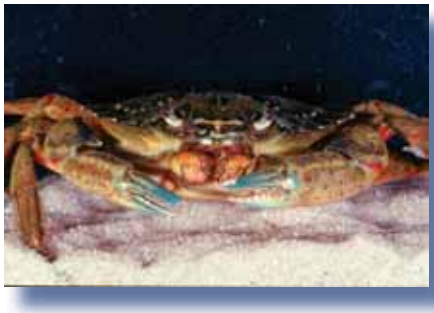
Because public education is so important, Sea Grant funded biologist Enric Sala of Scripps Institution of Oceanography to create an educational display on *Caulerpa* for the Birch Aquarium in La Jolla, which has more than 350,000 visitors per year. CSG also hosted the first International *Caulerpa taxifolia* Conference in 2002 and produced the conference proceedings on CD. Sea Grant communications wrote two feature stories on *Caulerpa*, which have been posted on CSG's website and published in *Intercoast Network*, an international newsletter on coastal management published by the University of Rhode Island.

Chinese Mitten Crabs

Researchers at UC Santa Barbara dissected several hundred Chinese mitten crabs and crayfish captured from the San Francisco Bay-Delta to look for evidence of lung flukes – dangerous human parasites common in Asia where mitten crabs are a delicacy. The project was motivated by concerns that the illegal sale of locally caught mitten crabs might be spreading parasites. The scientists found no evidence of parasitism in the crustaceans, but they did find all the requisite hosts that are needed to support a future infestation. This finding is significant given the push to open a commercial mitten crab fishery.

European Green Crabs

Sea Grant funded two researchers at UC Santa Barbara to investigate the efficacy and safety of using a biological control agent – a parasitic barnacle – to reduce the number of European green crabs. The scientists found the parasite is not host-specific enough to warrant its use,



European Green Crab (Photo UCSB)

as it was able to infect the commercially important Dungeness crab. The findings received widespread media coverage from venues such as the *Los Angeles Times* and National Public Radio and steered resource managers away from investing in a plan that would have likely backfired, resulting in unintended and costly repercussions (see project R/CZ-162).

Exotic Invertebrates and Wetland Restoration

With Sea Grant funding, researcher Lisa Levin of Scripps Institution of Oceanography showed that a burrowing Australian isopod (*Sphaeroma quoyanum*) undercuts marsh banks, increasing sediment loss and erosion by as much as 250 percent. The isopod, however, cannot invade gently sloping marsh banks, but only steep, near-vertical ones. With the knowledge that marsh banks should be built to slope gently, wetlands can be constructed (or restored) to be more resilient to exotic invaders. Levin's findings have been incorporated into the long-term planning documents of the Port of San Diego and the U.S. Navy for San Diego Bay (see project R/CZ-150).

Marine Biotechnology

Marine Biotechnology

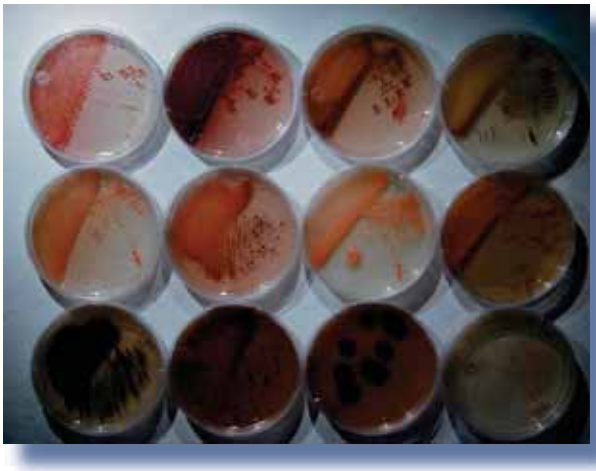
As one of the nation's leading supporters of high-risk, early-stage drug discovery research, CSG has repeatedly demonstrated the value of marine organisms as sources of new anti-cancer, anti-inflammatory and anti-microbial compounds. Since 1977, CSG supported researchers have isolated more than 600 promising compounds, resulting in dozens of patents and licensing agreements and millions in royalties to the University of California. California Sea Grant's success at transferring technology to industry was a major impetus for the National Sea Grant Biotechnology Initiative and a model for other funding agencies. Here are some recent program highlights.

Technologies for Developing New Anticancer Therapies

Marine organisms often produce only trace amounts of compounds of interest, making it nearly impossible to obtain sufficient quantities for testing, let alone commercial production. Even when a sufficient amount can be obtained, this often comes with a high environmental price, since wild harvesting can damage fragile ecosystems. A preferred alternative to wild collecting – both environmentally and economically – is to develop technologies for synthesizing or "growing" compounds. Sea Grant researcher Margo Haygood of Scripps Institution of Oceanography has made some of the most significant advances to date in developing a supply technology for bryostatin 1, which is expected to be approved in 2003 for treating esophageal cancer. If it is, it will be one of the first, if not *the* first, marine-derived anticancer drug on the market. Haygood's Sea Grant work led to a patent, the licensing rights to which are held by CalBioMarine Technologies, Inc. Haygood is currently being funded by the National Cancer Institute and Department of Defense Breast Cancer Research Program to try to insert the genes that code for bryostatin production into an easily cultured bacterium or yeast. These microbes, it is hoped, could be grown in industrial vats to produce virtually unlimited quantities of bryostatin (see project R/MP-84).

Deep-Sea Sediments Hold Promise in Developing Antiviral Therapies

After testing more than 5,000 compounds from deep-sea sediments, Sea Grant researcher William Fenical of Scripps Institution of Oceanography discovered a set of novel peptides, called halovirs, which suppress replication of the herpes virus in mammalian cells. A patent has been filed on the discovery and San Diego-based Nereus Pharmaceuticals, co-founded by Fenical, largely as a result of his many Sea Grant projects, has sought licensing rights. In collaboration with the Salk Institute, Fenical and his team recently identified a cyclic peptide – sansalvamide – that is the first known inhibitor of the topoisomerase enzyme for the *molluscum contagiousum* virus, a major breakthrough in efforts to find a cure for the human poxvirus. Fenical and colleagues have also shown that compounds called thalassiolins halt HIV replication, and thus have potential as a treatment for AIDS.



This is a photo of numerous strains of the new marine bacterium *Salinospora*. The *Salinospora* inhabit the world's tropical oceans and are of particular abundance in deep ocean muds. These microbes produce new antibiotic and anticancer agents demonstrating that the deep oceans are a new biomedical resource. (Photo W. Fenical)

Advances in Finding Better Anti-Inflammatory Drugs

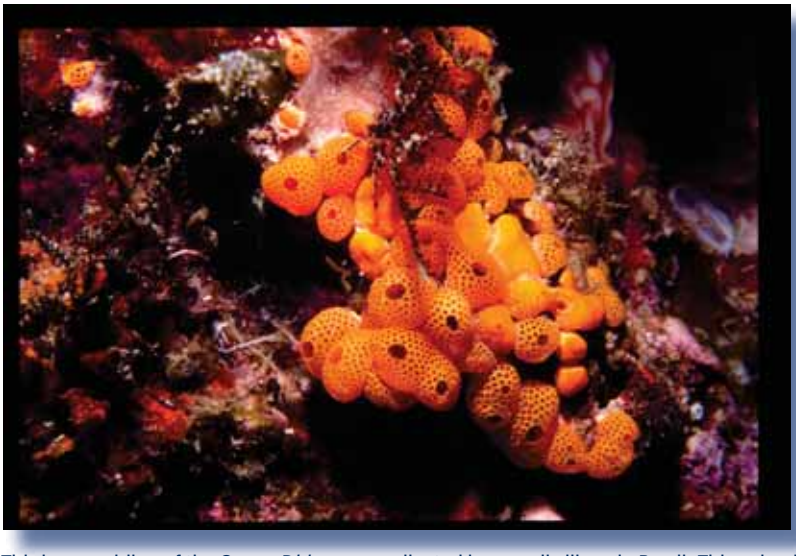
Robert Jacobs of UC Santa Barbara has isolated and described many new anti-inflammatory compounds. Some of these were discovered a decade ago and are now being investigated or sold by pharmaceutical companies. Topsentin is being studied by Johnson & Johnson and has advanced to pre-clinical testing. Scytonemin is being studied by GlaxoSmithKline and has also advanced to pre-clinical trials. Manolide and sclardial are now sold as research probes by Biomol Research Laboratories. Pseudoterosin A, an ingredient in cosmetics, is being investigated as a treatment for certain skin disorders. Jacobs and colleagues are trying to synthesize pseudoterosin, which, like bryostatin, is believed to be produced by bacterial symbionts. The National Institutes of Health is supporting a large-scale screening program for a class of anti-inflammatory compounds discovered by Jacobs with Sea Grant support.

Marine Sponges Inspire the Next Generation Silicon Chip

Imagine the miracle of a silicon chip so small it could be implanted in the retina of a blind person's eye to restore sight, or a synthetic "bone" that could

grow onto human bone to heal terrible wounds. These scenarios are not so far-fetched, as recent Sea Grant research led by Daniel Morse of UC Santa Barbara is proving. Researchers have characterized the molecular mechanism controlling the nanofabrication of spicules, tiny silica-based structures that together form the "skeleton" of a sponge. The scientists have found that a single protein, which they named "silicatein," directs the formation of ceramic-like silica composites. These composites are precisely arranged and remarkably strong – properties that are attractive starting points for designing new electronic, optical and medical materials. At present, silicon and oxygen polymers are manufactured under intense heat, pressure, or acidity to produce glass, resins, semiconductors, and optical fibers. The discovery of a natural pathway for synthesizing silicon-based materials opens the door for new, less costly and environmentally cleaner ways of producing the next generation of high-tech materials.

In other work, Morse and his team have developed catalysts that mimic the action of silicatein, and the technology has since been patented. More recently, they use the catalysts, in conjunction with a unique fluorescent precursor, to make fluorescent microwires of silica – an achievement that has excited the private sector because of its potential application in the development of new photonic devices such as semiconductors and LEDs. Morse is now collaborating with researchers from Dow Corning Corporation and the Los Alamos National Laboratory to further examine the potential applications of his Sea Grant research.



This is an ascidian of the Genus *Didemnum* collected in a small village in Brazil. This animal contains a series of very potent cancer cell growth inhibitors which have been useful in the cancer drug discovery process. (Photo W. Fenical)

Novel Protein Polymer

Robert Shadwick of Scripps Institution of Oceanography and his team have characterized the biomechanical properties of protein polymers in marine snail egg capsules. Their tests have shown that the polymer has "self-healing" properties. It can be stretched and re-stretched without tearing. The discovery of a strong yet elastic material could help build better soft-tissue transplant material such as artificial tendons and ligaments for treating joint injuries.

This is *Pseudopterogorgia elisabethae*, a soft-coral from the Caribbean Sea. UC researchers developed a novel skin care additive from this animal that is in wide use today. The additive eliminates the allergenic response some users experience to common skin care products. (Photo W. Fenical)

Seafood Technology

Most of us take it for granted that our seafood looks appetizing, tastes fresh and is safe. But if you consider its source, the widespread availability of good, safe seafood – whether fresh, frozen, live, smoked or canned – is a feat of modern technology.

Many key innovations have been developed by CSG's Seafood Technology Program, led for the last thirty years by Seafood Technology Specialist Dr. Robert Price. One particular point of pride has been the program's role in helping industry meet the first FDA regulations on seafood. These require anyone selling, importing or handling fish products to follow a set of procedures known as the Hazard Analysis Critical Control Point program, or HACCP. Since HACCP went into effect in 1997, Price (who retired in 2003) and Program Manager Pamela Tom have led about fifty HACCP training courses, including "train-the-trainer courses" for seafood processing plants and inspectors.

Impacts of the HACCP Program

As of 2001, training courses led by Price, Tom and others with the National Seafood HACCP Alliance (an intergovernmental partnership with industry and academia) have reached about 5,000 U.S. processing plants, 6,000 importers and international suppliers and 14,000 employees and regulators. The U.S. Department of Health and Human Services estimates that the HACCP program has prevented between 20,000 and 60,000 seafood-related illnesses a year, translating into savings of about $155 million annually. In one survey of seafood businesses, 77 percent reported that they could not have met FDA regulations without training programs provided by the National Seafood HACCP Alliance.

In recognition of Sea Grant's efforts, the Secretary of Agriculture in 1999 awarded the National Seafood HACCP Alliance Steering Committee, on which Price served and Tom now serves, its Group Honor Award for Public Service. That same year, the U.S. Department of Agriculture bestowed on Price its "Outstanding Leadership Award" and awarded the Seafood HACCP Alliance its "Group Award for Excellence."

Invigorating the U.S. Seafood Industry

The following projects illustrate some of CSG's issue-specific, results-driven research and outreach projects. These fall into one of two broad categories: developing new products or adding value to existing products.

* In collaboration with fishers, Price developed at-sea techniques for preventing tuna from spoiling. This project helped create the West Coast's fresh and frozen albacore tuna industry.

* In another collaboration with industry, Price published "The Colors of California Market Squid," which aims to disabuse Asian buyers of the false belief that the color of California squid is indicative of an inferior product. The multimedia CD has since been widely distributed by California squid processors.

* Price collaborated with researchers at Oregon State University who developed techniques for processing Pacific whiting into an imitation crab product known as surimi. The industry generates about $40 million annually. Price has taught extensively at Oregon State's surimi school.

Providing a Forum for Learning and Sharing Ideas

In the last five years, the Internet and email have become the primary vehicles used by the Seafood Technology Program to disseminate information. The transition to digital forums has been led by Tom. She built and now maintains an extensive digital library on seafood topics, including food safety and HACCP. The program's website is the Seafood Network Information Center, or SeafoodNIC, at http://seafood.ucdavis.edu. This site receives 250 "hits" a day and has links from about 1,000 universities, government agencies and industries. Some of the other websites developed by Sea Grant and housed at SeafoodNIC are:

Consumer Seafood Information -consumer tips on buying, preparing, storing and preserving seafood.

Seafood HACCP - the National Seafood HACCP Alliance website.

Compendium of Fish and Fishery Product Processes, Hazards and Controls - a 500-page companion to the FDA's "Fish & Fishery Products Hazards & Controls Guide," receiving 1,250 visitors a month, most of whom are government workers involved in seafood safety issues.

In addition to the websites, Tom also maintains two email list-servs, one related to HACCP and one for state issues. The two groups have more than 1,000 subscribers from key stakeholder groups, including seafood importers and foreign processors.

In 2003, the Food and Agriculture Organization of the United Nations invited Tom to be a "gatekeeper" for its new FishPort website, which will be the cornerstone of the FAO's new Aquatic Food Product Initiative. The goal of the initiative is to make the most current information on seafood safety and quality equally available to both developed and developing nations.

Education

Educating the Next Generation

In addition to supporting graduate students in the marine sciences, Sea Grant funds a small number of projects that offer exceptional – and cost effective – opportunities for furthering the education of our nation's youth. CSG funds these special projects in the hopes of teaching students how to think analytically and through the lens of the scientific method. The need for these types of enrichment programs is clear. In the last two decades, despite rhetoric about education's importance, Scholastic Aptitude Test scores have continued to decline – a distressing trend for a nation whose economic prosperity hinges on our scientific and technological eminence. The marine sciences provide an ideal gateway for teaching basic science principles – and for encouraging stewardship of our natural heritage.

Brief synopses follow for some of the educational partnerships Sea Grant has joined in the last five years.

Camp Sea Lab Monterey Bay, 2003. (Photo J. De Lay)

Camp SEA Lab

In 2002, Camp SEA Lab Monterey Bay opened its doors for the first time. SEA Lab – short for Science, Education and Adventure Lab – has been a labor of love for CSG marine advisor Rick Starr, chair and president of the camp's board of directors for the last four years.

In its first year, more than 100 children ages eight to thirteen kayaked through kelp forest canopies, hiked along beach dunes and boated in search of sea otters. Complementing these outdoor activities, children participated in educational programs based on National Science Education Standards. In addition to working with students, the camp operates ocean science training programs for teachers.

Funding and support for the camp exemplifies the power of community participation. Collaborating organizations include the outdoor store Adventures-by-the-Sea, the California Coastal Commission, Monterey Bay Aquarium, the California State University system, the University of California, Stanford University, and NOAA's Elkhorn Slough National Estuarine Research Reserve.

Camp Sea Lab Monterey Bay, 2002. (Photo J. De Lay)

Summer Science Camp for Underrepresented Urban Youth

In order to provide educational opportunities for children from economically disadvantaged backgrounds, Sea Grant supported the creation of a marine science youth camp, open to all but specifically aimed at inner-city youth from Los Angeles. The camp, originally run by UCLA, is today self-sustaining and is managed by Heal the Bay and the City of Santa Monica, in collaboration with Los Angeles Boys' and Girls' Clubs.

In 2001, about 600 children, ages five to seventeen, attended Sea Camp and participated in a variety of field and lab experiments in Santa Monica Bay. Perhaps, the greatest value of the camp, however, has been in exposing these children, many of whom had never been to the beach, to the wonders and magic of the sea (see project R/E-71PD).

Young Marine Scientists and Teachers as Scientists

California's large and growing Hispanic population is highly underrepresented in the sciences. One reason may be the quality of science education in public schools in underserved communities. To encourage scientific literacy, Sea Grant supported researchers at UC Santa Barbara to work with K-12 students from the Santa Barbara County School District on a variety of experiments and classroom science activities. Besides developing science skills, interpersonal interactions were geared

to motivate students and build self-confidence in their academic abilities. Many of the participating students attend schools at which a majority of families qualify for federally subsidized school lunch programs.

Another component of the project has been the creation and publication of new classroom materials on topics such as bioluminescence and kelp forests, aimed at helping students pass the state's Science Standards and fostering a genuine – lifelong – interest in learning.

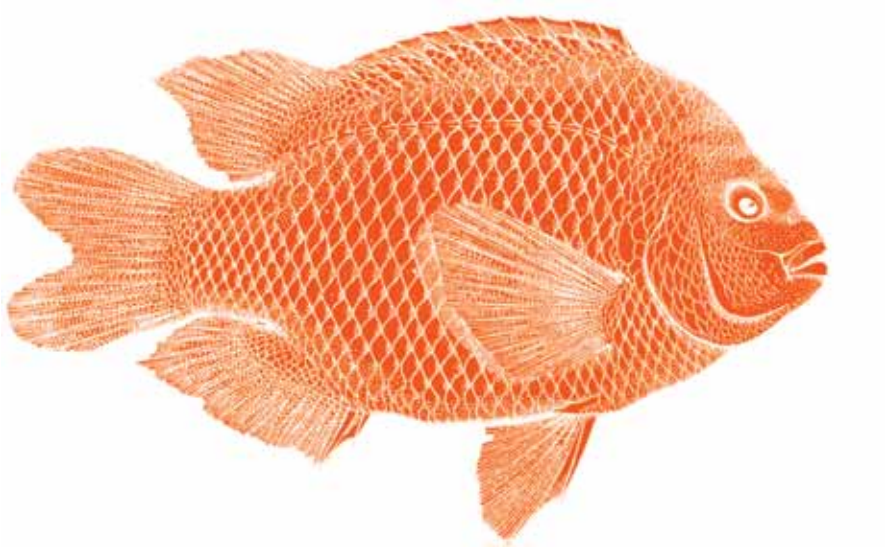
The principal investigator, Miriam Polne-Fuller of UC Santa Barbara, was awarded the university's Alumni Association Teaching Excellence Award in 2001 (see project R/E-54PD).

Assessing Sanctuary Shorelines

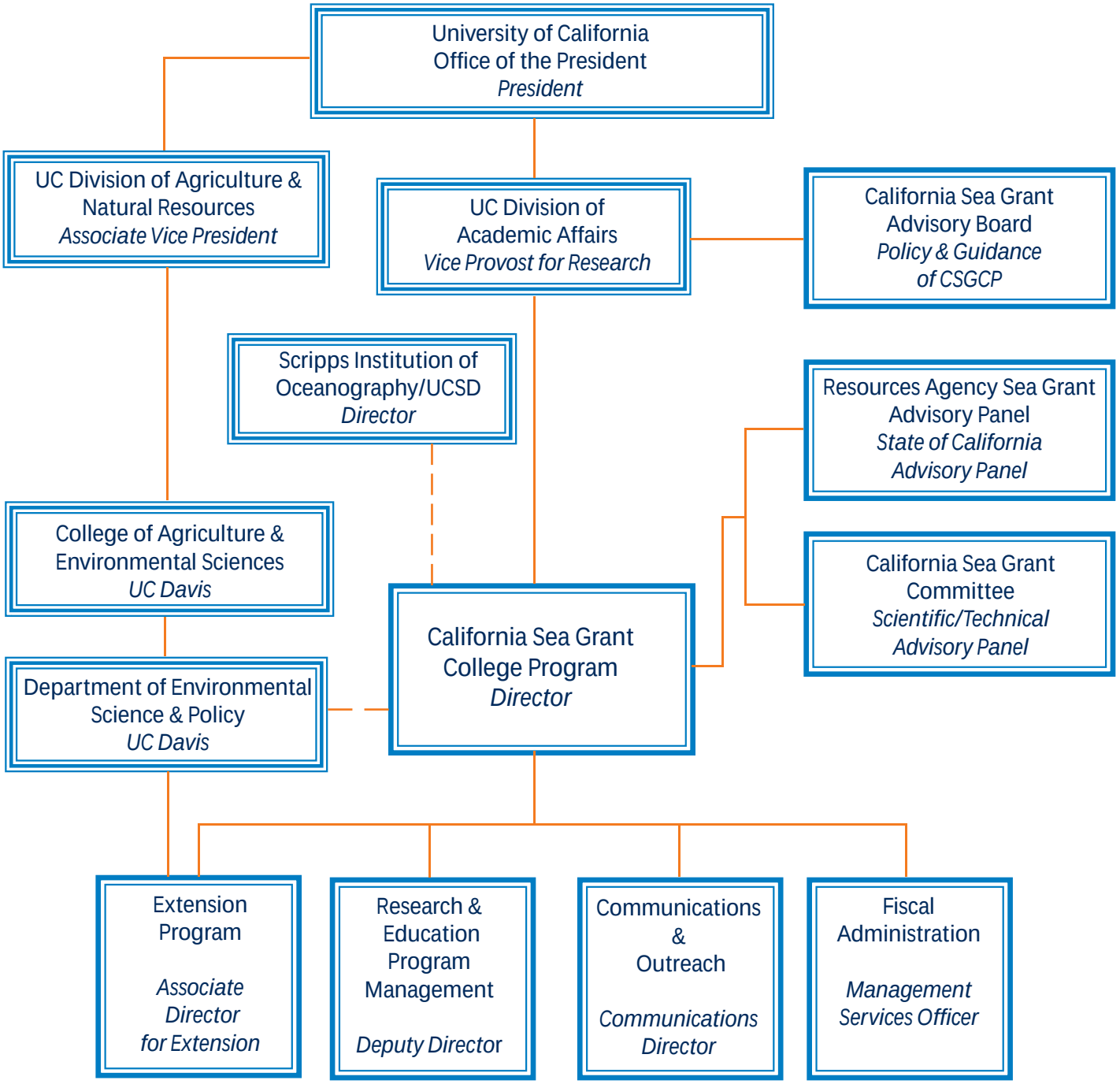
Sea Grant provided funding to develop the Seymour Intertidal Monitoring Program, a quantitative monitoring program designed to be conducted by high school students, volunteers and teachers in perpetuity. The goal is to survey plants and animals living within rocky intertidal habitats of NOAA's Monterey Bay National Marine Sanctuary, both as an educational program and to provide long-term baseline ecological data. The need for this type of data was made apparent in the 1980s as people tried but were unable to fully evaluate the ecological damage caused by an oil spill.

The project is a collaboration with area schools and NOAA's Monterey Bay National Marine Sanctuary and was adapted from a college curriculum developed by widely regarded *emeritus* biology professor John Pearse of UC Santa Cruz. His work in biology and education has long captured the attention of media. In response to this most recent work, the *Santa Cruz Sentinel* ran, "Students Get Their Feet Wet in Intertidal Monitoring Project" in November 2000. Pearse and four participating students were also interviewed on a radio show in April 2001, and UC Santa Cruz featured the project in their on-line magazine. Pearse was awarded the Sanctuary's Recognition Award for Education in 2003 (see project E/UG-5PD).

APPENDICES



ORGANIZATION OF THE CALIFORNIA SEA GRANT COLLEGE PROGRAM



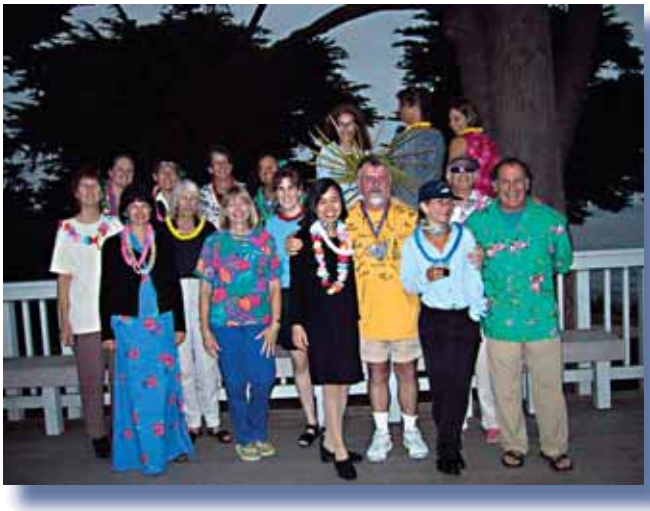
ADMINISTRATION

Administrative Office

	Yrs *
Russell A. Moll, Director	(3 yrs)
Carol Bailey-Sumber, Fiscal Assistant	(10 yrs)
Jenniffer Bourgeois, Program Assistant	(2 yrs)
Terri Branson, Fiscal Assistant	(14 yrs)
Debi Dyck, Proposal Coordinator	(1 yr)
Roslyn Johnson, Business Manager	(26 yrs)
Shauna Oh, Program Manager	(5 yrs)
Georgia Ratcliffe, Programmer/Analyst	(27 yrs)
Jane Weinzierl, Special Projects	(4 yrs)
Dolores Wesson, Deputy Director	(13 yrs)

COMMUNICATIONS

Marsha Gear, Communications Director	(25 yrs)
Gretchen Frederick, Publications & Marketing	(19 yrs)
Joann Furse, Publishing & Editing	(20 yrs)
Christina Johnson, Science Writer	(2 yrs)



California Sea Grant Retreat dinner and retirement party for Chris Dewees, 2001.

EXTENSION PROGRAM

Administrative Office

	Yrs *
Paul Olin, Interim Assoc. Director	(9 yrs)
Kim Beaird, Manager	(13 yrs)

Technical Specialists and Staff

Christopher M. Dewees, Marine Fisheries Specialist	(31 yrs)
Kristen Sortais, Staff Research Assoc.	(3 yrs)
Janelle Kohl, Assistant	(1 yr)
Vacant, Seafood Technology Specialist	
Pamela Tom, Program Manager	(30 yrs)

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HUMBOLDT AND MENDOCINO COUNTIES

Susan McBride, Advisor	(11 yrs)
Debbie Marshall, Assistant	(22 yrs)

MARIN AND SONOMA COUNTIES

Paul Olin, Advisor	(9 yrs)
Kathy Perry, Assistant	(3 yrs)

SAN FRANCISCO BAY COUNTIES

Jodi Cassell, Advisor	(8 yrs)
Irene Contreras, Assistant	(21 yrs)

MONTEREY AND SANTA CRUZ COUNTIES

Richard M. Starr, Advisor	(11 yrs)
Amy Palmer, Assistant	(1 yr)

SAN LUIS OBISPO AND SANTA BARBARA COUNTIES

Deborah McArdle, Advisor	(10 yrs)

SAN DIEGO COUNTY

Leigh Taylor Johnson, Advisor	(19 yrs)
Carol Anderson, Assistant	(6 yrs)

* Years of Service with University of California

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California Resources Agency
Expertise: Marine Policy

Mr. John Briscoe, Esq.
International Lawyer
Stoel Rives LLP
Expertise: International Law and Fisheries

Dr. Andrew Cameron
Senior Research Associate
California Institute of Technology
Expertise: Marine Biotechnology

Dr. Gary N. Cherr
Professor
Bodega Marine Laboratory
Expertise: Impacts of Pollution on Marine Organisms

Dr. Linda Fernandez
Professor
Department of Environmental Sciences, UC Riverside
Expertise: Marine Resource Policy

Dr. Peggy Fong
Assistant Professor
Organismic Biology, Ecology & Evolution, UCLA
Expertise: Marine Ecology

Dr. William Frost
Program Leader, UC Natural Resources
El Dorado County Director, UC Cooperative Extension
Expertise: Water Resources Policy

Dr. Gary Griggs
Director
Institute of Marine Sciences, UC Santa Cruz
Expertise: Marine Geology/Geophysics

Dr. David Hankin
Professor
Department of Fisheries, Humboldt State University
Expertise: Marine Fisheries

Mr. Winston H. Hickox
Secretary
California Environmental Protection Agency
Expertise: California Environmental Policy

Dr. Helen Ingram
Professor
Urban & Regional Planning, UC Irvine
Expertise: Public Policy

Dr. Geraldine Knatz
Managing Director
Port of Long Beach
Expertise: Plankton Ecology and Ports

Mr. Justin Malan
Executive Director
California Aquaculture Association
Expertise: Aquaculture

Ms. Mary D. Nichols
Secretary
California Resources Agency
Expertise: Terrestrial and Aquatic Resources Policy

Ms. Diane Pleschner-Steele
President, DB Pleschner & Associates
Expertise: Commercial Fishing

Dr. Lisa Shaffer
Director, International Relations
Scripps Institution of Oceanography
Adjunct Professor, International Relations & Pacific Studies
UC San Diego
Expertise: Climate and International Policy

Dr. Harry N. Scheiber
Professor
Boalt Hall School of Law, UC Berkeley
Expertise: Marine Law and History

Dr. Russell J. Schmitt
Director
Coastal Research Center, Marine Science Institute,
UC Santa Barbara
Expertise: Marine Fisheries

Mr. Howard Wayne
Former California Assemblyman, 78th District
Expertise: Legislative Processes and Coastal Water Quality

Ms. Kate Wing
Ocean Policy Analyst
Ocean Program, Natural Resources Defense Council
Expertise: Aquaculture, Marine Reserves and Marine Policy

Dr. Russell Moll (*ex officio*)
Director
California Sea Grant, UC San Diego
Expertise: Plankton Ecology

CALIFORNIA SEA GRANT COMMITTEE 2003

Dr. David Brune
Professor
Department of Agricultural and Biological Engineering
Clemson University
Research Interests: Aquaculture; Water Quality; Biotechnology; Environmental Engineering

Dr. Patrick Gaffney
Professor & Director of Marine Biology-Biochemistry Program
College of Marine Studies, University of Delaware
Research Interests: Genetics of Marine Organisms, Aquacultural Genetics

Dr. Donald Gunderson
Professor
Aquatic and Fishery Sciences, University of Washington
Research Interests: Direct Assessment, Population Dynamics, and Management of Fish Stocks; Use of Marine Protected Areas in Fisheries Conservation and Management

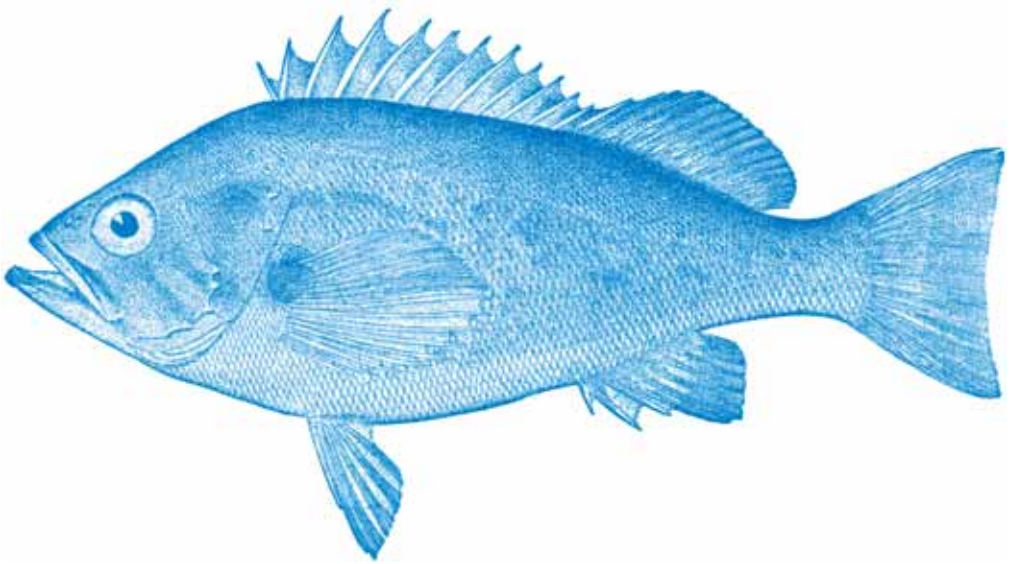
Dr. Bruce Menge
Professor (of Marine Biology)
Department of Zoology, Oregon State University
Research Interests: Structure and Organization of Marine Benthic Communities; Population, Community, and Geographical Ecology; Linking Benthic and Nearshore Pelagic Communities; Rocky Intertidal Eco-Oceanography; Models of Community Regulation; Biotic Interactions

Dr. Bradley S. Moore
Assistant Professor
Department of Pharmacology & Toxicology
University of Arizona
Research Interests: Natural Product Diversity in Microorganisms for Drug Discovery; Marine Invertebrate-Associated Microbes for Secondary Metabolic Capabilities

Dr. Jennifer Ruesink
Assistant Professor
Department of Zoology, University of Washington
Research Interests: Thresholds Species Interactions; Introduced Species; Energy Sources Supporting Estuarine Productivity

Dr. Russell D. Vetter
Research Physiologist, Team Leader
Southwest Fisheries Science Center, La Jolla
National Marine Fisheries Service
Research Interests: Biochemical Adaptations to Environmental Stress; Larval Ecology of Marine Fishes; Molecular Genetics of Marine Fish

Dr. Warren Wooster
Professor Emeritus
School of Marine Affairs, University of Washington
Research Interests: Application of Climate and Oceanographic Information to Fishery Problems; Ocean Affairs



Priest-fish, *Sebastodes mystinus* Jordan & Gilbert. Monterey, California

RESOURCES AGENCY SEA GRANT ADVISORY PANEL (RASGAP) 2003

Mr. Brian Baird
Ocean Program Manager
California Resources Agency
Expertise: Ocean Policy

Mr. Gary L. Bane
Vice President, Nauticos
Expertise: Marine Engineering

Mr. Peter Douglas
Executive Director
California Coastal Commission
Expertise: Coastal Policy

Dr. Reinhard Flick
Oceanographer, California Department of Boating & Waterways and Research Associate, Scripps Institution of Oceanography
Expertise: Coastal Processes

Dr. Margy Gassell
Research Scientist
California Office of Environmental Health Hazard Assessment
Expertise: Environmental Toxicology

Dr. Eric H. Knaggs
Marine Biologist
California Department of Fish and Game
Expertise: Marine Fisheries

Mr. Justin Malan
Executive Director
California Aquaculture Association
Expertise: Aquaculture

Honorable Bruce McPherson
Senator
15th Senate District, California State Senate
Expertise: Marine Policy

Dr. Anthony Michaels
Director, Wrigley Institute for Environmental Studies
University of Southern California
Expertise: Marine Ecology/Plankton Biology

Mr. Carlton Moore
Interim Administrator
Office of Oil Spill Prevention and Response
California Department of Fish and Game
Expertise: Oil Spill Technology and Science

Dr. Timothy J. Mulligan
Professor, Department of Fisheries
Humboldt State University
Expertise: Fisheries

Dr. Francis Palmer
Chief, Ocean Standards Unit
State Water Resources Control Board
Expertise: Water Quality

Mr. Rob Ross
Executive Director
California Fisheries and Seafood Institute
Expertise: Seafood and Fisheries Policy

Mr. Dwight E. Sanders
Chief of Environmental Planning and Management
State Lands Commission
Expertise: Land Use Planning

Dr. Susan Williams
Director, Bodega Marine Laboratory
University of California, Davis
Expertise: Marine Phycology and Coastal Ecology

Mr. Darryl Young
Director, California Department of Conservation
Expertise: Land Resource Protection, Geological Surveying, and State Mining and Geology

The common nautilus (*Nautilus pompilius*).

PROGRAM MANAGEMENT INDICATORS
PROJECT SELECTION – CORE FUNDS

	Year 1 (98-99)	Year 2 (99-00)	Year 3 (00-01)	Year 4 (01-02)	Year 5 (02-03)	TOTAL
Preproposals	77	0	93	84	61	315
Full Proposals Submitted	31	3	26	29	32	121
Full Proposals Funded	26	3	11	23	12	75
Institutions (Preproposals)	23	0	27	28	26	54*
Institutions (Full Prop. Submitted)	10	3	10	13	18	26*
Institutions (Full Prop. Funded)	7	3	3	11	9	16*

*Total number of different institutions over the last five years

PROGRAM MANAGEMENT INDICATORS
RECRUITING AND FOCUSING THE BEST TALENT

	Year 1 (98-99)	Year 2 (99-00)	Year 3 (00-01)	Year 4 (01-02)	Year 5 (02-03)
New Research Projects*	20	1	11	23	12
Continuing Research Projects*	7	22	8	6	24
New Research Investigators*	12	1	2	17	11
Continuing Research Investigators*	29	35	27	33	52
Success of Home Institution*	22%	13%	32%	34%	36%
New Institutions*					1
Success in National Competitions	30%	26%	11%	19%	7%
Regional and Multi-Program Projects**	2	3	3		1
Multi-Investigator Research Projects**	23	23	15	21	25
Multi-Institution Research Projects**	7	10	6	6	6

*Core only; does not include program development projects
**Does not include program development projects

DISTRIBUTION OF CORE FEDERAL & MATCHING FUNDS AMONG PROGRAM AREAS*

Year	Sea Grant	Match	Research	Extension	Education	Comm.	Prog. Dev.	Admin.
Year 1 (95-96)	3,410,000	1,705,000	2,453,094	1,106,925	453,738	363,893	186,847	550,503
Year 2 (96-97)	2,632,000	1,365,135	2,230,220	464,547	464,411	166,347	425,741	245,869
Year 3 (97-98)	3,595,000	1,815,500	2,355,074	1,215,221	618,737	376,188	300,415	544,865
Year 4 (98-99)	3,613,000	1,840,697	2,288,010	1,105,884	620,716	397,998	411,740	629,349
Year 5 (99-00)	3,684,000	1,789,039	2,014,872	1,153,279	683,226	412,326	449,913	759,423
Year 6 (00-01)	3,684,000	1,946,472	2,636,373	1,105,977	557,260	399,103	160,530	771,229
Year 7 (01-02)	3,749,000	2,814,294	2,909,435	1,164,211	916,712	423,925	311,823	837,188
Year 8 (02-03)	3,859,500	1,929,750	3,333,702	687,793	695,374	416,867	100,001	555,513

*The distribution of funds over the last eight years: Research 47%, Extension 18%, Education 12% (includes funding for Trainees affiliated with research projects), Communications 7%, Program Development 5%, and Administration 11%.

CALIFORNIA SEA GRANT UNIVERSITY, STATE AND COUNTY SUPPORT*

YEAR	SIO/UCSD	UCCE-ANR	Resources Agency	ELP	Various Counties
Year 1 (95-96)	193,781	116,586	250,415	99,000	19,000
Year 2 (96-97)	197,458	118,644	250,415	99,000	19,000
Year 3 (97-98)	166,783	124,014	250,415	99,000	19,500
Year 4 (98-99)	171,754	131,171	250,415	99,000	19,500
Year 5 (99-00)	176,266	152,724	250,415	99,000	21,000
Year 6 (00-01)	181,493	250,416	250,415	99,000	22,000
Year 7 (01-02)	192,606	341,663	785,000	99,000	22,500
Year 8 (02-03)	204,270	352,873	591,105	99,000	23,000

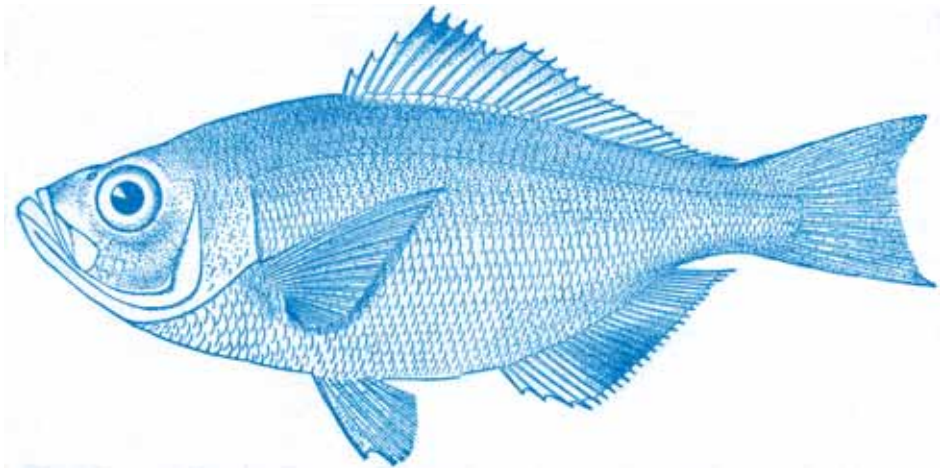
*Does not include information for California Sea Grant researchers

Legend

SIO/UCSD - Scripps Institution of Oceanography/University of California San Diego
UCCE-ANR - University of California Cooperative Extension-Agriculture and Natural Resources
ELP - Environmental License Plate

NATIONAL COMPETITION FUNDING – NSI & PASS THROUGH AWARDS

	Year 1 (95-96)	Year 2 (96-97)	Year 3 (97-98)	Year 4 (98-99)	Year 5 (99-00)	Year 6 (00-01)	Year 7 (01-02)	Year 8 (02-03)	TOTALS
Aquatic Nuisance Species	-	-	255,054	342,750	493,360	274,426	235,648	237,352	1,838,590
Biotechnology	75,000	75,000	-	387,408	394,274	-	-	-	931,682
Environmental Marine Biotech.	-	-	-	-	-	297,656	298,000	-	595,656
Fisheries Extension Enhancement	-	-	-	-	-	-	-	208,869	208,869
Fisheries Habitat	-	-	-	-	-	289,430	275,922	-	565,352
Industrial Fellows	24,000	24,000	24,000	30,000	60,000	60,000	-	30,000	252,000
Knauss Fellows	36,000	72,000	36,000	36,000	36,000	76,000	76,000	38,000	406,000
National Outreach	-	-	-	69,212	41,402	-	-	-	110,614
Sea Grant-NMFS Fisheries Fellows	-	-	-	-	-	63,334	31,667	31,667	126,668
Oyster Disease/ Gulf Oyster	78,975	80,653	163,859	169,175	158,412	73,167	-	-	724,241
Pass-Through Proposals	248,095	202,653	258,816	166,467	139,030	-	100,000	-	1,115,061
Pharmacology & Biomaterials	563,622	1,103,867	1,059,506	470,213	-	-	-	-	3,197,208
Sea Grant Tech.	-	-	-	-	425,000	351,732	39,846	-	816,578
TOTALS	1,025,692	1,558,173	1,797,235	1,671,225	1,747,478	1,485,745	1,057,083	545,888	10,888,519



Silver Surf-fish (viviparous), *Hypocritichthys analis* (Agassi). Monterey.

CALIFORNIA SEA GRANT LEVERAGED & ADDITIONAL PROGRAM FUNDING*

Source of Funds	Year 1 (98-99)	Year 2 (99-00)	Year 3 (00-01)	Year 4 (01-02)	Year 5 (02-03)
CalFed Bay Delta Program				210,000	
California Coastal Commission		70,000	60,000		
California Dept. of Boating & Waterways					50,000
California Dept. of Fish & Game		52,623	791,329	104,284	1,000
California Ocean Agenda (State Resources Agency & National Sea Grant Program)	160,000				
California State University, Long Beach		5,000			
Center for Pesticide Mgmt. Res. & Ed. (UC Davis)		8,000		7,500	
Channel Islands National Marine Sanctuary					2,000
City of Eureka			2,000		
County of San Diego		450			
David and Lucile Packard Foundation			68,000	103,000	18,500
Humboldt Bay Harbor, Recreation & Conservation Dist.				500	
Louisiana State University				1,000	
Marine Ecological Reserves Research Program	369,459	263,839	35,970		
Monterey Bay National Marine Sanctuary		7,000		42,500	
Morro Bay Harbor Department					4,000
Morro Bay Maritime Museum					5,000
National Fish & Wildlife Foundation	50,000	51,000	96,193		
National Marine Fisheries Service					20,000
National Marine Sanctuary Program					25,000
NOAA Coastal Services Center				40,000	
National Sea Grant (Supplement)			82,557	114,000	
National Undersea Research Program	107,000	10,000			
Oregon Sea Grant Program	32,048	33,758	35,558	37,455	37,535
Pacific Marine Conservation Council				5,000	
PISCO					200
Renewable Resources Extension Act	26,350	5,000		2,000	
San Diego Bays Foundation			5,357		
Sea Grant Extension Program Mini-Grant				5,000	
State Water Resources Control Board				129,283	
UC Cooperative Ext.	1,000	1,000	1,000	1,000	1,000
UC Cooperative Ext., Food Science & Tech. Dept.	4,500	2,500	4,300	4,300	1,500
UC Cooperative Ext., Natural Resources Program				1,200	
UC Division of Agriculture & Natural Resources				25,930	30,000
U.S. Fish and Wildlife Service				500	
U.S. Geological Survey					15,700
Total	750,357	510,170	1,182,264	834,452	211,435

*Does not include funding information for California Sea Grant researchers

LEADERSHIP BY STAFF ON BOARDS AND COMMITTEES 1998-2003

Cassell, Jodi, L., Marine Advisor, San Francisco Bay Counties

UC Berkeley Biocomplexity Group, 2002-2003
Pacific Ballast Water Group, 1998-2003
Western Regional Panel on Aquatic Nuisance Species, 1997-2001
Invasive Species Advisory Council, 1999-2000

Dewees, Christopher, Marine Fisheries Specialist

California Dept. Fish and Game (CDFG), Restricted Access Policy Team, 1999-present; Director's Sea Urchin Advisory Com.., 1987-2002
California Agriculture, Associate Editor, 1997-present
National Sea Grant Fisheries Theme Team, Member, 1997-present
California King Salmon Marketing Council, Non-voting Member, 1995-present
Ecology Graduate Group, UC Davis, Member, 1989-present
CDFG Center for Aquatic Biology & Aquaculture, UC Davis, National Review Team, 2002
Oregon State University Sea Grant, Reviewer for 34 fisheries proposals, 2001

Gear, Marsha, Communications Director

National Sea Grant, Communications Chair-Elect, Chair, Past-Chair, 2003-2005;
Communications Fellowship Com., Member 2002,Chair 2003;
Seafood Theme Team, Member, 2001-present
Public Relations Society of America, San Diego Chapter Board Member, 1998-2000

Johnson, Leigh T., Marine Advisor, San Diego County

The Coastal Society, International Conference Steering Com. Member, 2001-2002; Membership Chair, 2000; Board Member, 1999-2001
Agua Hedionda Lagoon Shellfish Technical Advisory Com., Fund Development, 1998-2000
County of San Diego Land Use and Environment Group, Watershed Working Group, Chair,1998-2000
San Diego Bay Watershed Task Force, Co-Chair, 1998-2000

McArdle, Deborah, Marine Advisor, San Luis Obispo & Santa Barbara Counties

The World Conservation Union, Marine Protected Area Commission, 1998-present
The National Center for Ecological Analysis and Synthesis, Marine Historical Records
Working Group, 2001-2003; Marine Reserve Working Group, 1998-2000
Channel Islands Marine Reserve Working Group, 1999-2001
California Resources Agency, Marine Managed Areas Working Group, 1999-2000
Pacific Ocean Conservation Network, Scientific Panel, 1999-2000

McBride, Susan, Marine Advisor, Humboldt & Mendocino Counties

Northern California Institute of Marine Sciences, Board Member, 2003-present
Journal of the World Aquaculture Society, Associate Editor, 2000-present
Humboldt Bay Shellfish Technical Advisory Com., 1998-present
Humboldt Bay Interagency Com., Member, 1998-present
International Abalone Society, Member and Treasurer, 1997-present
Humboldt Sigma Xi, President, 2002-2003
Sea Urchin 2003 Organizing Com., 2001-2003
Humboldt State University, Five Master's Thesis Committees, 1998-2003
Humboldt Bay and Watershed Symposium Organizing Com., 2001-2002
Humboldt Bay Watershed, Advisory Com., 1997-2002; Education Subcommittee Chair, 1997-2002
CDFG Director's Sea Urchin Advisory Com., 1995-2001
Fourth International Abalone Symposium Organizing Com., 1999-2000
Western Regional Aquaculture Center Research Subcommittee, 1996-1999

Moll, Russell, Director

Ocean Research Meeting in Honolulu, Co-Chair, 2004
California Ocean Research Trust, State of California, Trustee, 2003-present
Florida Sea Grant, Reviewer, 2003
Sea Grant Association, Program Mission Com., 2003; Board Member, 1999-2002; President, 1999-2000; External Relations Com. Chair, 1998-1999
National Ocean Science Bowl, Regional Competitions Chief Science Judge/Science Judge,1998-2001, 2003
American Society of Limnology & Oceanography, Board Member, 1996-2003; Treasurer,1996-2002
National Association of State Universities & Land Grant Colleges, Executive Com., Board on Oceans & Atmosphere, 2000-present
Birch Aquarium Advisory Board, 2001-present
Univ. of California, San Diego, Academic Administrators Review Panel, 2001-present
University of California Marine Council, 2000-present
California Sea Grant Advisory Board, Ex-Officio Member, 2000-present
Resources Agency Sea Grant Advisory Panel, Ex-Officio Member, 2000-present
Ocean Sciences Meeting, Co-Chair, 2002
Third International Marine Bioinvasions Meeting, Co-Chair, 2002
U.S. Environmental Protection Agency, Reviewer, 2000-01
Canada Journal of Fisheries and Aquatic Sciences, Reviewer, 2001, 2003
Limnology and Oceanography, Reviewer, 1999, 2003
National Science Foundation, Reviewer, 2000

Olin, Paul, Interim Associate Director for Extension

University of California (UC) Coastal and Marine Resources Workgroup, Co-Chair, 2000-present
UC Inland and Anadromous Fish Workgroup, 2000-present
Pacific Aquaculture Caucus, Board Member, 1999-present
Tomales Bay Watershed Council, 1999-present
UC Tomales Bay Water Quality Advisory Com., 1999-present
Marin County Wildlife & Fisheries Advisory Com., 1994-present
Tomales Bay Advisory Com., 1994-present
Tomales Bay Shellfish Technical Advisory Com., 1994-present
Russian River Coho Recovery Task Force, 2001-present
UC Program Planning Advisory Com., 1999-2002

Price, Robert, J., Seafood Technology Specialist (retired)

Seafood HACCP Alliance, Steering Com., 1998-2003
Institute of Food Technologists, Executive Com., 2002-2003; Professional Membership Task Force, 2000-2001; Information Systems Com., 1999-2002
Center of Aquatic Biology, External Panel Review Com., 2002
California Seafood Council, 1998-2001

Starr, Richard, Marine Advisor, Santa Cruz & Monterey Counties

Monterey Bay National Marine Sanctuary, Joint Management Plan Working Group, 2003; Research Activities Panel, 1993-present; Sanctuary Advisory Com., Alternate, 1998-2001; Com. Vice Chair, 1995-2001
Friends of Camp Lab Monterey Bay, President, 2002-present
California Department of Fish and Game (CDFG) Marine Life Protection Act Working Group, Alternate, 2002-present
Elkhorn Slough National Estuarine Research Reserve, Research Advisory Committee, 1993-present; Com. Chair, 1996-1998; Reserve Advisory Com., 1993-present; Com. Chair, 1994-1995
S.E.A. Lab Monterey Bay, Board of Directors Chair, 1996-2001
CDFG Squid Fishery Advisory Com., 1998-1999
Pacific Ocean Conservation Network, Scientific Advisory Panel for Marine Reserves, 1998-1999

Tom, Pamela, Program Manager, Seafood Technology

Institute of Food Technologists, Aquatic Food Products Division Councilor, 2002-2003; Professional Membership Task Force, 2000-2001
Seafood HACCP Alliance, Steering Com., 2001-2003
Pacific Fisheries Technologists, Executive Com., 2000-2002

Waldvogel, Jim, Marine Advisor, Del Norte & Curry Counties

Curry County Agricultural Water Quality Com., 2001-present
CDFG Steelhead Joint Scientific & Technical Team, 2000-present
American Fisheries Society, 1972-present; Member of Native American & Endangered Species Committes, 1999-present
41st Agricultural District Fair Board Director, 1997-present; President, 2000-2001
Del Norte County Fish and Game Commission Technical Advisor, 1996-present
Chetco & Winchuck Rivers Watershed Councils Technical Advisor, 1992-present
Brookings/Harbor Fishery Com., 1992-present
Northcoast Marine Mammal Center Board of Directors, 1992-present
Klamath Management Zone Coalition Technical Advisor, 1992-present
Klamath River Task Force Technical Workgroup, 1990-present
Klamath Management Council Technical Advisory Team, 1990-present
Curry County Cooperative Extension Advisory Com., 1980-present
Del Norte County Resources Advisory Com., 2001-2003
Smith River Advisory Council, 1992-present; Chairman, 1995-2003
Southern Oregon Watershed Technical Team, 1994-2002
Del Norte "Schools in Service" Community Partner, 2001
Del Norte High School Vocational Ag. Advisory Com., 1990-2001

Wesson, Dolores, Deputy Director

Commission for Environmental Cooperation, North American Fund for Environmental Cooperation, Selection Com., 2003
EPA National Advisory Com. on Implementation of North American Agreement on Environmental Cooperation, 2003
Tijuana National Estuarine Research Reserve, Coastal Trainers Program, Board, 2002-present
NEMO California Planning Com., 2002-present
Bight Bulletin Newsletter, Editor, 2001-present
Pacific Rivers Council, Board Member & Vice Chair, 1996-present
Coastal Management Journal, Book Review Editor, 1995-present
Pacific Fisheries Legislative Task Force, Liaison, 1990-present
Aqualink, Board Member, 2000-2002
North American Commission for Environmental Cooperation, Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities, Ad-Hoc Com. on the Bight of the Californias, Co-Chair, 1998-2000; Executive Com. Member, 1999-2000

Anemone

CALIFORNIA SEA GRANT COLLABORATIONS & PARTNERSHIPS 1998-2003

FEDERAL

Channel Islands National Marine Sanctuary
Elkhorn Slough National Estuarine Research Reserve
Inter-American Tropical Tuna Commission
International Boundary and Water Commission
Los Alamos National Laboratory, NM
Monterey Bay National Marine Sanctuary
NASA
- Ames Research Center
- Jet Propulsion Laboratory

National Aquatic Nuisance Species Clearinghouse
National Center for the Culture of Marine Phytoplankton
National Center for Ecological Analysis & Synthesis
National Estuarine Research Reserve System
National Fish and Wildlife Service
National Institutes of Health
- National Cancer Institute
- National Pituitary Program

National Research Council ITQ Review Committee National Science Foundation
- Biocomplexity Program

Naval Postgraduate School, Monterey, CA
National Oceanic & Atmospheric Administration (NOAA)
- National Marine Fisheries Service
  - Alaska Fisheries Science Center
  - Coastal Fisheries Resources Division
  - Pacific Fisheries Environ. Lab., Pacific Grove, CA
  - Pacific Marine Environmental Laboratory, Seattle
  - Southwest Fisheries Science Center, La Jolla, CA
  - Tiburon Center, CA
- MPA Center
- National Coastal Resources Research & Development Institute
- National Data Buoy Center
- National Marine Sanctuary Program
- National Ocean Service
  - Coastal Ocean Program
  - Marine Biotoxins Program, Charleston, SC
- National Oceanographic Data Center
- National Satellite Data & Information Service
- National Sea Grant College Program
- National Undersea Research Program
- Oceanic and Atmospheric Research
- Pacific Land-falling Jets Experiment (PACJET)
- Restoration Center

Oak Ridge National Laboratory
Office of Naval Research
Smithsonian Institution
Smithsonian Marine Research Station, Fort Pierce, FL
U.S. Army Corps of Engineers
U.S. Coast Guard
U.S. Department of Agriculture
- Animal and Plant Health Inspection Service

U.S. Department of State
U.S. Department of the Interior
- Los Padres National Forest
- Minerals Management Service

U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service, Office of Endangered Species
U.S. Forestry Service
U.S. Geological Survey
- Sacramento

U.S. Department of Defense
- Marine Corps, Camp Pendleton-Mission Resource Conservation District
- Navy SPAWAR Systems Center

U.S. Public Health Service
Yurok Tribe of Northern California

STATE

Alaska Department of Fish & Game
California
- Artificial Reef Enhancement
- Association of Harbor Masters & Port Captains
- Coastal Commission
  - San Francisco and Santa Cruz
- Coastal Conservancy
- Cooperative Oceanic Fisheries Investigation (CalCOFI)
- Department of Boating & Waterways
- Department of Fish & Game
- Department of Fish & Game Marine Region
- Department of Food & Agriculture
- Department of Health Services, Emeryville
- Department of Health Services, Food & Drug Branch
- Department of Parks & Recreation
- Department of Pesticide Regulation
- Department of Water Resources
- Division of Mines & Geology
- Fish and Game Commission
- Halibut Hatchery Program, Redondo Beach
- Mussel Watch Program Moss Landing
- NanoSystems Institute
- Regional Water Quality Control Board
  - Central Coast, Los Angeles, San Diego, San Francisco Bay, Santa Ana
- Resources Agency
- State Lands Commission
- State Parks
- State Water Resources Control Board

Michigan Department of Natural Resources
Oregon Department of Fish & Wildlife
- Marine Resources Program (Fish Division), Newport, OR

Pacific States Marine Fisheries Commission
State of Hawaii, Department of Transportation
Vermont Department of Environmental Conservation
Washington State
- Department of Fish & Wildlife
- Department of Natural Resources
- Department of Fish and Game

COUNTY

Alameda County Flood Control & Water Conservation District
Alliance of Communities for Sustainable Fisheries
Association of Monterey Bay Area Governments

COLLABORATIONS & PARTNERSHIPS, CONT'D

The Bay Foundation of Morro Bay
County of Los Angeles
- Lifeguard Association
- Sanitation District
- Wastewater Management Treatment Plant

County of San Diego
- Department of Public Works
- Land Use & Environment Group

East Bay Regional Parks District
Fagan Slough
Humboldt Bay Harbor, Recreation & Conservation District
Humboldt Bay Interagency Committee
Monterey County
- Office of Education
- Planning & Building Inspection Department

Monterey Peninsula Regional Park District
North County Transit District, San Diego
Orange County Marine Institute
Orange County Sanitation District
San Diego Association of Governments
Santa Clara Valley Water District
Santa Cruz County Planning Department

CITY

City of Encinitas
City of Los Angeles
- Bureau of Sanitation & Environmental Monitoring Div.

City of Monterey, Harbor Department
City of Morro Bay, Harbor Department
City of Redwood, California
City of San Diego
- Department of Parks and Recreation
- Water Utilities Department

City of Solana Beach, California
Fort Bragg City Council
Regional Water Quality Control Board, Los Angeles
Port of Long Beach
Port of Los Angeles
Port of Oakland
Port of Stockton
San Diego Unified Port District
San Francisco Bay Conservation & Development Commission
Santa Barbara Waterfront Department

EDUCATION (UNIVERSITY)

Bodega Marine Laboratory
California Space Institute
California State University
- Fresno
- Fullerton
  - Department of Biological Science
- Humboldt State University
- Long Beach
  - College of Natural Sciences & Mathematics
- Monterey Bay
  - Recruitment in Science & Education (RISE) Program
- Northridge
- Ocean Studies Institute
- San Diego State University
- San Francisco

Coastal Engineering Research Center
College of the Redwoods
Harbor Branch Oceanographic Institution, Fort Pierce, FL
Hopkins Marine Station, Stanford University
Institute of Ecosystem Studies, NY
Lawrence Livermore National Laboratory
Louisiana State University
- Department of Biological Sciences
- Medical Center, New Orleans

Loyola University Medical Center, Chicago
Marine Advanced Technology Education (MATE)
Marine Conservation Biology Institute
Marine Mammal Center, Sausalito
Marine Pollution Studies Laboratory at Granite Canyon
Marine Science Institute, Redwood City
Midwestern University, IL
Mira Costa Community College, CA
Monterey Academy of Oceanographic Science
Moss Landing Marine Laboratories
North Carolina State University
Occidental College
Oregon State University
- Seafood Laboratory, Astoria, OR
- Surimi Technology School, Astoria, OR

Palomar Community College
Partnership for the Interdisciplinary Studies of Coastal Oceans (PISCO)
Rutgers University-Institute of Marine & Coastal Sciences, New Brunswick, NJ
Scientific Advisory Committee for Estuarine Restoration
Scripps Institution of Oceanography
Sea Urchin Fishery Advisory Committee, Cerritos
Smith River Advisory Council
Southern California Coastal Water Research Project
St. Lawrence University, Canton, New York
University of California (Systemwide)
- Cooperative Extension, County of San Diego
- Agriculture & Natural Resources
- Marine Council
- Natural Reserve System
- Office of Vice Provost for Research
- Systemwide Biotechnology Research & Education Program

University of California, Berkeley
- Department of Integrative Biology
- Lawrence Hall of Science
- Resources & Education (MARE) Program

University of California, Davis
- Department of Aquaculture & Fisheries
- Center for Aquatic Biology & Aquaculture
- Center for Food Animal Health
- Department of Environmental Science & Policy
- Department of Environmental Toxicology
- Department of Wildlife, Fish & Conservation Biology
- Nuclear Magnetic Resonance Facility
- School of Veterinary Medicine

COLLABORATIONS & PARTNERSHIPS, CONT'D

White Sturgeon Broodstock Development Program
University of California, Los Angeles
Marine Science Center
Stein-Oppenheimer Program
University of California, San Diego
STARS Program
Coastal Data Information Program
University of California, Santa Barbara
Institute for Computational Earth System Science
Marine Sciences Institute
Materials Research Laboratory
University of California, Santa Cruz
Department of Earth Sciences
Seymour Marine Discovery Center
University of Florida
University of Guam, Mangilao
University of Hawaii
Institute of Marine Biology
University of Illinois
Chicago
Urbana-Champaign
University of Mississippi
University of New Hampshire
University of Oregon
University of San Diego
University of Southern California
University of Texas
Medical Branch, Galveston
University of Utah
University of Washington
Friday Harbor Laboratories
Seattle-School of Aquatic & Fishery Sciences
University of Wisconsin, Madison
Virginia Institute of Marine Science
Wayne State University, Detroit, MI

EDUCATION (K-12)

Aptos High School
California Center for Ocean Science Education Excellence
Cooperative Inst. for Coastal & Estuarine Environ. Tech.
Coral Reef Research Foundation
Dos Pueblos High School
Eureka High School
Fort Bragg High School
Harbor High School, Santa Cruz
La Cumbre Middle School, Santa Barbara
San Francisco Bay area counties middle school
and high school teachers
San Lorenzo Valley High School, Felton
Santa Barbara Unified School District
Santa Catalina School for Girls, Monterey
Santa Cruz County Office of Education
S.E.A. Lab, Monterey
Watsonville High School

INDUSTRY

The Abalone Farm, Inc.
Abalone International, Inc.
Abbott Laboratories, Chicago, IL, Immunosciences Div.
ABC Associates
Adventures by the Sea, Monterey, CA
AGP Video Production Company, Morro Bay, CA
Amgen Inc., Thousand Oaks, CA
Animal Planet Television Network
Aquatechnics, Inc.
Bazal Inc.
Bristol-Myers Squibb Company
British Broadcasting Corporation
CalBioMarine Technologies, Inc.
Catalina Offshore Products
Chevron USA, Inc.
Chiron Corp.
Clorox Company
The Cultured Abalone, Inc.
Datacube, Inc.
Digital Instruments, Inc.
Dow Corning
DuPont Corporation
DuPont Merck Pharmaceutical Company
Elkhorn Slough Safaris
Estée Lauder, Inc.
The Fishery, Inc.
4Cs Breeding Technologies, Inc.
Hammon, Jensen, and Wallen
Hog Island Oyster Company
Kuiper Mariculture, Inc.
Kent SeaTech Corporation
Ligand Pharmaceuticals, Inc.
MEC Analytical Systems, Inc,.
Merkel and Associates
Monsanto Corporation, St. Louis, MO
Monterey Company
Nereus Pharmaceuticals, La Jolla
North Bay Shellfish Company
Norvartis Pharmaceuticals USA
Ocean Resources Enhancement & Hatchery Prog., Carlsbad
OsteoArthritis Sciences, Inc., Cambridge, MA
Pacific Aqua Farm, Niland
Pacific Merchant Shipping Association
Pacific Park, Inc.
Philip Williams and Associates
Phytera, Inc., Worcester, MA
Rowdy Creek Fish Hatchery, Smith River
San Diego County Underwater Hull Cleaners
SeaK Fisheries, Sausalito
Seattle food processors
SmithKline Beecham, King of Prussia, PA
Stolt Sea Farm California, LLC
Taylor Shellfish Farms, Quilcene, WA
Underwater World, San Francisco
Vemco, Inc.
Westcott Bay SeaFarms

COLLABORATIONS & PARTNERSHIPS, CONT'D

NON-PROFITS

American Fisheries Society, Humboldt Chapter
Audubon Society
Big Sur Land Trust
Boys & Girls Clubs of America
- Echo Park
- Hollywood
- Malibu
- Venice

California Aquaculture Association
The Channel Islands Marine Resource Institute
Citizens for Port Development
Compass Group
Consortium for Oceanographic Research and Education
Elkhorn Slough Foundation
Environmental Defense Fund
Environmental Health Coalition
Eureka Rotary Club
The Fishermen's Marketing Association, Inc., Bodega Bay
Fishermen's Marketing Association, Inc., Eureka
Fort Bragg commercial fishermen
Friends of the Dunes, Arcata
Friends of Famosa Slough, San Diego
HOLA (Heart of Los Angeles) Bridges
The Homeland Foundation
Hubbs-Sea World Research Institute
Hudson River Foundation
Humboldt Bay
- commercial fishermen
- shellfish growers
- Stewards
- Watershed Advisory Committee
- *Zostera japonica* Eradication Group
- *Zostera marina* Survey Group

International Abalone Society
International Assoc. of Milk, Food & Environ. Sanitarians
Invasive Spartina Project
The Jiji Foundation
Knitas Group Home
Marina Recreation Association
Mendocino Coast Botanical Gardens, Fort Bragg
Monterey Bay Aquarium
Monterey Bay Aquarium Research Institute
Morro Bay Maritime Museum
Mote Marine Laboratory, Sarasota, FL
The Curtis and Edith Munson Foundation
National and International Paint & Coating Manufacturers
North American Echinoderm Society
The Ocean Conservancy
Pacific Coast Federation of Fishermen's Associations, Inc.
Pacific Fisheries Technologists
The David and Lucile Packard Foundation
Palau Conservation Society
A Place Called Home, Los Angeles
Recreational Boaters of California
Reservation Ranch, Smith River
Russian River Tributary Restoration & Landowner Outreach Program
Salk Institute for Biol. Studies, Infectious Disease Lab., La Jolla
Salmon Trollers Marketing Association, Fort Bragg
San Diego
- BayKeeper
- County Boat Repair Yard Operators
- County Commercial Fishermen
- County Marina and Yacht Club Managers
- County Recreational Boat Owners
- County Watershed Organizations
- Divebums
- Oceans Foundation
- Port Tenants Association

San Francisco Estuary Institute
San Gabriel Mountains Regional Conservancy
San Luis Obispo Historical Society
Santa Barbara Fishermen
Santa Barbara Museum of Natural History
Save Our Shores, Santa Cruz
Save San Francisco Bay Association
Sierra Club
Solano County Open Space Committee
Sonoma Land Trust
Southern California *Caulerpa* Action Team
Southern California Trawlers' Association
Spring-run Chinook Salmon Recovery Workgroup
Tomales Bay
- Agricultural Producers Group
- shellfish growers
- watershed landowners

Tuberculosis Antimicrobial Acquisition & Coordinating Facility
Western Pacific Fishery Management Council, Honolulu, HI
Wildlife Conservation Society
World Wildlife Fund
YMCA
- Los Angeles
- San Gabriel
- Santa Monica

SEA GRANT COLLEGE PROGRAMS

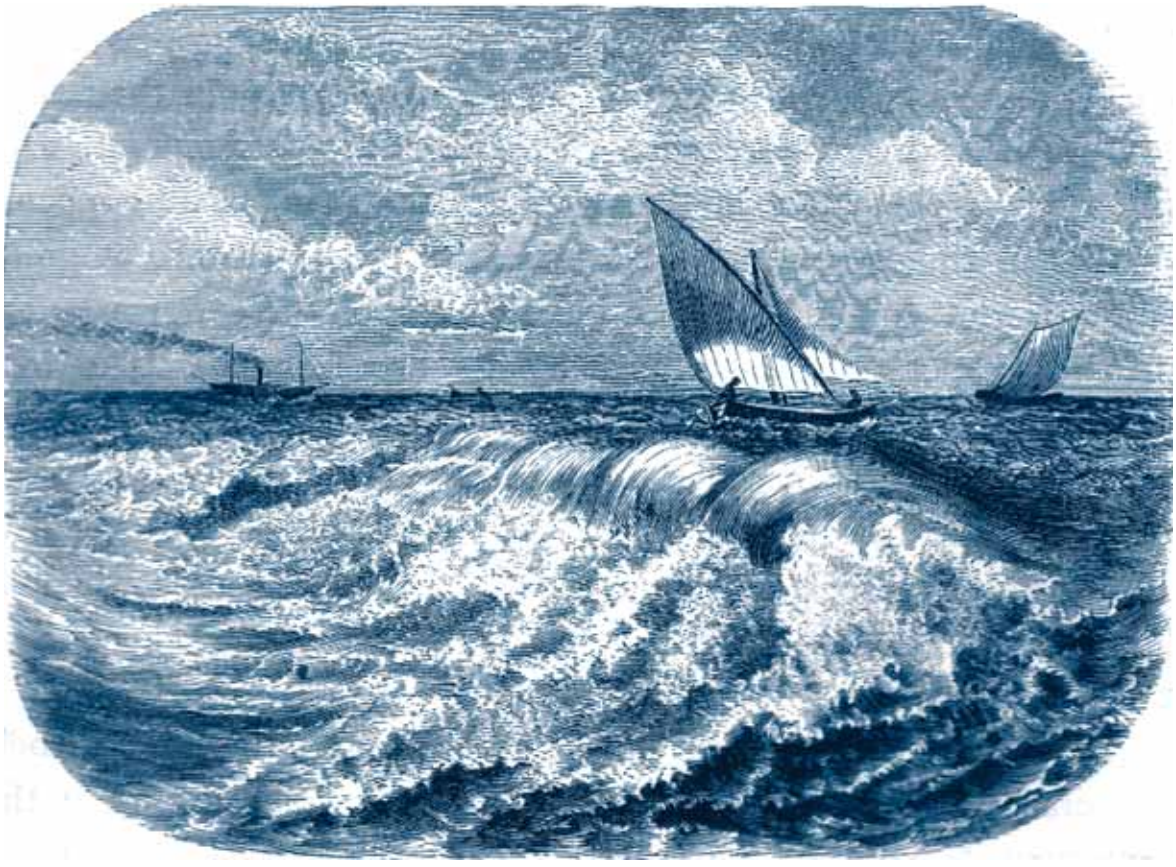
Florida Sea Grant
Hawaii Sea Grant
Louisiana Sea Grant
Oregon Sea Grant
University of Southern California Sea Grant
Washington Sea Grant

FOREIGN

Blanes Ctr. for Adv. Studies - Spanish Research Council
Canadian Department of Fisheries & Oceans
Centre for Research on Introduced Marine Pests, Australia
Dow Corning Asia
IFREMER, Montpellier, France

COLLABORATIONS & PARTNERSHIPS, CONT'D

Institute of Zoophysiologie, University of Bonn, Germany
Institute of Zoology, Academia Sinica, Taipei, Taiwan
Instituto Nacional de Pesca
Koror State Government
Max-Planck Institut fur Polymerforschung
The Fridtjof Nansen Institute, Polhgda, Norway
New Zealand Ministry of Fisheries
Pacific Biological Station, Nanaimo, British Columbia, Canada
Republic of Palau National Government
Simon Fraser University, Burnaby, British Columbia, Canada
Behavioral Research Group
Technical University of Denmark
Tijuana River National Estuarine Research Reserve
Tokyo University of Fisheries, Japan
Tungkang Marine Laboratory, Taiwan
United Nations Food and Agriculture Association
Universidad Autonoma de Baja California Sur
Universidade da Coruna, Spain
Universidade de Evora, Portugal
Universidade de Vigo, Spain
University of British Columbia, Canada
University of Bristol, England
University of Cape Town
University of Copenhagen, Denmark
University of Frankfurt, Germany
Institute of Inorganic Chemistry
University of Tokyo, Japan
Weizmann Institute, Tel Aviv, Israel



"A Hollow Wave"

"Foremost among the beauties of the sea are the waves, with their constant and regular progression, their everlasting and monotonous roar, their dancing, flying foam which rises and falls, and rises again only to disappear upon the shore. Sometimes the billow lashes itself against the cliffs; but on low shores it sweeps back again to its bed, forming a thousand cascades, a thousand rivulets, a thousand sinuous rills. . ." *THE WORLD OF THE SEA* – 1882

RESEARCH PROJECTS & PRINCIPAL INVESTIGATORS 1998 - 2002

1998

Coastal Ocean Research

R/C-31PD Cohen SFEI
Is Zebra Mussels' Calcium Threshold Higher Than Reported?

R/CZ-141 Dayton UCSD
Effect of Spore Abundance on Recruitment and Maintenance of Subtidal Kelp Populations

R/CZ-143 Epel SU
Molecular Biomarkers for Detecting Pollution and Its Remediation

R/CZ-154 Foin Collins Leopold UCD
Characterizing Vegetation-Hydrology Interactions for Tidal Marsh Restoration

R/CZ-145 Garrison Silver Tjeerdema UCSC
Assessing Environmental Control of Domoic Acid Production by the Planktonic Diatom, *Pseudo-nitzschia australis*, in California Coastal Waters

R/CZ-157 Griggs Seymour UCSC
Coastal Cliff Erosion in San Diego County, California

R/CZ-146 Hering CIT
Speciation of Metal Inputs to Coastal Waters: Consequences for Metal Transport and Bioavailability

R/CZ-148 Lafferty UCSB
Safety and Efficacy of Green Crab Biological Control

R/CZ-140 Levin Dayton UCSD
Faunal Recovery in Restored Wetlands

R/CZ-155 Mulligan Hankin Roelofs HSU
Ecosystem and Restoration Analysis of the Smith River Estuary, California, with Emphasis on Anadromous Salmonids

R/CZ-138 Mullin UCSD
Interdecadal Change in California Current Zooplankton—Retrospective Analyses by Optical Plankton Counter

R/CZ-144 Smith UCLA
Domoic Acid Biosynthesis in Marine Diatoms: Biochemical Pathways and Environmental Regulation

R/CZ-139 Stoddart Dietrich UCB
Processes of Tidal Channel Morphological Evolution and Application to Wetland Restoration and Conservation

R/CZ-156 Stolzenbach McWilliams UCLA
Integrated Modeling of the Southern California Coastal Ocean: Biogeochemistry and Particulate Dynamics

R/CZ-158 Strong Andersen Olin UCD
Initial Steps Toward Eradication of Alien Cordgrass from California Waters

R/CZ-142 Tjeerdema UCSC
Direct In Vivo Measurements of Enzyme Reaction Rates in Red Abalone as Indices of Sublethal Toxic Effects

R/CZ-137 Welschmeyer SJSU
The Effects of Coastal Fog on Planktonic Production and Food Web Structure

R/CZ-136 Wright Hope SDSU
A GIS-Based Monthly River Discharge Model for Coastal Watersheds in Southern California - Baja California

Aquaculture Research & Development

R/A-106 Doroshov Moberg UCD
Enhancing Spawning Performance of White Sturgeon

R/A-109 May UCD
Preservation of Genetic Variation Within Aquacultural Stocks of the White Sturgeon

R/A-105 Powers SU
Genetic Engineering of Fish with Hemoglobins that Facilitate Survival under Oxygen Depleted Environments

R/A-108 Snyder Chang UCD
Biotechnological Techniques to Improve Crustacean Aquaculture

Fisheries Research & Development

R/F-33PD Block Dewar Stanford
Aerobic Capacity, Physiological Ecology and Migratory Movements of Captive and Wild Pacific Bluefin Tuna

R/F-169 Botsford Wilen Quinn UCD
Bioeconomic Management Model of a Metapopulation: The Red Sea Urchin

R/F-170 Burton UCSD
Recruitment Patterns in Red Sea Urchins: A Population Genetics Approach

R/F-174 Cailliet Coale MLML/SJSU
Radiometric Age Validation of the Bocaccio Rockfish, *Sebastes paucispinis*

R/F-172 Checkley Trivedi UCSD
Realtime Assessment of Pelagic Fish Eggs at Sea

R/F-171 Forrester UCLA
Trace Elemental Fingerprinting of Otoliths Using ICP-MS to Determine the Population Structure of Marine Fishes

RESEARCH PROJECTS & PRINCIPAL INVESTIGATORS, CONT'D

R/F-43PD Friedman UCD
Examination of the Geographic Distribution of Rickettsiales-like Procaryotes in Red Abalone in Central and Northern California

R/F-35PD Hankin HSU
Size-Specific Molting Probabilities of Female Dungeness Crabs Following the 1997/98 El Niño

R/F-175 Hunter Vetter __
Population Genetics and Management of Nearshore Rockfishes (*Sebastes*) Taken in the Live Fish Fishery

R/F-42PD McBride Olin UCD
Assess *Carcinus maenas* Impacts on Cultured Shellfish in Tomales Bay and Monitoring Population Dynamics in Humboldt and Tomales Bays

New Marine Products Research & Development

R/MP-76 Butler UCSB
Marine Enzymes and Siderophores: A Biochemical and Bio-Organic Approach to Marine Pharmacology

R/MP-78 Crews UCSC
Marine Sponges and Their Associated Micro Organisms as a Source of Antiinfective Therapeutic Leads

R/MP-40PD Jacobs UCSB
Sea Grant Research at Three Florida Sites During Sabbatical Leave 1998

R/MP-81 Jacobs UCSB
Marine Inflammation Research Program 1. Pharmacological and Biochemical Studies of Inflammatory Processes

R/MP-82 Morse UCSB
New High-Performance Composite Materials From Marine Biomineralization

R/MP-77 Shadwick UCSD
Marine Natural Materials: Novel Biological Elastomers from Marine Organisms

Ocean Engineering & Instrumentation

R/OE-36 Sobey UCB
Wave Climate Risk Analysis: Seasonal Triple Annual Maximum Frequency Analyses, with Intensity-Duration-Frequency Summaries

R/OE-35 Webster UCB
The Feasibility of Large-Scale Floating Runways

Nonindigenous Species

R/CZ-147 Kuris UCSB
Containment of Sabellid Pests of California Abalone: Assessment of Habitats and Hosts at Risk of Infestation

R/CZ-150 Levin UCSD
Contrasting Effects of Ecosystem Alteration by Two Exotic Wetland Invertebrates

R/CZ-151 Wijte CSULB
Eradicating *Arundo donax* from California Ecosystems: Establishing the Most Effective Timing for Mechanical and Chemical Procedures

R/CZ-149 Williams Ebert SDSU
Settlement, Survival, Growth, and Reproduction of the Non-Indigenous Mussel (*Musculista senhousia*): Effects on Eelgrass

Marine Affairs

R/MA-39 Pomeroy FitzSimmons UCSC
Socio-Economic Organization of the California Market Squid Fishery: Assessment for Optimal Resource Management

R/MA-40 Scheiber UCB
The New Regionalization in International Fisheries Law and Management

Education

E/G-12-PD Berger Rathburn UCSD
An Atlas of Oceanic Productivity

R/E-39PD Bishop AERE
Travel Fellowships for the World Congress of Environmental and Resource Economists

R/E-45PD Cassell Jensen UCD/UMN
Clean Boater Videotape

R/E-37A-PD Hamner Young UCLA
Urban Youth and the Year of the Ocean

R/CZ-131 Ingmanson SDSU
Wetlands Restoration by Public School Teachers and Students

R/E-36PD Starr Hansch CSUMB
Strategic Planning for SeaCamp Monterey Bay

E/G-2 Sullivan UC-SG
Sea Grant Trainees

E/UG-4 Sullivan Amidei UC-SG
John D. Isaacs Memorial Sea Grant Scholarship

E/UG-9 Sullivan Amidei UC-SG
California Sea Grant State Fellowship Program

R/E-38PD Yamaguchi Katsumata SM Bay Project
Educational Video for California's Boating Community

R/E-37B-PD Young Hamner UCLA
Boys & Girls Club of Pasadena
Developing Community Partnership to Introduce Urban Youth to the Marine Development

RESEARCH PROJECTS & PRINCIPAL INVESTIGATORS, CONT'D

Outreach

A/EA-2 Cassell UCD
West Coast Ballast Water Initiative: An Outreach Program to Improve Ballast Management

A/S-3 Sullivan Wesson UC-SG
International Technology and Information Transfer Program

Workshop/Conference

W98-4PD Chryssostomidis MIT Sea Grant
National Conference on Marine Bioinvasions

R/W-44PD Crews UCSC
Fourth U.S.-JAPAN Symposium on Marine Bioorganic Chemistry

W98-1PD Devoe USCSG
International Conference on Shellfish Restoration

A/EA-1B Dewees UCD
Pacific Region Marine Biotechnology Extension Program: Biotechnology Training Conference

R/W-42PD Dewees UCD
Interactive Approach Towards Long-term Cooperative Management of the Sea Urchin Fishery

W98-2PD Nielson SU
Sponsorship of two symposiums with EEEF in Seattle, WA

W98-5PD Olin UCD
Contribution Towards Zebra Mussel Conference

R/W-34PD Patel UCLA
Conference of Living Marine Resources of California

W98-3PD Saxena PACON
9th Pacific Congress on Marine Science and Technology (PACON 2000) The Pacific Century

R/W-41PD Scheiber UCB
Conference on Law of the Sea and Implications for U.S. Ocean Policy--A "Year of the Ocean" Dialogue

Marine Biotechnology

R/CZ-153 Brunk UCLA
Quantitative PCR Assay for Marine Bacteria

A/EA-1A Dewees UCD
Pacific Region Marine Biotechnology Extension Program: A Three-year Adaptive Approach

R/MP-79 Epel Kaufman SU
Molecular and Biochemical Characterization of Microbial Symbionts and Their Bioactivities in Sepiod and Loliginid Squids

R/MP-80 Fenical UCSD
Antiviral Drugs from Deep-Sea Marine Microorganisms

R/CZ-152 Zimmer Browne UCLA
Identification of Natural and Synthetic Peptides for Controlling Marine Larval Set

Oyster Disease

R/A-110 Burns Friedman UCSD/UCD
Creation of an Oyster Cell Line in *Crassostrea Virginica*

R/A-107 Burns UCSD
Genetic Engineering to Create a Transformed Oyster Cell Line

1999

Coastal Ocean Research

R/CZ-141 Dayton UCSD
Effect of Spore Abundance on Recruitment and Maintenance of Subtidal Kelp Populations

R/CZ-154 Foin Collins Leopold UCD
Characterizing Vegetation-Hydrology Interactions for Tidal Marsh Restoration

R/C-49PD Hamner UCLA
Ongeim'l Tketau (Jellyfish Lake) Assessment and Monitoring Program

R/C-50PD Helfrich HIMB
Proposal for Chill House Using Deep Ocean Water (DOW)

R/CZ-146 Hering CIT
Speciation of Metal Inputs to Coastal Waters: Consequences for Metal Transport and Bioavailability

R/C-46PD Jiang UCI
Detection of Human Viruses and Male-Specific Coliphages in Coastal Waters of Southern California

R/C-47PD Lange UCSD
Historical Changes in Climate and Diatom Diversity Off California During the Last Century

R/CZ-140 Levin Dayton UCSD
Faunal Recovery in Restored Wetlands

R/CZ-155 Mulligan Hankin Roelofs HSU
Ecosystem and Restoration Analysis of the Smith River Estuary, California, with Emphasis on Anadromous Salmonids

R/CZ-145 Silver Garrison Tjeerdema UCSC
Assessing Environmental Control of Domoic Acid Production by the Planktonic Diatom, *Pseudo-nitzschia australis*, in California Coastal Waters

RESEARCH PROJECTS & PRINCIPAL INVESTIGATORS, CONT'D

R/CZ-144 Smith Zimmerman SJSU
Domoic Acid Biosynthesis in Marine Diatoms: Biochemical Pathways and Environmental Regulation

R/CZ-156 Stolzenbach McWilliams UCLA
Integrated Modeling of the Southern California Coastal Ocean: Biogeochemistry and Particulate Dynamics

R/CZ-142 Tjeerdema UCSC
Direct In Vivo Measurements of Enzyme Reaction Rates in Red Abalone as Indices of Sublethal Toxic Effects

R/CZ-137 Welschmeyer SJSU
The Effects of Coastal Fog on Planktonic Production and Food Web Structure

Aquaculture Research & Development

R/A-111 Chang Hayes UCD/UCB
Collaborative Studies with the University of Hawaii: Studies Addressing the Growth Stimulating Potential of Recombinant Bovine Growth Hormone in the Aquaculture of Tilapia and Shrimp

R/A-106 Doroshov Moberg UCD
Enhancing Spawning Performance of White Sturgeon

R/A-109 May UCD
Preservation of Genetic Variation Within Aquacultural Stocks of the White Sturgeon

R/A-105 Powers SU
Genetic Engineering of Fish with Hemoglobins that Facilitate Survival under Oxygen Depleted Environments

R/A-108 Snyder Chang UCD
Biotechnological Techniques to Improve Crustacean Aquaculture

Fisheries Research & Development

R/F-48PD Hamner UCLA
Design Criteria for Larval Squid Investigations

New Marine Products Research & Development

R/MP-76 Butler UCSB
Marine Enzymes and Siderophores: A Biochemical and Bio-Organic Approach to Marine Pharmacology

R/MP-81 Jacobs UCSB
Marine Inflammation Research Program 1. Pharmacological and Biochemical Studies of Inflammatory Processes

R/MP-82 Morse UCSB
New High-Performance Composite Materials From Marine Biomineralization

R/MP-77 Shadwick UCSD
Marine Natural Materials: Novel Biological Elastomers from Marine Organisms

Ocean Engineering & Instrumentation

R/OE-36 Sobey UCB
Wave Climate Risk Analysis: Seasonal Triple Annual Maximum Frequency Analyses, with Intensity-Duration-Frequency Summaries

R/OE-35 Webster UCB
The Feasibility of Large-Scale Floating Runways

R/CZ-150 Levin UCSD
Contrasting Effects of Ecosystem Alteration by Two Exotic Wetland Invertebrates

R/CZ-151 Wijte CSULB
Eradicating Arundo donax from California Ecosystems: Establishing the Most Effective Timing for Mechanical and Chemical Procedures

Marine Affairs

R/MA-39 Pomeroy FitzSimmons UCSC
Socio-Economic Organization of the California Market Squid Fishery: Assessment for Optimal Resource Management

R/MA-40 Scheiber UCB
The New Regionalization in International Fisheries Law and Management

Education

E/G-12 Berger UCSD
An Atlas of Ocean Productivity

E/G-11 Haggard Carson UCSD
Dissertation Fellowships on Marine Policy

R/CZ-131 Ingmanson SDSU
Wetlands Restoration by Public School Teachers and Students

R/AS-53PD Kolbe Webster
Regional Library of Seafood Technology-A Proposal for Phase I Planning

R/E-54PD Polne-Fuller UC
Translating Research Into K-12 Education: Genuine Reseach Experiences for Pre-College Students and Sharing with Classmates, Teachers & Families

R/E-51PD Strand Ahuja UCLA
Urban Youth and the Ocean

E/G-2 Sullivan Wesson UC-SG
Sea Grant Trainees

RESEARCH PROJECTS & PRINCIPAL INVESTIGATORS, CONTD

E/UG-4 Sullivan Wesson Gear UC-SG
John D. Isaacs Memorial Sea Grant Scholarship

E/UG-9 Sullivan Wesson Gear UC-SG
California Sea Grant State Fellowship Program

R/E-52PD Young Boys & Girls Club
Developing Community Partnership to Introduce Urban Youth to the Marine Development

Outreach

A/EA-2 Cassell UCD
West Coast Ballast Water Initiative: An Outreach Program to Improve Ballast Management

A/S-3 Sullivan Wesson UC-SG
Technology and Information Transfer Program in Asia-Pacific

Workshop/Conference

W99-7PD Cook Univ. of Cape Town
Abalone Symposium- Cape Town South Africa

R/W-56PD Hanson Mullin Hunter PSMF
"Sardine Symposium 2000" conference, May 23-25, 2000

W99-2PD Heine MLML
19th Annual Scientific Diving Symposium, Santa Cruz (November 3-7, 1999)

W99-1PD Helsley UH
Marine Ornamentals '99 Conference

W99-4PD Lemus USC
Harmful Algal Bloom Online Workshop (HAB)

W99-3PD Stone Ewing Calif. Shore & Beach Pres. Assoc.
Sand Rights '99 Bringing Back the Beaches

R/W-55PD Thompson Jr. Engberg SU
Sea Change: NAELS Conference on Ocean and Environmental Law March 10-12,2000

Sea Grant Industry Fellows

E/IF-2 Jacobs UCSB
Industrial Fellows Program: Marine Natural Products that Modulate Platelet-derived Growth Factor Receptor Activation and Fibroblast Proliferation

E/IF-3 Crews UCSC
Accelerating the Discovery of Small Molecules for the Treatment and Prevention of Heart Attack

Marine Biotechnology

R/CZ-153 Brunk UCLA
Quantitative PCR Assay for Marine Bacteria

R/MP-79 Epel SU
Molecular and Biochemical Characterization of Microbial Symbionts and Their Bioactivities in Sepiod and Loliginid Squids

R/MP-80 Fenical UCSD
Antiviral Drugs from Deep-Sea Marine Microorganisms

R/CZ-152 Zimmer Browne UCLA
Identification of Natural and Synthetic Peptides for Controlling Marine Larval Set

Oyster Disease

R/A-110 Burns Friedman UCD
Creation of an Oyster Cell Line in *Crassostrea Virginica*

R/A-112 Burns Friedman UCD
National Oyster Research Program: Toward the Genetic Engineering of Disease Resistance in Oysters

Aquatic Nuisance Species

R/CZ-159 Cohen Jenkins Navarret SFEI/UCB
Aquatic Nuisance Species Research and Outreach. Testing Ballast Water Treatment at a Municipal Wastewater Treatment Plant: Assessing Effectiveness, Limiting Factors and Cost

R/CZ-160 Dugan UCSB
Aquatic Nuisance Species Research and Outreach: Evaluating the Health Risk Posed by the Invasive Chinese Mitten Crab

R/CZ-161 Geller SJSU
Aquatic Nuisance Species Research and Outreach: Post-Invasion Genetic Structure of European Green Crab Populations on the US West Coast and Its Implications for Their Control

R/CZ-162 Kuris Goddard UCSB
Aquatic Nuisance Species Research and Outreach. Biological Control of Invasive Green Crabs: A New, Rapid and Reliable Safety Test of a Proposed Control Agent

R/CZ-163 Wijte CSULB
Aquatic Nuisance Species Research and Outreach: Combating *Arundo donax*, and Other Rhizomatous, Aquatic and Estuarine Nuisance Grasses, by Exploiting Their Ecophysiological Characteristics

Sea Grant Technology

R/CZ-167 Brunk UCLA
Sea Grant Technology Program: PCR Based Quantitative Assay for Marine Bacteria

R/A-113 Burns Klimpel UCSD/Supershrimp Group
Sea Grant Technology Program: Genetic Engineering of a Shrimp Cell Line with Pantropic Retroviral Vectors

RESEARCH PROJECTS & PRINCIPAL NVESTIGATORS, CONTD

R/MP-84 Haygood Sherman Allen UCSD/U. of Minn.
Sea Grant Technology Program: Cloning and Expression of Bryostatin Synthesis Genes and Combinatorial Biosynthesis of Novel Bryostatins

2000

Coastal Ocean Research

R/CZ-154 Foin Collins Leopold UCD
Characterizing Vegetation-Hydrology Interactions for Tidal Marsh Restoration

R/CZ-166 Guza UCSD
Surfzone Drifters: A New Tool for Observing Nearshore Circulation

R/CZ-164 Largier UCSD
Alongshore Coherence of Nearshore Temperature Variability

R/CZ-57PD Levin UCSD
Restoration of Coastal Wetlands: Colonization Enhancement and Evaluation of Trophic Function

R/CZ-165 Levin Dayton Largier UCSD
Improving Ecosystem-Level Function of Artificial Armored Shorelines

R/CZ-155 Mulligan Hankin Roelofs HSU
Ecosystem and Restoration Analysis of the Smith River Estuary, California, with Emphasis on Anadromous Salmonids

R/CZ-60PD Mullin UCSD
California Current Zooplankton: Test for Interdecadal Variation In Size Composition

R/CZ-63PD Murray CSUF
Identifying the Invasion Potential of Aquarium Seaweeds in Changing Southern California Coastal Waters

R/CZ-156 Stolzenbach McWilliams UCLA
Integrated Modeling of the Southern California Coastal Ocean: Biogeochemistry and Particulate Dynamics

Aquaculture Research & Development

R/A-111 Chang Hayes UCD/UCB
Collaborative Studies with the University of Hawaii: Studies Addressing the Growth Stimulating Potential of Recombinant Bovine Growth Hormone in the Aquaculture of Tilapia and Shrimp

R/A-115 Friedman UCD
Tools for Management of Withering Syndrome in Abalone, *Haliotis* spp.: PCR Detection and Feed-based Therapeutic Treatment

R/A-114 Hedrick Arkush UCD
Control of Rickettsial Infections in White Sea Bass (*Atractoscion nobilis*)

R/A-109 May UCD
Preservation of Genetic Variation within Aquacultural Stocks of the White Sturgeon

R/A-108 Snyder Chang UCD
Biotechnological Techniques to Improve Crustacean Aquaculture

Fisheries Research & Development

R/F-178 Burton UCSD
Patterns of Recruitment in Red Sea Urchins: A Population Genetics Approach

R/F-176PD Cailliet SJSU
Radiometric Age Validation of Two Deep-water Fishes: the Yelloweye (*Sebastes ruberrimus*) and Blackgill (*S. melanostomus*) Rockfishes

R/F-59PD Collins UCSB
Potential Fecundity and Realized Reproductive Output in the Grass Rockfish, *Sebasters rastrelliger*

R/F-65PD Hankin HSU
Presentation of Results of CA Sea Grant sponsored research on Female Dungeness Crabs

R/F-179 Wilen Botsford UCD
Spatial Management of Fisheries

New Marine Products

R/MP-89 Epel SU
Environmental Effects on Antimicrobial Activity of Bacterial Symbionts in the Reproductive System of Squid

R/MP-87 Faulkner UCSD
The Biomedical Potential of California Marine Organisms

R/MP-88 Haygood UCSD
Investigation of Anti-Cancer Compounds in the Marine Bryozoan, *Bugula pacifica*

R/MP-82 Morse UCSB
New High-Performance Composite Materials from Marine Biomineralization

Education

E/IF-2 Jacobs UCSB
Industry Fellows Program: Marine Natural Products that Modulate Platelet-derived Growth Factor Receptor Activation and Fibroblast Proliferation

R/E-59PD Keasling UCB
MarBEC MSURF Summer Undergraduate Research Program

E/UG-5PD Pearse Levin UCSC
Assessing Sanctuary Shorelines: A Role for High School Students in Resource Management

RESEARCH PROJECTS & PRINCIPAL INVESTIGATORS, CONTD

E/G-2 Winant Wesson UC-SG
Sea Grant Trainees

E/UG-4 Winant Wesson Gear UC-SG
John D. Isaacs Memorial Sea Grant Scholarship

E/UG-9 Winant Wesson UC-SG
California Sea Grant State Fellowship Program

Outreach

R/M-61PD Richards UC Davis
Seeking Common Ground: Facilitating Discussions on Sea Otter and Marine Resource Issues in California

Workshop/Conference

W99-8PD Chew UW
National Shellfisheries Association Meeting

W00-9PD DeVoe Sea Grant South Carolina
The Fourth International Conference on Shellfish Restoration

W01-10PD Saxena PACON
The Fifth Regional Symposium: PACON 2001 "Environmental Technologies for Sustainable Maritime Development"

Marine Biotechnology

R/CZ-152 Zimmer UCLA
Identification of Natural and Synthetic Peptides for Controlling Marine Larval Set

Oyster Disease

R/A-112 Burns Friedman UCSD/UCD
National Oyster Disease Research Program: Toward the Genetic Engineering of Disease Resistance in Oysters

Aquatic Nuisance Species

R/CZ-160 Dugan UCSB
Aquatic Nuisance Species Research and Outreach: Evaluating the Health Risk Posed by the Invasive Chinese Mitten Crab

R/CZ-161 Geller SJSU
Aquatic Nuisance Species Research and Outreach: Post-Invasion Genetic Structure of European Green Crab Populations on the U.S. West Coast and its Implications for their Control

R/CZ-162 Kuris Goddard UCSB
Aquatic Nuisance Species Research and Outreach: Biological Control of Invasive Green Crabs: A New, Rapid and Reliable Safety Test of a Proposed Control Agent

R/CZ-163 Wijte CSULB
Aquatic Nuisance Species Research and Outreach: Combating *Arundo donax*, and other Rhizomatous, Aquatic and Estuarine Nuisance Grasses, by Exploiting their Ecophysiological Characteristics

R/CZ-62PD Williams UCD
Environmental Constraints of *Caulerpa taxifolia* (putative) in California

Sea Grant Technology

R/MP-85 Jacobs UCSB
Sea Grant Technology Program: Pharmacological Adaptation of *Protoctista* as Novel Models to Study Inflammation

R/MP-86 Javor Trischman CalBioMarineTech/CSUSM
Sea Grant Technology Program: Antiviral Drugs from Marine Bacteria

Environmental Marine Biotechnology

R/CZ-169 Conrad Gardner Chechowitz UCD
Environmental Marine Biotechnology: Molecular and Bioassay-based Investigation of Bivalves as Transmission Vectors of Protozoal Encephalitis in Southern Sea Otters

R/CZ-168 Snyder Cherr Peeke UCD
Environmental Marine Biotechnology: Development of Molecular and Cellular Tools for the Detection of Environmental Endocrine Disruption in Aquatic Invertebrates

Fisheries Habitat

R/F-181 Greene Kvitek MLML/SJSU
Fisheries Habitat: Characterization of the California Continental Margin: Identification, Quantification, and Synthesis of Existing Information

2001

Coastal Ocean Research

R/CZ-77PD Breaker Broenkow MLML/SJSU
Reconstructing the 82-Year Record of Sea Surface Temperature at Pacific Grove, California

R/CZ-177 Dayton Tegner UCSD
The San Diego-La Jolla Ecological Reserve: Implications for the Design and Management of Marine Reserves

R/CZ-174 Dugan Page Wenner UCSB
Ecological Impacts of Beach Grooming on Exposed Sandy Beaches

R/CZ-166 Guza UCSD
Surfzone Drifters: A New Tool for Observing Nearshore Circulation

R/CZ-172 Lange Weinheimer UCSD
Exploring the 1990s: Investigation into Factors Controlling Siliceous Microplankton Distribution in the Santa Barbara Channel

R/CZ-164 Largier UCSD
Alongshore Coherence of Nearshore Temperature Variability

RESEARCH PROJECTS & PRINCIPAL INVESTIGATORS, CONT'D

R/CZ-173 Levin UCSD
Recovery of Trophic Function in a Restored Pacific Coastal Wetland

R/CZ-178 Love Warner Washburn UCSB
Linking Early Fish Growth and Transport to Circulation Using Otolith Microstructure and Microchemistry

R/CZ-170 Stacey Powell UCB
Observation of Physical Fluxes Between an Estuary and the Ocean

R/CZ-171 Stolzenbach McWilliams UCLA
Modeling of Water and Sediment Quality in Impacted Coastal Embayments

R/CZ-176 Strong BML/UCD
Dynamics and Ecosystem Threats of Bidirectional Cordgrass Hybridization in San Francisco Bay

R/CZ-175 Venkatesan UCLA
Fate and Transport of Planar and Mono-Ortho Polychlorinated Biphenyls and Polychlorinated Naphthalenes in Southern California Sediments

Aquaculture Research & Development

R/A-115 Friedman UCD
Tools for Management of Withering Syndrome in Abalone, *Haliotis* spp.: PCR Detection and Feed-based Therapeutic Treatment

R/A-116 Piedrahita Conklin UCD
Development of a Recirculation System and Diet for the Culture of California Halibut (*Paralichthys californicus*)

R/A-117 Tjeerdema Friedman Viant UCD
Characterizing the Role of Environmental Stressors in the Development of Withering Syndrome in Red Abalone

Fisheries Research & Development

R/F-188 Anderson SDSU
Fisheries Habitat: Recruitment, Growth, and Survival of Coastal Fishes on an Experimental Artificial Reef

R/F-185 Block Farwell SU
Migratory Movements of Pacific Bluefin Tuna off California

R/F-178 Burton UCSD
Patterns of Recruitment in Red Sea Urchins: A Population Genetics Approach

R/F-182 Cailliet Coale MLML/SJSU
Radiometric Age Validation and Demographic Analysis of Commercially Important, Long-Lived Rockfishes

R/F-180 Checkley Trivedi UCSD
Pelagic Fish Egg Abundance and Mortality Estimation by CUFES and Real-Time Machine Vision

R/F-183 Collins UCSB
Assessment of the Reproductive Potential of Nearshore Rockfish and the Impact of Environmental Conditions

R/F-177 Grosberg UCD
Molecular Genetic Analyses of Recruitment Patterns in the Dungeness Crab, *Cancer magister*

R/F-187 Hankin Hackett Dewees HSU
California's Dungeness Crab: Conserving the Resource and Increasing the Net Economic Value of the Fishery

R/F-184 Hedgecock BML/UCD
Quantifying and Minimizing Risk that Hatchery-Enhancement Will Reduce Genetic Diversity of White Seabass

R/F-186 Marinovic Croll UCSC
Assessing the Impacts of Climate Change on the California Squid Fishery: An Integrated Ecosystem Approach

R/F-179 Wilen Botsford UCD
Spatial Management of Fisheries

New Marine Products

R/MP-87 Faulkner UCSD
The Biomedical Potential of California Marine Organisms

R/MP-67PD Jacobs UCSB
The Physiology of Wound Plug Formation in *Dasyladus vermicularis*

R/MP-93 Lehrer Taylor UCLA
Novel, Post-Translationally Modified Peptide Antibiotics from Solitary Tunicates ("Sea Squirts")

R/MP-92 Morse UCSB
New High-Performance Nanocomposite Materials from Marine Biomineralization: Biotechnological and Interdisciplinary Approach

R/MP-91 Shadwick Waite UCSD/UCSB
Marine Natural Materials: Novel Biological Elastomers from Marine Invertebrates

Ocean Engineering

R/OE-37 Ashford UCSD
Mitigation of Coastal Bluff Instability in San Diego County, California

Nonindigenous Species

R/CZ-74PD Graham Stachowicz UCD
Reproductive Biology of *Undaria pinnatifida*, a Seaweed Recently Introduced to southern California: Assessing the Potential for Establishment and Spread.

R/E-74PD Wasson Elkhorn Slough Foundation
"Least wanted" invaders: an early detection program for invasions of nonindigenous marine species in central Calif.

RESEARCH PROJECTS & PRINCIPAL INVESTIGATORS, CONTD

Marine Affairs

R/MA-41 Wilen Botsford UCD
Building Marine Policy Analysis Capabilities in California

Education

R/E-70PD Griggs UCSC
The Otter Bowl is an Educational Project to Encourage High School Students to Learn More about Ocean Science through Participation in the National Ocean Sciences Bowl.

R/E-68PD Keasling UCB
MarBEC MSURF Summer Undergraduate Research Program at UCB

R/E-73PD Love UCSB
Creating an Internet-Accessible Video Library of Pacific Coast Fisheries

E/G-2 Moll UC-SG
Sea Grant Trainees

E/UG-4 Moll UC-SG
John D. Isaacs Memorial Sea Grant Scholarship

E/UG-9 Moll UC-SG
California Sea Grant State Fellowship Program

E/UG-6 Pearse Heffington UCSC
Assessing Sanctuary Shorelines: A Role for Volunteers, Particularly High School Students, in Resource Management

R/E-71PD Strand UCLA
Urban Youth and the Ocean

R/F-79PD Venrick UCSD
CalCOFI Conference 2001

Outreach

A/EA-2 Cassell Hart UCD
West Coast Ballast Outreach Project

Workshop/Conference

W01-12PD Chryssostomidis MIT
The Second International Conference on Marine Bioinvasions

R/W-75PD Grosholz UCD
International *Caulerpa taxifolia* Workshop: Research, Management and Outreach

R/W-76PD Hodgson UCLA
Workshop on Educating California Coastal and Ocean Management

W02-14PD Saxena PACON
The Tenth Pacific Congress on Marine Science and Technology PACON 2002 The Ocean Century

Aquatic Nuisance Species

A/EA-3 Cassell UCD
Aquatic Nuisance Species Research and Outreach: West Coast Ballast Outreach Project

R/CZ-179 Somero SU
Aquatic Nuisance Species Research and Outreach: Physiological Adaptation and Invasion Success: A Comparison of Native and Invasive Species of Bay Mussels (*Mytilus trossulus* and *M. galloprovincialis*) in the Central California Hybrid Zone

Sea Grant Technology

R/OE-38 Ashford UCSD
Sea Grant Technology Program: Seismic Performance of Port Facilities: Full-Scale Testing at Port of Long Beach

Environmental Marine Biotechnology

R/CZ-169 Conrad Gardner Chechowitz UCD
Environmental Marine Biotechnology: Molecular and Bioassay-based Investigation of Bivalves as Transmission Vectors of Protozoal Encephalitis in Southern Sea Otters

R/CZ-168 Snyder Cherr Peeke UCD
Environmental Marine Biotechnology: Development of Molecular and Cellular Tools for the Detection of Environmental Endocrine Disruption in Aquatic Invertebrates

Fisheries Habitat

R/F-181 Greene Kvitek MLML/SJSU
Fisheries Habitat: Characterization of the California Continental Margin: Identification, Quantification, and Synthesis of Existing Information

2002

Coastal Ocean Research

R/CZ-180 Atwill Conrad UCD
Bacterial and Protozoal Contamination of Nearshore Marine Environments in California, with Ecologically Sustainable Management Recommendations

R/CZ-181 Broenkow Breaker Mavor MLML/SJSU
Climatological and Near-Real-Time Satellite-Observed Ocean Fronts along the California Coast

R/CZ-177 Dayton Sala UCSD
The San Diego-La Jolla Ecological Reserve: Implications for the Design and Management of Marine Reserves

R/CZ-89PD Dugan Page Schroeter UCSB
An Experimental Investigation of the Recovery of Sandy Beaches from Beach Grooming

R/CZ-174 Dugan Page Schroeter UCSB
An Experimental Investigation of the Recovery of Sandy Beaches from Beach Grooming

RESEARCH PROJECTS & PRINCIPAL INVESTIGATORS, CONT'D

R/CZ-182 Epel Luthy SU
Nitromusk Compounds: Are they Bio-Available and Do they Compromise Toxin Defense Systems?

R/CZ-166 Guza UCSD
Surfzone Drifters: A New Tool for Observing Nearshore Circulation

R/CZ-183 Hastings Dayton UCSD
Effects of the San Diego-La Jolla Marine Reserve on the Abundance, Diversity and Population Structure of Reef Fishes

R/CZ-172 Lange Venrick UCSD
Exploring the 1990s: Investigation into Factors Controlling Siliceous Microplankton Distribution in the Santa Barbara Channel

R/CZ-164 Largier UCSD
Alongshore Coherence of Nearshore Temperature Variability

R/CZ-173 Levin UCSD
Recovery of Trophic Function in a Restored Pacific Coastal Wetland

R/CZ-81PD Martin Pepperdine
Does Beach Grooming Harm Grunion Eggs?

R/CZ-170 Stacey Powell UCB
Observation of Physical Fluxes Between an Estuary and the Ocean

R/CZ-171 Stolzenbach McWilliams UCLA
Modeling of Water and Sediment Quality in Impacted Coastal Embayments

R/CZ-176 Strong BML/UCD
Dynamics and Ecosystem Threats of Bidirectional Cordgrass Hybridization in San Francisco Bay

R/CZ-175 Venkatesan UCLA
Fate and Transport of Planar and Mono-Ortho Polychlorinated Biphenyls and Polychlorinated Naphthalenes in Southern California Sediments

Aquaculture Research & Development

R/A-119 Burns Friedman UCSD/UCD
Creation of a Molluscan Cell Line

R/A-120 Hedgecock UCD
Meiosis in Tetraploid Pacific Oysters, Their Triploid Mothers, and Diploid Grandmothers

R/A-116 Piedrahita Conklin UCD
Development of a Recirculation System and Diet for the Culture of California Halibut (*Paralichthys californicus*)

R/A-117 Tjeerdema Friedman Viant UCD
Characterizing the Role of Environmental Stressors in the Development of Withering Syndrome in Red Abalone

Fisheries Research & Development

R/F-188 Anderson SDSU
Fisheries Habitat: Recruitment, Growth, and Survival of Coastal Fishes on an Experimental Artificial Reef

R/F-185 Block Farwell SU
Migratory Movements of Pacific Bluefin Tuna off California

R/F-189 Burton UCSD
Conservation Genetics of California Abalone: Developing Tools for Management

R/F-182 Cailliet Coale MLML/SJSU
Radiometric Age Validation and Demographic Analysis of Commercially Important, Long-Lived Rockfishes

R/F-190 Cailliet Coale MLML/SJSU
Bomb Carbon in the Yelloweye Rockfish, *Sebastes ruberrimus*, as a Chronological Benchmark for Age Validation of Commercially Important Fishes

R/F-180 Checkley Trivedi UCSD
Pelagic Fish Egg Abundance and Mortality Estimation by CUFES and Real-Time Machine Vision

R/F-191 Checkley Hunter UCSD
Pattern and Association in Pelagic Zooplankton and Fish and their Use in Resource Assessment

R/F-183 Collins UCSB
Assessment of the Reproductive Potential of Nearshore Rockfish and the Impact of Environmental Conditions

R/MA-42 Dalton Ralston CSUMB
Empirical Evaluation of Regional Scale Marine Reserves and the Groundfish Trawl Fishery with Geographical Information Systems, Analysis of Covariance and Bioeconomic Modeling

R/F-85PD Graham UCSD/SIO
Movement Patterns and Bioenergetics of the Shortfin Mako Shark (*Isurus oxyrinchus*)

R/F-187 Hankin Hackett Dewees HSU
California's Dungeness Crab: Conserving the Resource and Increasing the Net Economic Value of the Fishery

R/F-184 Hedgecock BML/UCD
Quantifying and Minimizing Risk that Hatchery-Enhancement Will Reduce Genetic Diversity of White Seabass

R/F-88PD Hedrick Arkush UCD
Prevalence and Inactivation of Viral Hemorrhagic Septicemia Virus in Sardines

R/F-192 Lowe Kelley CSULB
Catch and Release of California Sheephead: Physiological and Behavioral Stress Effects and Post-Release Survivorship

RESEARCH PROJECTS & PRINCIPAL INVESTIGATORS, CONT'D

R/F-186 Marinovic Croll UCSC
Assessing the Impacts of Climate Change on the California Squid Fishery: An Integrated Ecosystem Approach

R/F-179 Wilen Botsford UCD
Spatial Management of Fisheries

New Marine Products Research & Development

R/MP-94 Butler UCSB
Molecular Approaches in Marine Pharmacology

R/MP-87 Faulkner UCSD
The Biomedical Potential of California Marine Organisms

R/MP-93 Lehrer Taylor Vaquier UCLA
Novel, Post-Translationally Modified Peptide Antibiotics from Solitary Tunicates ("Sea Squirts")

R/MP-92 Morse UCSB
New High-Performance Nanocomposite Materials from Marine Biomineralization: Biotechnological and Interdisciplinary Approach

R/MP-91 Shadwick Waite UCSD
Marine Natural Materials: Novel Biological Elastomers from Marine Invertebrates

Ocean Engineering

R/OE-37 Ashford UCSD
Mitigation of Coastal Bluff Instability in San Diego County, California

Marine Affairs

R/MA-41 Wilen Botsford UCD
Building Marine Policy Analysis Capabilities in California

Education

R/E-82PD Cloherty UCSD
An educational project to encourage high school students to learn more about ocean sciences through participation in the National Ocean Sciences Bowl.

R/E-87PD Dayton UCSD
WSN Student Symposium, "Historical Perspectives on Natural History and Ecology"

E/IF-4 Fenical UCSD
Sea Grant Industry Fellowship: Controlling Cancer with Marine Derived Angiogenesis Inhibitors

R/E-83PD McFarlane MBARI
National Ocean Sciences Bowl- Regional Competition - The Otter Bowl: An educational project to encourage high school students to learn more about ocean sciences through participation in the National Ocean Sciences Bowl.

E/G-2 Moll UC-SG
Sea Grant Trainees

E/UG-4 Moll UC-SG
John D. Isaacs Memorial Sea Grant Scholarship

E/G-9 Moll UC-SG
California Sea Grant State Fellowship Program

E/UG-6 Pearse Heffington UCSC
Assessing Sanctuary Shorelines: A Role for Volunteers, Particularly High School Students, in Resource Management

R/E-90PD Starr Crane MLML/SJSU
Promoting Ocean Science and Technology through Youth Education: Opportunities for Minorities at Camp SEA Lab

R/E-86PD Strand Campbell UCLA
Urban Youth and the Ocean

Workshop/Conference

W02-16PD Bates Restore America's Estuaries
2003 Inaugural National Conference on Coastal and Estuarine Habitat Restoration

WO2-17PD Chryssostomidis MIT
3rd International Conference on Marine Bioinvasions on March 16-19, 2003 at SIO.

W02-15PD Magoon
California and the World Ocean '02 (CWO '02)

W02-13PD McDermid UH
Workshop on the Taxonomy and Diversity of Economic Seaweeds in the Pacific Basin.

R/W-84PD Scheiber Kagan UCB
To assist in support of a two-part conference on ocean law and policy at UC Berkeley on April 5-7, 2002.

Aquatic Nuisance Species

A/EA-3 Cassell UCD
Aquatic Nuisance Species Research and Outreach: West Coast Ballast Outreach Project

R/CZ-179 Somero SU
Aquatic Nuisance Species Research and Outreach: Physiological Adaptation and Invasion Success: A Comparison of Native and Invasive Species of Bay Mussels (*Mytilus trossulus* and *M. galloprovincialis*) in the Central California Hybrid Zone

Environmental Marine Biotechnology

R/CZ-169 Conrad Gardner Chechowitz UCD
Environmental Marine Biotechnology: Molecular and Bioassay-based Investigation of Bivalves as Transmission Vectors of Protozoal Encephalitis in Southern Sea Otters

PATENTS FROM CALIFORNIA SEA GRANT RESEARCH 1998-2003

Jane C. Burns 5,969,211 Pantropic retroviral vectors for gene transfer in mollusks UC1996-211

Alison Butler 5,811,253 Use of Vanadium Bromoperoxidase as a Signal Generating Enzyme for Chemiluminescent Systems: Test Kits and Analytical Methods.

Alison Butler 2000-248-1 Cloning and Overexpression of Vanadium-Dependent Bromoperoxidase from Marine Algae (pending)

D. John Faulkner 6,300,371 Rameswaralide and Rameswaralide Derivatives SD2000-020

D. John Faulkner 5,591,740 Use of debromohymenialdisine for treating osteoarthritis UC1996-023

William Fenical 6,458,766 Halovir, an Antiviral Marine Natural Product, and Derivatives Thereof SD1998-056

William Fenical 6,066,635 Avrainvillamide, a Cytotoxic Marine Natural Product, and Derivatives Thereof SD1998-017

William H. Fenical 5,919,926 Salinamides UC1993-113

William H. Fenical Salinamides 5,688,783 UC1993-113

William H. Fenical 5,593,960 Cyclic heptapeptide anti-inflammatory agent UC1993-007

William H. Fenical 5,473,057 Eleutherobin and analogs thereof UC1995-090

William H. Fenical 5,444,043 Cyclic heptapeptide anti-inflammatory agent UC1993-007

Robert S. Jacobs 5,624,911 Ether derivatives of pseudopterosin UC1994-076

Alejandro Mayer 6,387,916 Anti-inflammatory uses of manzamines

Daniel Morse 9,856,599 Methods, Compositions and Biomimetic Catalysts for In Vitro Synthesis of Silica, Polysilsesquioxanes and Polymetallo-Oxanes (pending)

Daniel Morse 2000-265-2 Bifunctional Catalysts and Methods for Use for Synthesis of Impermeable and Semipermeable Coatings, Membranes, Sealants, Encapsulants, Insulators, Polymers and Materials of Glass, Silicones and Polymetallo-Oxanes at Low Temperature and Neutral pH (provisional)

Daniel Morse 2002-524 Structure-Directing Synthesis of Metal Oxides and Nitrides, Metalloid Oxides and Nitrides, Rare-Earth Oxides and Nitrides for Electronic and Other Applications (pending)

N.B. Margo Haygood patented bryostatin synthesis. However, the patent is in the name of CalBioMarine Technologies.

This is Eleutherobia, a soft-coral collected along the coast of Western Australia. This animal contains a very potent anticancer agent, eleutherobin, which mimics the properties of Taxol, one of the most widely-used anticancer drugs.
Photo W. Fenical

REPRINTS – JOURNAL ARTICLES, BOOK CHAPTERS, PROCEEDINGS 1998-2002

Aquaculture Research

Boulo, V., J.-P. Cadoret, H. Shike, C. Shimizu, A. Miyanohara, and J.C. Burns. 2000. Infection of cultured embryo cells of the Pacific oyster, *Crassostrea gigas*, by pantropic retroviral vectors. *Vitro Cell. Dev. Biol*. 36:395-399.

Chang, E.S. 2001. Crustacean hyperglycemic hormone family: Old paradigms and new perspectives. *Amer. Zool.* 41: 380-388.

Chang, E.S., S.A. Chang, B.S. Beltz, and E.A. Kravitz. 1999. Crustacean hyperglycemic hormone in the lobster nervous system: Localization and release from cells in the subesophageal ganglion and thoracic second roots. *J. Comp. Neurol.* 414:50-56.

Chang, E.S., S.A. Chang, R. Keller, P. Sreenivasula Reddy, M.J. Snyder, and J.L. Spees. 1999. Quantification of stress in lobsters: Crustacean hyperglycemic hormone, stress proteins, and gene expression. *Amer. Zool.* 39:487-495.

Chang, E.S., S.A. Chang, and E.P. Mulder. 2001. Hormones in the lives of crustaceans: An overview. *Amer. Zool*. 41:1090-1097.

Clegg, J.S., K.R. Uhlinger, S.A. Jackson, G.N. Cherr, E. Rifkin, and C.S. Friedman. 1998. Induced thermotolerance and the heat shock protein–70 family in the Pacific oyster *Crassostrea gigas*. *Mol. Mar. Biol. Biotechnol.* 7(1): 21-30.

Culver, C.S., and A.M. Kuris. 2000. The apparent eradication of a locally established introduced marine pest. *Biological Invasions* 2:245-253.

Finley, C.A., T.J. Mulligan, and C.S. Friedman. 2001. Life history of an exotic sabellid polychaete, *Terebrasabella heterouncinata*: Fertilization strategy and influence of temperature on reproduction. *J. Shellfish Res*. 20(2): 883-888.

Gisbert, E., G. Merino, J.B. Muguet, D. Bush, R.H. Piedrahita, and D.E. Conklin. 2002. Morphological development and allometric growth patterns in hatchery-reared California halibut larvae. *J. Fish Biol*. 61:1217-1229.

McBride, S.C. 1998. Current status of abalone aquaculture in the Californias. *J. Shellfish Res*. 17(3): 593-600.

McBride, S.C., J.M. Lawrence, A.L. Lawrence, and T.J. Mulligan. 1998. The effect of protein concentration in prepared feeds on growth, feeding rate, total organic absorption, and gross assimilation efficiency of the sea urchin *Strongylocentrotus franciscanus*. *J. Shellfish Res*. 17(5): 1567-1570.

McBride, S.C., J.M. Lawrence, A.L. Lawrence, and T.J. Mulligan. 1999. Ingestion, absorption, and gonad production of adult *Strongylocentrotus franciscanus* fed different rations of a prepared diet. *J. World Aqua. Soc*. 30(3): 364-370.

McBride, S.C., E. Rotem, D. Ben-Ezra, and M. Shpigel. 2001. Seasonal energetics of *Haliotis fulgens* (Philippi) and *Haliotis tuberculata* (L.). *J. Shellfish Res*. 20(2): 659-665.

McQuown, E.C., B.L. Sloss, R.J. Sheehan, J. Rodzen, G.J. Tranah, and B. May. 2000. Microsatellite analysis of genetic variation in sturgeon: New primer sequences for *Scaphirhynchus* and *Acipenser*. *Trans. Am. Fish. Soc*. 129: 1380-1388.

Moore, J.D., C.A. Finley, T.T. Robbins, and C.S. Friedman. 2002. Withering syndrome and restoration of southern California abalone populations. CalCOFI Rep. 43: 112-116.

Okazaki, R.K., W. Ye, N.J. Berthelemy-Okazaki, and E.S. Chang. 2001. Preliminary study of heat shock proteins in nemerteans. *Hydrobiologia* 456:211-219.

Peeke, H.V.S., G.S. Blank, M.H. Figler, and E.S. Chang. 2000. Effects of exogenous serotonin on a motor behavior and shelter competition in juvenile lobsters (*Homarus americanus*). *J. Comp. Physiol.* 186:575-582.

Rodzen, J.A., and B. May. 2002. Inheritance of microsatellite loci in the white sturgeon (*Acipenser transmontanus*). *Genome* 45:1064-1076.

Rossi, S., and M.J. Snyder. 2001. Competition for space among sessile marine invertebrates: Changes in HSP70 expression in two Pacific cnidarians. *Biol. Bull.* 201: 385-393.

Shike, H., C. Shimizu, K.S. Klimpel, and J.C. Burns. 2000. Expression of foreign genes in primary cultured cells of the blue shrimp *Penaeus stylirostris*. *Mar. Biol.* 137: 605-611.

Shimizu, C., H. Shike, K.R. Klimpel, and J.C. Burns. 2001. Hemolymph analysis and evaluation of newly formulated media for culture of shrimp cells (*Penaeus stylirostris*). *In Vitro Cell. Dev. Biol. – Animal* 37:322-329.

Snyder, M.J. 1998. Cytochrome P450 enzymes belonging to the CYP4 family from marine invertebrates. *Biochem. Biophys. Res. Commun*. 249: 187-190.

REPRINTS – JOURNAL ARTICLES, ETC. CONT'D

Snyder, M.J. 1998. Identification of a new cytochrome P450 family, CYP45, from the lobster, *Homarus americanus*, and expression following hormone and xenobiotic exposures. *Arch. Biochem. Biophys.* 358(2): 271-276.

Snyder, M.J. 2000. Cytochrome P450 enzymes in aquatic invertebrates: recent advances and future directions. *Aquat. Toxicol.* 48: 529-547.

Snyder, M.J., E. Girvetz, and E.P. Mulder. 2001. Induction of marine mollusc stress proteins by chemical or physical stress. *Arch. Environ. Contam. Toxicol.* 41:22-29.

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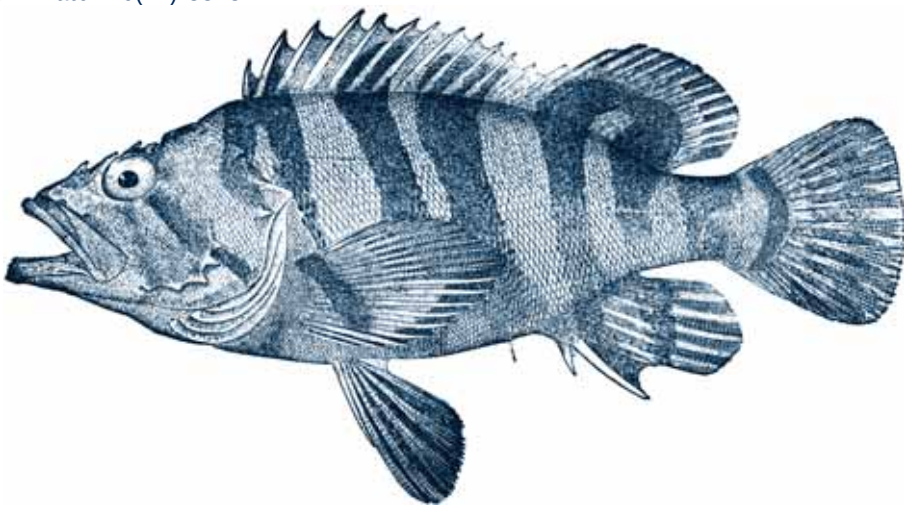

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Steglis vulsus (Jordan & Gilbert). Point Reyes, California

NUMBERS OF GRADUATE AND UNDERGRADUATE STUDENTS SUPPORTED 1998-2003

Students	Year 1 (98-99)	Year 2 (99-00)	Year 3 (00-01)	Year 4 (01-02)	Year 5 (02-03)	Total Students Total Dollars
Isaacs Scholars (Undergraduates)	4 $10,000	4 $10,000	4 $12,000	4 $12,000	4 $12,000	20 $56,000
Knauss Fellows (Post-graduates)	1 $36,000	1 $36,000	2 $76,000	2 $76,000	1 $38,000	7 $262,000
State Fellows (Post-graduates)	0	0	2 $34,200	2 $49,488	4 $98,976	8 $182,664
Trainees (Graduates)	36 $546,048	34 $541,416	31 $505,311	43 $713,940	37 $625,596	181 $2,932,311
SG-NMFS Fisheries Fellows (Graduates)	NC -	NC -	2 $63,334	1 $31,667	1 $31,667	4 $126,668
Industry Fellows (Graduates)	1 $30,000	2 $60,000	2 $60,000	NC	1 $30,000	6 $180,000
Total Students Total Dollars	42 $622,048	41 $647,416	43 $750,845	52 $883,095	48 $836,239	226 $3,739,643

NC= No Competition in that given year

CALIFORNIA SEA GRANT FELLOWS 1998 - 2003

Knauss Fellowships

1998 **Lani Watson** (UCSC), NOAA's Office of Policy
1999 **Ashley Simons** (Stanford), Bureau of Insular Affairs, Coral Reef Task Force
2000 **Nelia Forest** (UCB), U.S. EPA, Wetlands Div.
2000 **Lisa Wooninck** (UCSB), Office of Rep. Sam Farr
2001 **Alix Cotumaccio** (MIIS), Coastal Ocean Program Office
2001 **Kimberly Puglise** (MLML), Office of Rep. Bart Stupak
2002 **Johanna Polsenberg** (Stanford), Office of Rep. Sam Farr
2003 **Carrie McDougall** (UCSB), NOAA Office of the Under Secretary

CSG State Fellowships

2000 **David Hamm** (UCSD), Joint Committee on Fisheries & Aquaculture
2000 **Megan Johnson** (SDSU), CA Coastal Commission
2001 **Alina Baspayeva** (MIIS), CA Research Bureau
2001 **Rebecca Lameka** (MIIS), CA Ocean Resources Mgt. Program
2002 **Christine Blackburn** (UCSD), CA Ocean Resources Mgt. Program
2002 **Nick Haring** (CSUN), CA Coastal Commission
2002 **Edward Salinas** (UCD), CALFED/Resources Agency
2003 **Meriah Arias** (UCSD), CAL EPA

NSGO Industry Fellowships

1998 **Carie Kopay** (UC Santa Barbara), Smith Kline Beecham
1999 **Jennifer Carroll** (UC Santa Cruz), Galileo Labs., Inc.
1999 **Chris Stevenson** (UC Santa Barbara), Smith Kline Beecham
2002 **Eric Miller** (UC San Diego), Nereus Pharmaceuticals Inc.

NMFS-SG Joint Graduate Fellowship in Population Dynamics & Marine Resource Economics

2000 MRE: **Sylvia Brandt** (UC Berkeley), NE Fisheries Science Center
2000 MRE: **Ronald Felthoven** (UC Davis), SW Fisheries Science Center; AK Fisheries Science Center
2002 PD: **Yasmin Lucero** (UC Santa Cruz), SW Fisheries Science Center, Santa Cruz
2003 MRE: **James Hilger** (UC Berkeley), SW Fisheries Science Center, Santa Cruz

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Bemis, Debra Lynn. 1998. Fatty acid oxidation in isolated chloroplasts from the tropical marine chlorophyte, *Anadyomene stellata*. Ph.D. dissertation abstract, University of California, Santa Barbara.

Benumof, Benjamin T. 1999. The dynamics, kinematics, and geomorphic evolution of the San Diego, California coastline. Ph.D. dissertation abstract, University of California Santa Cruz.

Bowden Lehmann, V.K. 2002. Part I. Metabolites from the Pohnpei sponge *Stylissa massa*. Part II. Identification of illudin S as the sole antiviral compound in the fruiting bodies of *Omphalotus illudens*. Part III. Structure elucidation of oscellacidins A and B from a Homer Lake *Oscillatoria* Sp. Ph.D. dissertation abstract, University of Illinois at Urbana-Champaign.

Burton, Erica J. 1999. Radiometric age determination of the giant grenadier (*Albatrossia pectoralis*) using 210Pb: 226Ra disequilibria. M.S. thesis abstract, San Francisco State University.

Crooks, Jeffrey A. 1998. The effects of the introduced mussel, *Musculista senhousia*, and other anthropogenic agents on benthic ecosystems of Mission Bay, San Diego. Ph.D. dissertation abstract, University of California, San Diego.

Culberson, Steven D. 2001. The interaction of physical and biological determinants producing vegetation zonation in tidal marshes of the San Francisco Bay Estuary, California, USA. Ph.D. dissertation abstract, University of California, Davis.

Culver, Carrie S. 1999. The aperture of marine gastropods: Factors precluding settlement of fouling organisms. Ph.D. dissertation abstract, University of California, Santa Barbara.

Datuin, Jason P. 1999. Stress, glucocorticoids, IGF-I and the modulation of cartilage growth in the tilapia, *Oreochromis mossambicus*. M.S. thesis abstract, University of California, Berkeley.

Davidson, Seana K. 1999. Biology of the bryostatins in the marine bryozoan *Bugula neritina*: Symbiosis, cryptic speciation and chemical defense. Ph.D. dissertation abstract, University of California, San Diego.

Davis, Jana L.D. 2000. Temporal and spatial dynamics of a tidepool fish assemblage in San Diego, California. Ph.D. dissertation abstract, Scripps Institution of Oceanography, University of California, San Diego, La Jolla, California.

Garcia-Rossi, Dino. 1998. Consequences of the loss of herbivore resistance for invasive cordgrass *Spartina alterniflora*. M.S. thesis abstract, Sonoma State University.

Graham, Michael H. 2000. Planktonic patterns and processes in the giant kelp *Macrocystis pyrifera*. Ph.D. dissertation abstract, University of California, San Diego.

Hamm, David E. 1999. Genetic divergence among populations of black abalone, *Haliotis cracherodii* along the central California Coast. M.S. thesis abstract, University of California, San Diego.

Han, Deug-woo. 1998. Factors influencing in vitro production of estradiol by isolated oocytes in white sturgeon, *Acipenser transmontanus*. M.S. thesis, University of California, Davis.

Johnson, Megan R. 2000. Investigating functional equivalency: Quality and availability of food provided to benthic detritivores by the seagrasses *Ruppia maritima* and *Zostera marina*. M.S. thesis abstract, San Diego State University, San Diego, California.

MacPherson, Jennifer C. 1998. Studies on the mechanism of eicosanoid biosynthesis in the primative arthropod, *Limulus polyphemus*. Ph.D. dissertation abstract, University of California, Santa Barbara.

Mahoney, Melissa M. 2002. Age, growth, and radiometric age validation of the blackgill rockfish, *Sebastes melanostomus*. M.S. thesis abstract, San Francisco State University, San Fransicso, California.

Martello, Linda B. 1999. The combined effects of chemical and natural stressors on phosphagens and nonspecific immunity in two species of abalone. Ph.D. dissertation abstract, University of California, Santa Cruz.

McQuown, Eve. 2000. Inheritance of microsatellite loci and delineation of lake sturgeon (*Acipenser fulvescens*) population genetic structure. M.S. thesis abstract, University of California, Davis.

Miller, Todd W. 1999. Description of setal stages and estimation of their durations in female Dungeness crabs, *Cancer magister*. M.S. thesis abstract, Humboldt State University, Arcata, California.

DISSERTATION & THESIS ABSTRACTS, CONT'D

Mizutani, Takayuki. 2000. Indole-3-acetic acid and rooting of *Arundo donax*. M.S. thesis abstract, California State University, Long Beach.

Moberg, Philip E. 1998. Spatial and temporal genetic differentiation among populations of the red sea urchin, *Strongylocentrotus franciscanus*. M.S. thesis abstract, University of California, San Diego.

Ng, Kevin P. 1998. Effects of estrogens in vivo and in vitro on cartilage growth in a teleost fish, the tilapia, *Oreochromis mossambicus*. M.S. thesis abstract, University of California, Berkeley.

Oh, Shauna J. 2000. The sperm plug is a reliable indicator of mating success in female Dungeness crabs, *Cancer magister*. M.S. thesis abstract, Humboldt State University, Arcata, California.

Park, Richard. 1998. Regulation of serum insulin-like growth factor-binding proteins (IGFBPs) in various physiological conditions in tilapia, *Oreochromis mossambicus*. M.S. thesis abstract, University of California, Berkeley.

Peck, George W. 1999. Temporal variation in the growth, nitrogen partitioning, and critical nitrogen concentration of *Arundo donax L.* (Poaceae) in relation to herbicide effectiveness. M.S. thesis abstract, California State University, Long Beach.

Rodzen, Jeffrey A. 2001. Preservation of genetic variation within aquaculture stocks of white sturgeon (*Acipenser transmontanus*). Ph.D. dissertation abstract, University of California, Davis.

Schmidt, Eric W. 1999. Marine sponges and symbionts: Chemical and biological studies. Ph.D. dissertation abstract, Scripps Institution of Oceanography, University of California, San Diego.

Siegel, Stuart W. 2002. Slough channel network and marsh plain morphodynamics in a rapidly accreting tidal marsh restoration on diked, subsided baylands: San Francisco Estuary, California. Ph.D. dissertation abstract, University of California, Berkeley.

Smith, Martin D. 2001. Spatial behavior, marine reserves, and the northern California red sea urchin fishery. Ph.D. dissertation abstract, University of California, Davis.

Storms, Wendy E. 2000. Growth and domoic acid in two species of a toxic diatom. M.S. abstract, Scripps Institution of Oceanography, University of California, San Diego.

Talley, Drew M. 2000. The role of resident fishes in linking habitats of a southern California salt marsh. Ph.D. dissertation abstract, University of California, San Diego.

Toonen, Robert J. 2001. Genetic analysis of recruitment and dispersal patterns in the porcelain shore crab, *Petrolisthes cinctipes*. Ph.D. dissertation abstract, University of California, Davis.

Walker, Jerrylaine V. 1998. Investigations of the mechanism and reactivity of vanadium bromoperoxidase isolated from the marine brown alga *Ascophyllum nodosum*. Ph.D. dissertation abstract, University of California, Santa Barbara.

Webb, Molly Ann H. 1999. Ovarian steroidogenesis and environmental temperature effects during final ovarian maturation and ovulation of white sturgeon. Ph.D. dissertation abstract, University of California, Davis.

Zaremba, Charlotte M. 1998. Structure and reaction studies of biological organic and inorganic composite materials: Abalone shells, diatoms, and a unique birch bark. Ph.D. dissertation abstract, University of California, Santa Barbara.

Zaremba, Katherine. 2001. Hybridization and control of native-non native *spartina* complex in San Francisco Bay. M.S. thesis abstract, San Francisco State University, San Francisco, California.

Zhang, Guangping. 1999. Marinobactins and petrobactins: Two new sets of siderophores from marine bacteria. Ph.D. dissertation abstract, University of California, Santa Barbara.

The Common Shrimp (*Crangon vulgaris*) 1882

CALIFORNIA SEA GRANT TRAINEES – WHERE ARE THEY NOW?

California Sea Grant has financially supported hundreds of graduate students during the last 30 years. Here is a representative sampling and where they are now:

David Aubrey, Director, Coastal Research Center, Woods Hole Oceanographic Institute
Christine Blackburn, Office of Science & Technology, National Institutes of Health
Louis Botsford, Professor, Wildlife, Fish & Conservation Biology, University of California, Davis
Thomas Boyd, Microbiologist, U.S. Naval Research Laboratory
Denise Breitburg, Curator, Benedict Estuarine Research Center, Academy of Natural Sciences
William Brinkop, Red Top Aquafarms
Erica Burton, Research Specialist, Monterey Bay National Marine Sanctuary
Jim Carlberg, President, Kent SeaTech Corporation
Christopher Carr, Washburn, Briscoe & McCarthy
David Chapman, Woods Hole Oceanographic Institute
Jeffrey Crooks, Research Coordinator, Tijuana River National Estuarine Research Reserve
Carrie Culver, Research Biologist, Univ. of Calif., Santa Barbara
Christopher Dewees, Fisheries Specialist, Sea Grant Extension Program
John Dixon, Ecologist/Wetlands Coordinator, Calif. Coastal Commission
Falk Feddersen, Scripps Institution of Oceanography
William Fisher, Research Pathobiologist, U.S. Environmental Protection Agency
Peggy Fong, Assistant Professor, UCLA
J. Scott Foott, Fish Health Biologist, U.S. Fish & Wildlife Service
Elizabeth Fuchs, Coastal Program Manager, Calif. Coastal Commission
Phyllis Grifman, Associate Director, USC Sea Grant Program, Univ. of Southern California
Theodore Griswold, Procopio, Cory, Hargreaves & Savitch
Judith Hansen, Manager, Research & Development, Plant Sciences, Inc.
Bruce Harger, President, Neushul Mariculture, Inc.
Christopher Harrold, Director, Research & Conservation, Monterey Bay Aquarium
Thomas Herbers, Scripps Institution of Oceanography
Kevin Hill, Marine Biologist, California Department of Fish & Game
Anson Hines, Assistant Director, Smithsonian Environmental Research Center
Dale Holliday, Director of Research, BAE SYSTEMS
Todd Hopkins, Program Manager, San Francisco Bay National Estuarine Research Reserve
Scott Jenkins, Scripps Institution of Oceanography
Donald Kent, Executive Director, Hubbs-SeaWorld Research Institute
Aaron King, National Marine Protected Areas Center, Monterey Bay National Marine Sanctuary
Lisa Levin, Scripps Institution of Oceanography
Milton Love, Univ. of California, Santa Barbara
Christine McMichael, San Diego State Univ.
David Nees, National Institutes of Health
Michael Orbach, Director, Duke Univ. Marine Laboratory
Julie Packard, Executive Director, Monterey Bay Aquarium
Miriam Polne-Fuller, Univ. of California, Santa Barbara
Richard Reid, Director of Biochemical Research, Erik & Ese Banck Clinical Research Center
Michael Rice, Professor, University of Rhode Island
Jeff Rodzen, Calif. Department of Fish & Game
Laura Rogers-Bennett, Biologist, John Muir Institute, Bodega Bay Marine Lab
James Sanchirico, Resources for the Future, Washington, DC
Eric Schmidt, University of Utah, Medicinal Chemistry
Jongheon Shin, Korea Ocean Research & Development Institute
John Smikahl, Genentech, Inc.
Mark Snyder, Bodega Marine Laboratory
Theresa Stevens, Project Manager, U.S. Army Corps of Engineers
Steven Thomas, Hydraulic Engineer, National Marine Fisheries Service
Lani Watson, National Ocean Service, NOAA
Diana Watters, Calif. Department of Fish and Game
Amy Weinheimer, Scripps Institution of Oceanography
Richard Zimmer, Professor, UCLA

SPONSORSHIP OF EDUCATION & OUTREACH PROGRAMS 1998-2003

Education Programs	Audiences
"An Atlas of Ocean Productivity"	Community college instructors & K-12 teachers
"Assessing Sanctuary Shorelines: A Role for High School Students in Resource Management"	High school students & teachers
California COSEE (Center for Ocean Science Education Excellence)	K-12 students & teachers
Educational High Technology Symposium, "Tech Fair"	High school students
"Least Wanted Aquatic Invaders for Elkhorn Slough & the Monterey Bay Area" Guide	General public
Marine Bioproducts Engineering Center (MARBEC) Summer Undergraduate Research Fellowship Program (MSURF)	Undergraduates
Otter Bowl & Surf Bowl, National Ocean Science Bowl	High school students
Sea Lab Monterey Bay	Grades 5-8 students
"Translating Research into K-12 Education: Genuine Research Experience in Pre-College Students & Sharing with Classmates, Teachers, and Families"	K-12 students
"Urban Youth & the Ocean," UCLA Ocean Discovery Center & the Boys & Girls Clubs of Santa Monica	K-6 students
USC Summer Science Program for Junior High & High School Women	Junior high & high school female students
Youth Sportfishing	K-12 students

Photos from Camp Sea Lab Monterey Bay, June 2002. (Photo Jane De Lay)

RESEARCHER, STAFF AND PRODUCT AWARDS 1998–2003

NUMBER OF AWARDS: 66

Bandeh-Ahmadi, Ayeh, 1998 Isaacs Scholar, Robert L. Noland Leadership Award, California Institute of Technology.

Berger, Wolfgang, CSG researcher and Director, California Space Institute, SIO, Francis P. Shepard Medal of the Society of Sedimentary Geologists.

Braby, Caren, CSG trainee with George Somero at Stanford University, Hopkins Marine Station, Best Student Paper Award, Society of Integrative and Comparative Biology Conference.

California Sea Grant, Bight Bulletin (Boletín de la Cuenca), bilingual CSG newsletter, APEX 2002 Award of Excellence.

California Sea Grant, Certificate of Appreciation from Congressman Randy Cunningham for support of the annual "Tech Fair" for high school students.

California Sea Grant - Communications, Bernays Merit Award, Public Relations Society of America, for CSG Newsletter, 2000.

California Sea Grant - Communications, Bernays Merit Award, Public Relations Society of America, for CSG Strategic Plan, 2000.

California Sea Grant - Extension, Special Recognition Award of Merit from NOAA for education programs presented at the National Ocean Summit, June 1998.

California Sea Grant, Project Profiles, 2002 National Assn. of Govt. Communicators Blue Pencil First Place Award for Most Improved Publication.

Carter, Jayme, CSG trainee with Alison Butler at UC Santa Barbara, Second Place poster award, California and the World Ocean 2002 Sea Grant Graduate Researcher Symposium.

Cassell, Jodi, CSG Marine Advisor, First Place, posters, flyers and t-shirts category, 2001 National Assn. of Govt. Communicators, for West Coast Ballast Water Outreach Project poster.

Checkley, David, CSG researcher at SIO, Tech Awards 2002 Laureate for CSG research, Technical Museum, San Jose.

Craig, Matthew, CSG trainee with Philip Hastings of SIO, Best Student Paper award, American Institute of Fishery Research Biologists.

Davidson, Seana, CSG trainee with Margo Haygood of SIO, Western Society of Naturalists Award for excellent student presentation.

Dayton, Paul, the late Mia J. Tegner, Peter B. Edwards, and Kristin L. Riser, CSG researchers at SIO, William S. Cooper Ecology Award.

Dayton, Paul, 2002 Scientific Diving Lifetime Achievement Award, American Academy of Underwater Sciences.

Dayton, Paul, 2003 Faculty Research Lecturer awards, Academic Senate, UCSD.

Dewees, Christopher M., CSG Extension Marine Fisheries Specialist, California Sate Legislature Assembly Resolution 1974 for exemplary public service, June 2001.

Eufemia, Nancy, CSG trainee with David Epel, Stanford University, Cousteau-Zodiac Award for graduate research accomplishments.

The late **D. John Faulkner,** CSG researcher at SIO, Paul J. Scheuer Award in Marine Natural Products for Outstanding Contributions to the Field.

Fingerut, Jonathan, CSG trainee with Richard Zimmer of UCLA, Third Place oral presentation award, California and the World Ocean 2002 Sea Grant Graduate Researcher Symposium.

Flowers, Jonathan, CSG trainee with Ronald Burton of SIO, two-year fellowship, UC Marine Council, Coastal Environmental Quality Initiative, to continue CSG work on red sea urchins.

Hankin, David G., CSG researcher, Humboldt State University's 1998 Scholar of the Year.

Johnson, Christina S., CSG science writer, Award of Distinction, International Communicator Awards 2002, Print Media Division for Writing/Feature Story.

Johnson, Christina S., CSG science writer, Award of Distinction, International Communicator Awards 2003, for web article.

Johnson, Leigh T., CSG Marine Advisor, Master of Science degree from UC Davis, Ecology (Environmental Policy Analysis specialty), 2002.

Kerr, Lisa, CSG trainee with Greg Cailliet at Moss Landing Marine Laboratories, Second Place for oral presentations, California and the World Ocean 2002 Sea Grant Graduate Researcher Symposium.

Levin, Lisa, CSG researcher at SIO, nominated for the PEW Conservation Fellowship.

Levin, Lisa, UC San Diego Chancellor's Associates Award for Excellence in Research.

May, Bernie, CSG researcher and Director, Genomic Variation Laboratory, Dept. of Animal Science, UC Davis, 2001 Outstanding Mentor Award, Consortium for Women and Research Advisory Board.

McArdle, Deborah, Channel Islands Marine Reserve Working Group Recognition Award, 2002.

McArdle, Deborah, History of Marine Animal Populations Scholarship, University of Rhode Island, 2002.

STAFF AND PRODUCT AWARDS CONT'D

McBride, Susan, CSG Marine Advisor, 1998 Certificate of Appreciation, Red Bluff Union High School for Job Shadowing Program.

McBride, Susan, 2001 Humboldt County Fair Contributor Award, Redwood Coast Tsunami Workgroup.

McBride, Susan, 2002 Certificate of Appreciation, Humboldt County Board of Supervisors for contributions to Earthquake and Tsunami Mitigation Activities.

McBride, Susan, Certificate of Appreciation, UC, 2002.

McBride, Susan, 2003 Certificate of Appreciation, Arcata High School, for Job Shadowing Program.

McWilliams, Jim, CSG researcher at UCLA, elected a member, National Academy of Sciences, 2002.

Pearse, John, CSG researcher at UC Santa Cruz, Monterey Bay National Marine Sanctuary Recognition Award for Education, 2003.

Piedrahita, Raul H., CSG researcher at UC Davis, Outstanding Paper Award, Aquacultural Engineering Society.

Polne-Fuller, Miriam, CSG researcher and Director, Research Mentorship Program, Dept. of Summer Sessions, UC Santa Barbara, Alumni Association Excellence in Teaching Award.

Price, Robert J., retired CSG Seafood Specialist, and the National Seafood HACCP Alliance, 1999 U.S. Secretary of Agriculture's Group Honor Award for Public Service for seafood safety.

Price, Robert J., Outstanding Leadership Award, U.S. Dept. of Agriculture, Cooperative State Research, Education, and Extension Service, 1999.

Price, Robert J., National Fisheries Institute FINesse Award for Seafood Health, Nutrition Research and Food Safety, 2002.

Rapoport, Scott, CSG trainee with Robert Shadwick at SIO, won First Place in the oral presentation category at the California and the World Ocean 2002, Sea Grant Graduate Researcher Symposium held in Santa Barbara.

Rau, Greg, CSG researcher at the Institute of Marine Sciences, UC Santa Cruz, nominated a Fellow of the American Association for the Advancement of Science.

Scheiber, Harry N., CSG researcher at Boalt Hall School of Law, UC Berkeley, Honorary Fellow of the American Society for Legal History, 1999.

Singleton, E. Robert, UC ANR broadcast specialist, Award of Distinction, Audio Competition, 2002 Communicator Awards, for CSG radio science feature.

Smith, Martin, CSG trainee with James Wilen at UC Davis, American Agricultural Economics Association Essay Contest and Best Student Paper awards.

Starr, Richard S., CSG marine advisor, one of six scientists selected to explore the depths of the Monterey Bay National Marine Sanctuary in a one-person submersible as part of the Sustainable Seas Expedition.

Starr, Richard S., 1998 Monterey Bay National Marine Sanctuary Program Award.

Starr, Richard S., 1998 Most Creative Research Poster Award, Monterey Bay Regional Research Symposium.

Stevenson, Christopher, CSG Industry Fellow, Young Investigator Award, International Association of Inflammation Society, 2001.

Talley, Drew, CSG trainee with Lisa Levin at SIO, Visiting Scientist's Award, National Institute of Water and Atmospheric Research, New Zealand.

Tom, Pamela, CSG Seafood Extension Program Manager at UC Davis, named a Fellow of the Institute of Food Technologists (IFT).

Tom, Pamela, National Fisheries Institute FINesse Award for Seafood Health, Nutrition Research and Food Safety, 2002.

Vega, Rebecca, CSG trainee with David Epel of Stanford University, Third Place poster award, California and the World Ocean 2002 Sea Grant Graduate Researcher Symposium.

Waldvogel, Jim, CSG Marine Advisor, 1998 American Fisheries Society, Humboldt Chapter Education Award.

Waldvogel, Jim, Smith River Streamkeeper Award, 2003.

Weaver, James, CSG trainee with Daniel Morse at UC Santa Barbara, First Place for posters, California and the World Ocean 2002 Sea Grant Graduate Researcher Symposium.

Whitehead, Kenia, 1992 Isaacs Scholar, Harold C. Bold Award, Phycological Society of America for innovative pre-doctoral research.

Wilen, James, CSG researcher at UC Davis, Distinguished Fellow of the American Agricultural and Economics Association-their highest award.

Wilen, James, co-author on winning paper, 21st Century Essay Contest, American Agricultural and Economics Association.

Wolfe, Michelle, 1989 Isaacs Scholar, Society of Teachers of Family Medicine Award.

Wright, Richard, CSG researcher at San Diego State University, elected to Phi Kappa Phi National Honor Society, 1998.

Wright, Richard, California Geographic Information Association Award for outstanding contributions to geographic education and partnerships.

OUTREACH PUBLICATIONS & PRODUCTS 1998-2003

Books/Booklets

Benavides, G., D. Renoud, and K. Wasson. 2002. Least Wanted Aquatic Invaders for Elkhorn Slough and the Monterey Bay Area. Elkhorn Slough National Estuarine Research Reserve, Watsonville, California. 28 pp.

Johnson, L.T., and J.A. Miller. 2002. What You Need to Know About Nontoxic Antifouling Strategies for Boats. California Sea Grant College Program. 9 pp.

Leet, W.S. C.M. Dewees, R. Klingbeil and E.J. Larson, Editors. 2001. California's Living Marine Resources: A Status Report. Sacramento: California Department of Fish and Game. ANR Publication SG01-11. 592p.

McArdle, D.A., ed. 2002. California Marine Protected Areas Past and Present. CSGCP, 23 pp.

McArdle, D.A., S. Hastings, and J. Ugoretz. 2002. California Marine Protected Area Update. CSGCP, 4 pp.

Starr, R.M., K.A. Johnson, E.A. Laman, and G. M. Cailliet. 1998. Fishery Resources of the Monterey Bay National Marine Sanctuary. CSGCP, 102 pp.

Starr, R.M., J.M. Cope, and L.A. Kerr. 2002. Trends in Fisheries and Fishery Resources: Associated With the Monterey Bay National Marine Sanctuary From 1981-2000. CSGCP, 156 pp.

Wilder, R.J. 1998. Listening to the sea. Pitt Series in Policy and Institutional Studies. University of Pittsburgh Press.

Educational Workshop Proceedings

Hodgson, G., and L. Maun, eds. 2001. Proceedings, Workshop on Educating California Coastal and Ocean Managers, September 28, 2001, Institute of the Environment, University of California, Los Angeles. 60 pp.

Ingmanson, D., comp. 1998. Wetlands Restoration Workshops for Teachers Workbook. Coastal Wetlands Restoration Workshop, June 22-26, 1998, San Diego State University, San Diego, California.

SeaCamp Monterey Bay Working Group. 1998. Final Report of a workshop to investigate the development of a SeaCamp in the Monterey Bay Region.

One-Page K-12 Educational Documents

Underwater Expedition / NOAA Education Web Site Ready for Schools. (1999)

NOAA Education Web Sites Ready for Schools. (2000)

Ocean Science Education On-Line. (2000)

Underwater Expedition: Rick Starr in Sea of Cortez. (2000)

Videos

S.E.A. Lab Monterey Bay: An Ocean of Knowledge. S.E.A. Lab Monterey Bay promotional video. (2000)

Our Playground…Their World, produced by M. Yamaguchi and C. Katsumata. Santa Monica Bay Restoration Project Foundation in partnership with California Sea Grant, et al. (2001)

Historical Fishing of Morro Bay, California, McArdle, D., Rebuck, S. and M. Hunter. Includes 20 (1-2 hour) oral history videos of the oldest commercial fishermen in Morro Bay. Social, ecological and economic topics included. (2003)

Posters

Make Every Day A Clean Boating Day: Here's What You Can Do!, L.T. Johnson, Sea Grant Extension Program. (1998)

Stop Ballast Water Invasions, J. Cassell and K. Hart, West Coast Ballast Outreach Project, Sea Grant Extension Program. (2000)

Program Exhibit/Promotional Items

Six panel table-top display; includes research, education, publication, and Extension panels.

California Sea Grant banner.

Promotional pens and notepads with program Web site.

Mouse Pads.

Bookmarks.

Brochures

California Ocean Agenda: Research 1998-99. California Sea Grant. (1998)

Help Keep California Zebra Mussel-Free. J. Cassell. Sea Grant Extension Program in cooperation with other agencies. (1998)

Stop Ballast Water Invasions. J. Cassell and K. Hart. West Coast Ballast Outreach Project, Sea Grant Extension Program, and the San Francisco Estuary Program. (2000)

Marine Ecological Reserves Research Program: Research Results from MRPA Coastal Ecological Reserves. Announcement for CalCOFI Conference 2001, Scripps Institution of Oceanography. California Sea Grant. (2001)

California Sea Grant: Science Serving California's Coast. Promotional brochure. California Sea Grant. (2002)

OUTREACH PUBLICATIONS & PRODUCTS, CONT'D

News Releases

1998

Fazio Announces Isaacs Scholarship Winner from Sacramento. From the office of Congressman Vic Fazio.

Monterey Bay Sea Camp Proposed – First in a National Science Education Effort. National Media Relations, National Sea Grant College Program.

Stanford Scientists to Study Pacific Bluefin Tuna.

$10,000 Scholarship Competition for California High School Seniors.

1999

John D. Isaacs Scholarship Winner Announced.

$12,000 Scholarship Competition for California High School Seniors. Public service announcement for radio and TV; news release for print media.

Two California Graduate Students are Awarded Federal Fellowships.

UC Berkeley Graduate Student Awarded Marine Policy Fellowship.

2000

Governor's Budget Includes Major Funding Increase for Ocean and Coastal Research Program.

John D. Isaacs Scholarship Winner Announced.

University of California Names Director of California Sea Grant Program.

2001

John D. Isaacs Memorial Scholarship Winner Announced.

Commercial Fishermen Encouraged to Apply for Low-Interest Loans for Improving Fuel Efficiency of Their Vessels.

Food Safety Education Month.

Chinese Mitten Crabs Appear Free of Lung Flukes.

2002

California Sea Grant State Fellows Awarded.

CALFED Science Fellows Program: A New Opportunity for Doctoral and Postdoctoral Students in the Environmental Sciences.

Scientists Examine Status of California's Marine Resources in New Book. (California's Living Marine Resources, Dewees)

California Sea Grant Awarded $3.86 Million Federal Grant for Marine Research, Education and Outreach.

2002 John D. Isaacs Memorial Scholarship Winner Announced.

New Regional Newsletter Wins APEX 2002 Award.

Marine Ecological Reserves Research Program – Results Now Available on CD-ROM.

Newsletters

SEA GRANT IN BRIEF

- January, March, May, and October (1998)
- January, April, and November-December (1999)
- July-August and October-November (2001)
- March-April, May-June, July-August, and November-December (2002)

SEA GRANT NEWS

- February-March, May-June, and July-August (2000)

BIGHT BULLETIN / BOLETIN DE LA CUENCA (ENGLISH-SPANISH BILINGUAL)

- No. 1, April; No. 2, July; and No. 3 Winter (2001)
- No. 4, Spring/Summer (2002)

BALLAST EXCHANGE (WEST COAST BALLAST OUTREACH PROJECT)

- Vol. 1, Fall (1999)
- Vol. 2, Spring and Volume 3, Fall (2000)
- Vol. 4, Spring/Summer (2002)

Fellowship/Scholarship Announcements

Knauss Marine Policy Fellowship. (1998, 1999 & 2000)

California Sea Grant State Fellow Program. (1998, 1999 & 2000)

Graduate Fellowship Opportunities in Marine Policy: State and Knauss Fellowships. (2001 & 2002)

Sea Grant Industrial Fellows Program. (1998, 1999 & 2001)

Coastal Management Fellowship. (1998 & 1999)

National Sea Grant – National Marine Fisheries Service Joint Graduate Fellowship Program in Population Dynamics and Marine Resource Economics. (1999, 2001 & 2002)

CalFed Science Fellows Program: 2002 Request for Applicants. (2002)

John D. Isaacs Scholarship. (1998, 1999, 2000, 2001 & 2002)

OUTREACH PUBLICATIONS & PRODUCTS, CONT'D

Publication Announcements

Fishery Resources of the Monterey Bay National Marine Sancturary. (1998)

Taxonomy of Economic Seaweeds, Volume 7. (1999)

What You Need to Know About Nontoxic Antifouling Strategies for Boats. (2002)

California's Living Marine Resources: A Status Report. (2002)

California Marine Protected Areas Past and Present. (2002)

California Marine Protected Area Update. (2002)

Marine Ecological Reserves Research Progrram on CD-ROM. (2002)

Trends in Fisheries and Fishery Resources. (2002)

Taxonomy of Economic Seaweeds, Volume 8. (2002)

Publication Lists

Publcations Update: October 1998.

Publications Update: October 1999.

Publications Update: October 2000.

Publications Update: November 2001.

Publications Update: May 2002.

Web Publications

Gear, M. 1999. Aquatic Nuisance Species. Oceanographic and Atmospheric Research, NOAA, Web page In the Spotlight, National Sea Grant Program. http://www.oar.noaa.gov/nsgo.

Johnson, C.
http://www-csgc.ucsd.edu/STORIES/ResearchStoryIndx.html
2001. Coastal Erosion.
2001. Commercial Fishermen Encouraged to Apply for Low-Interest Loans for Improving Fuel Efficiency of Their Vessels.
2001. Killer Algae Found: *Caulerpa taxifolia*.
2001. New Take on Measuring Water Quality: Viral Loads.
2002. First Known Sightings of "Withering" Abalone Bacteria in Northern California.
2002. Frontiers in Squid Reproduction: Prospecting for New Antibiotics.
2002. Meet Sea Grant's Seafood Technology Specialist Dr. Robert Price.
2003. Does Beach Grooming Harm Grunion Eggs?

Ratcliffe, G. http://www-csgc.ucsd.edu/STORIES/ResearchStoryIndx.html 2002. "Who is Rick Starr?"

Yasuda, M., and W. Berger. 2001. Earthguide Web site.
http://earthguide.ucsd.edu/demo/seagrant/
http://earthguide.ucsd.edu/diatom/d1.html
http://earthguide.ucsd.edu/earthguide/diagrams/levitus/

Web Publications – Sea Grant Extension

Price, R.J. http://www-seafood.ucdavis.edu
1998. Oysters, Raw.
1999. Spreadsheet for Calculating the Amount of Wet Ice Needed for Commercial Fishing.

Price, R.J., and K. Hildebrand. http://www-seafood.ucdavis.edu
1998. Model Sanitation Standard Operating Procedure.

Price, R.J, and P.D. Tom. http://www-seafood.ucdavis.edu
1999. Training Resources: Food Safety, HACCP and Sanitation.
1999. Vessel Retail Guide for Northern California Fishermen.
2002. Crabmeat, Pasteurized Blue.
2002. Daily Sanitation Control Record.
2002. Generic Import Product Specification.
2002. Monthly Sanitation Control Record.
2002. Oysters, Raw. (Rev.)
2002. Periodic Sanitation Control Record.
2002. Salmon, Vacuum Packed Hot Smoked.
2002. Shrimp, Dried. (Rev.)

Tom, P.D. http://www-seafood.ucdavis.edu
1998. California Sea Grant Extension Program.
2000. Sources of Information on Preparing HACCP Forms. (Compiler)

Sea Grant Extension Print Publications

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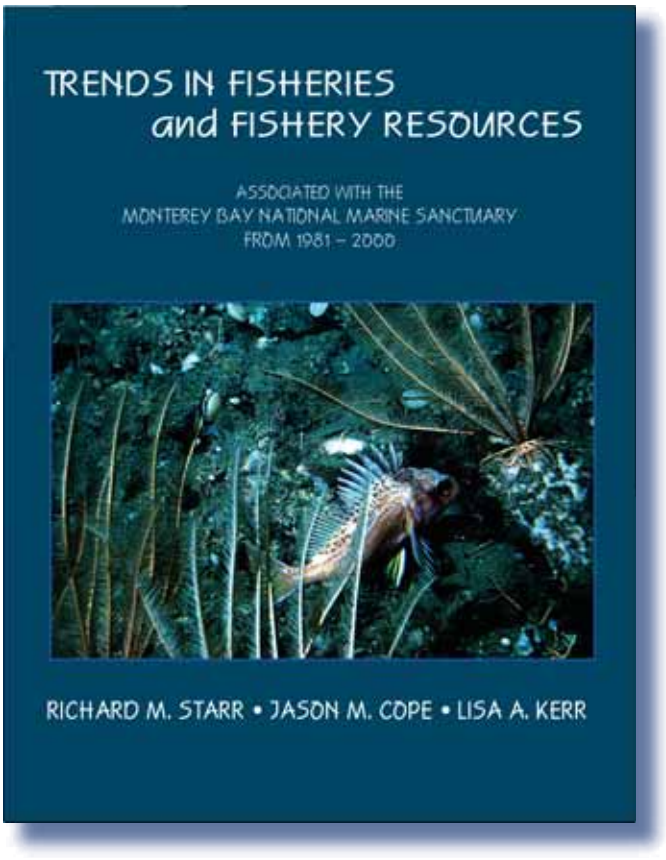


CALIFORNIA SEA GRANT PROJECT PROFILE INDEX – 2002

A series of one-page summaries of funded research, education and extension projects, and are available on our website.

Aquaculture

Chang R/A-111, 1999–2002, Accelerating Growth Rates in Shellfish with Bovine Growth Hormone

May R/A-109, 1998–2001 Developing a Breeding Plan for Farm-Raised Sturgeon

Aquatic Nuisance Species

Kuris R/CZ-162, 1999–2001, An Investigation of a Biological Control Agent for the Green Crab

Levin R/CZ-150,1998–2000, Alteration of Wetland Habitat by Two Exotic Invertebrates

Wijte R/CZ-151, 1998–2001 & **R/CZ-163**, 1999–2002 Combating *Arundo Donax* and Other Nuisance Grasses

Coastal Ocean

Brunk R/CZ-153, 1998–2000 & **R/CZ-167**, 2000–2002 Developing New Techniques for Evaluating Human Fecal Water Contamination

Dayton R/CZ-141, 1998–2000, Determining the Processes that Control Kelp Spore Abundance

Griggs R/CZ-157, 1998–1999, Coastal Cliff Erosion in San Diego County

Guza R/CZ-166, 2000-2003, Surf-Zone Drifters: A New Tool for Observing Nearshore Circulation

Hering R/CZ-146, 1998–2000, A Better Method for Evaluating Heavy Metal Water Pollution

Jiang R/C-46PD, 1999–2000, Detection of Human Viruses in Coastal Waters of Southern California

Silver R/CZ-145,1998–2000, Understanding Domoic Acid and Toxic Diatom Blooms

Smith R/CZ-144, 1998–2000, Domoic Acid in Marine Diatoms: Biochemical Pathways and Environmental Regulation

Stacey R/CZ-170, 2001–2004, Monitoring the Fluxes of Salinity, Pollution and Phytoplankton into the San Francisco Bay

Stolzenbach & McWilliams R/CZ-171, 2001–2004, Modeling Water and Sediment Quality in Two California Bays

Tjeerdema R/CZ-142, 1998–2001, Sublethal Toxic Effects of Water Pollution on Red Abalone

Venkatesan R/CZ-175, 2001–2003, Fate and Transport of Planar and Mono-Ortho Polychlorinated Biphenyls and Polychlorinated Napthalenes in Southern California Sediments

Wright R/CZ-136, 1997–1999, Predicting Flows in Semi-Arid Watersheds Using GIS Technologies

Zimmer R/CZ-152, 1998–2001, Finding the Chemical Signals that Induce Marine Larvae to Settle to the Sea Floor

Education

Berger E/G-12PD, 1998-2000, Innovative Tools for Educators: An Interactive Online Atlas of Ocean Productivity

Pearse E/UG-5PD, 2000–2001, Assessing Sanctuary Shorelines: A Role for High School Students in Resource Management

Polne-Fuller R/E-54PD, 1998–2000, Encouraging Learning Through an Exploration of the Sea

Strand R/E-71PD, 2001, Supporting an Educational Marine Science Camp for Urban Youth

Fisheries

Burton R/F-170, 1997–1999, Recruitment Patterns in Red Sea Urchins: A Population Genetics Approach

Cailliet R/F-174, 1998–1999, Validating Age Estimates for Bocaccio Rockfish with Radiometric Dating

Friedman R/F-43PD, 1998–2000, First Known Sightings of the Withering Syndrome Bacterium, Discovered North of San Francisco

Greene & Kvitek R/F-181, 2000–2001, Characterizing Fisheries Habitat Along the California Continental Margin

Wilen & Botsford R/F-179, 2001-2003, Spatial management of Fishes

New Marine Products

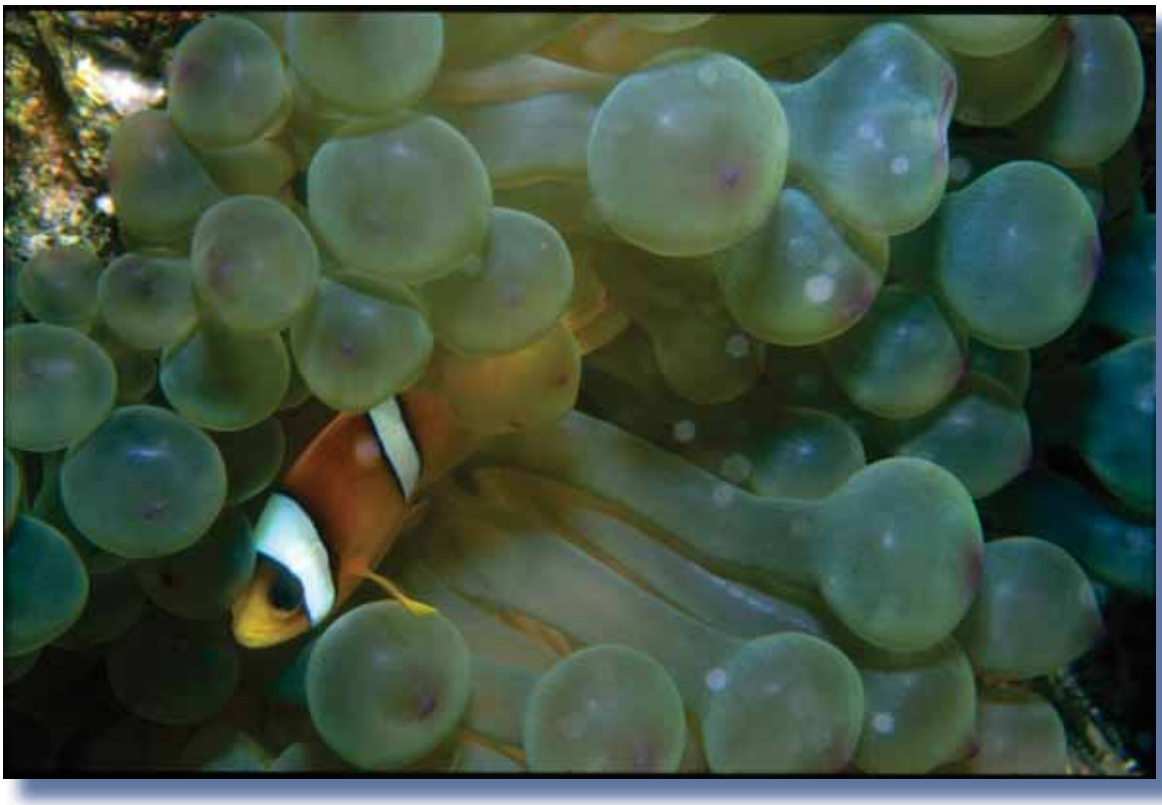
Epel R/MP-79,1998–2001 & **R/MP-89**, 2000–2002, Frontiers in Squid Reproduction: Prospecting for New Antibiotics

Mayer R/MP-73, 1995–2000, Neuroinflammation, Finding A Marine Natural Product that Targets Microglia in Brain

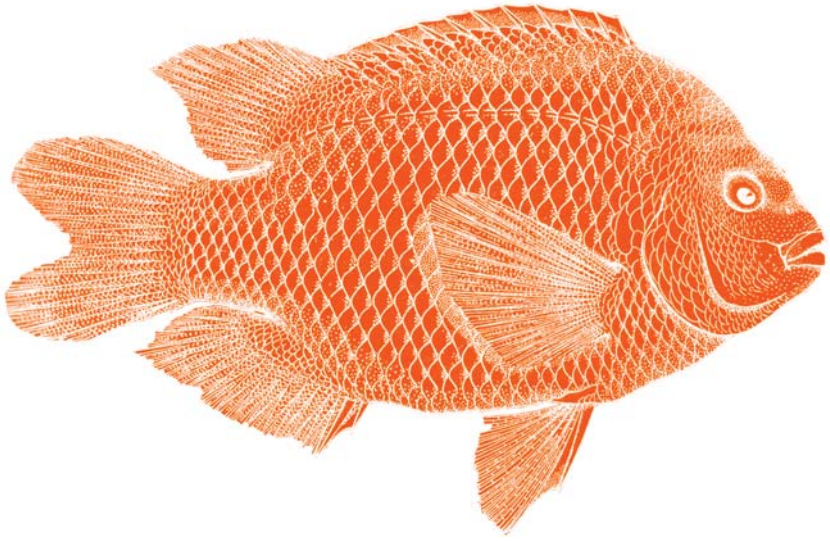
Haygood R/MP-84, 1999-2000, Searching for New Anti-Cancer Drugs: Biosynthesis of Bacteria-Produced Bryostatins

Ocean Engineering

Sobey R/OE-36, 1998–2001, Wave-Climate Risk Analysis: Predicting the Size, Frequency and Duration of Large Wave Events



"The sea is full of treasures which she gives out of her ample bosom to the inhabitants of her shores. With fishing lines, nets, drags, and numberless implements, the denizens of the ocean world are secured. No laws are made to regulate the pillage, and a source of great wealth is permitted to be abused."
THE WORLD OF THE SEA – 1882 (Photo C. Solomon)



Garibaldi *Hysypops rubicunda* (Girard). La Jolla, San Diego, California