COAST2013
ANNUAL REPORT

Covering Activities from
July 1, 2012 to June 30, 2013

www.calstate.edu/coast

CSU The California State University
COUNCIL ON OCEAN AFFAIRS, SCIENCE & TECHNOLOGY

Our Mission

To provide vision, leadership, and support throughout the CSU system for education, policy and research related to California's marine, estuarine, and coastal regions, and to promote the public dissemination of knowledge gained to foster stewardship and sustainable use of California's coast.

Our Vision

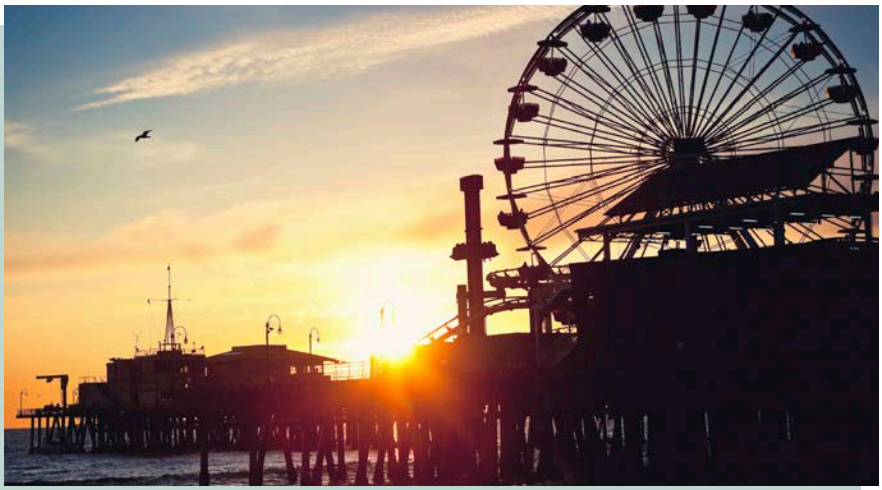
COAST will be a leader in coastal and marine-related research and education throughout California, and will promote environmental literacy leading to a significant increase in public awareness and stewardship of our coastal and marine resources.

The Value of a Healthy Coast and Ocean

A healthy coast and ocean are the keys to a healthy economy. The ocean economy is made up of activities that indirectly or directly use the ocean, such as ship and boat building, extraction of natural resources, tourism and recreation, and transportation. In California, the direct, indirect, and induced revenue from these sectors totaled **over $85 million** in 2010.

The *coastal economy* however, includes all activity that takes place in the coastal areas, and is two orders of magnitude larger than the ocean economy. It includes the ocean economy as well as other sectors such as financial activities, education and health services, and professional and business services. These sectors support the large population that chooses to live along and visit the coast for the climate, lifestyle and aesthetics. In 2010, California's coastal economy was valued at **$1.6 trillion** and accounted for 86% of the state's total economic activity. Thus, it is critical for California's future success that we maintain a healthy coastal environment.

As the umbrella organization for marine and coastal related activities within the California State University (CSU), the Council on Ocean Affairs, Science and Technology (COAST) supports marine and coastal research and education throughout the CSU and the state. We are dedicated to advancing our knowledge of California's natural coastal and marine resources and the processes that affect them. To accomplish this, we integrate system-wide resources, promote interdisciplinary multi-campus collaborations, and invest in CSU faculty members and their students. We also promote the dissemination of scientific information to decision makers and the public for the development of responsible policy statewide. This allows legislators, policy makers and resource managers to protect our coastal resources and safeguard their sustainable use for future generations, thus ensuring the economic well being of California and the nation.



Santa Monica Pier at sunset.

Currently, COAST is funded entirely by the CSU through generous contributions from the Chancellor's Office and each of the 23 campuses. All of our activities and resources are directed to support faculty and student research and develop new opportunities for our members. In 2012-13 we:

- Leveraged $126,259 in external funding, an amount equal to 19% of our total base budget;
- Supported 16 faculty members at 10 different campuses;
- Supported 81 individual students at 14 different campuses;
- Expanded the Summer Student Internship Program;
- Hosted the California Ocean Day 2013 Luncheon in Sacramento;
- Engaged state and national stakeholders;
- Expanded our membership.

Visit us online at
www.calstate.edu/coast
to learn more and to become a part of COAST!

COAST 2012-13 REVENUE AND EXPENDITURES

REVENUE		
Chancellor's Office	$500,000	
Campus Contributions	$163,000	
Rollover from 2011-12	$2,000	
TOTAL	**$665,000**	
EXPENDITURES		
	Amount	**% of total**
Student Support	$169,000	25%
Faculty Research Incentives	$129,370	19%
Network Development	$25,000	4%
Outreach and Communications	$12,200	2%
Annual Meeting	$15,000	2%
Personnel	$256,157	39%
Administrative Expenses	$20,708	3%
Indirect Costs	$37,278	6%
TOTAL	**$664,713**	**100%**
EXTERNAL FUNDING LEVERAGED	**$126,259**	**19%**

Increasing Extramural Grant Activity and Scholarship

COAST Faculty Research Incentive Program

COAST Funds Invested	**$375,612**
Extramural Funds Requested	**$19.1 M**
Extramural Funds Secured	**$3.62 M**
Return On Investment	**9.6:1**

INTERNAL COAST SUPPORT FOR FACULTY

COAST has developed several programs to assist faculty members in securing extramural funding and publishing the results of their research in peer-reviewed scientific journals.

- The **Faculty Research Incentive Program (FRIP)** was established in 2009 and provides assigned time funding awards to CSU tenured/tenure-track faculty members to develop and submit full proposals to external funding agencies and organizations for marine and coastal research and educational projects. Now in its fifth year, FRIP has demonstrated significant success and generated a positive return on investment. To date, CSU faculty members have requested over $19 M in extramural funding and secured $3.62 M.

  Recently, the National Science Foundation (NSF) awarded $649,625 to Dr. Mamta Rawat at CSU Fresno for her proposal *RUI: Thiols in Cyanobacteria*, bringing the total return on investment for this program to 9.6:1. Dr. Rawat received a COAST FRIP award for proposal development in Fall 2010. She submitted her full proposal to NSF for consideration in May 2012 and the NSF award was officially made in May 2013, illustrating the long time horizon for this program. Please see page 8 for more detail on Dr. Rawat's groundbreaking research.

  In AY 2012-13 FRIP provided $54,370 in assigned time funding to nine faculty members at six campuses (Appendix A).

- The **Collaborative Resource Sharing Program (CRSP)**, started in 2010, was designed to foster intercampus collaboration and technology transfer by promoting resource sharing across the CSU. The program allowed a PI from one CSU campus to obtain funding for highly specialized analyses, services, or use of unique equipment provided by a different CSU campus. Awards facilitated the generation of either preliminary data sets leading to the submission of full proposals to external funding agencies and organizations or the completion of ongoing research projects and subsequent submission of manuscripts for publication in peer-reviewed scientific journals.

  In AY 2012-13 CRSP provided $59,500 to support six projects comprising 12 faculty members at 10 different campuses (Appendix B).

- The **Grant Development Program (GDP)**, initiated in 2013, replaces CRSP with broader-use seed funding intended to be more attractive to a larger audience. GDP aims to increase 1) the total amount of extramural funding for marine and coastal related research and education and 2) the number of externally funded marine and coastal related PIs throughout the CSU by providing funding to CSU teaching and research faculty to support the development of proposals for extramural funding. Awards are intended to support activities deemed necessary to maximize subsequent success in obtaining external funding such as data collection and/or generation (e.g., field work, surveys, sample analysis), student support, or assigned time funding (for tenured/tenure-track faculty only).

Spanish Shawl nudibranch, *Flabellina iodinea*.

For AY 2013-14, COAST is providing $22,543 in support to faculty members through FRIP and $97,873 in support through GDP. The selected projects span a broad array of topics including desalination, port efficiency, ocean chemistry and its effects on marine organisms, and basic marine ecology. This portfolio speaks to the diversity of strengths of COAST scientists.

AY 2013-14 FACULTY RESEARCH INCENTIVE PROGRAM (FRIP) AWARD RECIPIENTS

AWARD RECIPIENTS	PROJECT TITLE
Dr. Andrea Achilli Environmental Resources Engineering Humboldt State University **Dr. Cheryl Logan** Science and Environmental Policy CSU Monterey Bay **Dr. Tyler Evans** Biological Sciences, CSU East Bay **Dr. Margaret Lang** Environmental Resources Engineering Humboldt State University	Minimizing ecological and carbon footprints of desalination plants in coastal California through alternative desalination technologies
Dr. Jin-Lee Kim Civil Engineering and Construction Engineering Management, CSU Long Beach	Developing multi-objective hybrid quay crane scheduling tool in California port container terminals

AY 2013-14 GRANT DEVELOPMENT PROGRAM (GDP) AWARD RECIPIENTS	
AWARD RECIPIENTS	**PROJECT TITLE**
Dr. Carl Carrano Chemistry and Biochemistry San Diego State University	Boron in a changing ocean: not so "boring" anymore?
Dr. William P. Cochlan Biology, San Francisco State University	The effects of ocean acidity on the toxicity of *Heterosigma akashiwo* in California waters
Dr. Sergei Fomin Mathematics and Statistics, CSU Chico	Mathematical modeling of subsurface reservoir contamination in a coastal zone
Dr. Kristy Forsgren Biological Science, CSU Fullerton	A proteomics approach to understanding the regulation of early ovarian development in fish
Drs. Brian Hentschel and Todd Anderson Biology, San Diego State University	Hydrodynamic mediation of predator-prey interactions in estuarine sediments
Dr. Cheryl Logan Science and Environmental Policy CSU Monterey Bay	Ocean acidification and hypoxia in the California Current: physiological effects on nearshore fishes
Dr. Mark Steele Biology, CSU Northridge **Dr. Scott Hamilton** Moss Landing Marine Labs San José State University	A mechanistic understanding of the demographic consequences of harvest selection for temperate sex–changing fishes

CSU Monterey Bay-CSU Fresno team mapping the Morro Bay sand spit using a terrestrial laser scanner. Image courtesy of Dr. Rikk Kvitek, CSUMB.

COAST 2013 ANNUAL MEETING

The COAST 2013 Annual Meeting focused on strategies for increasing extramural funding. Over 60 people attended the meeting on April 25 2013 at the Chancellor's Office, including faculty members from each campus and invited guests from potential funding agencies and strategic partners. These guests included:

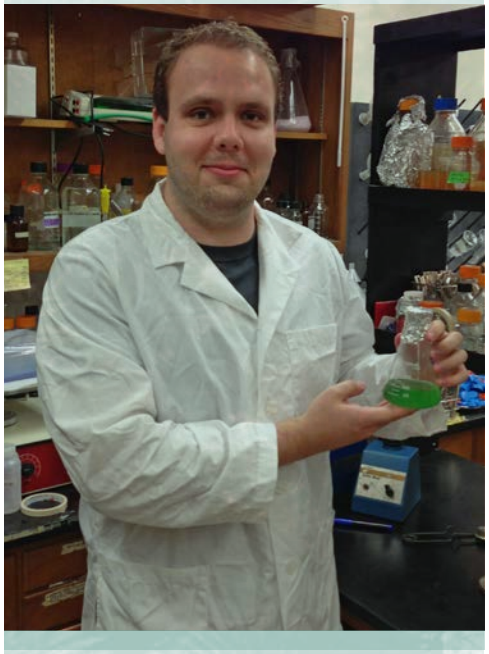
- Mr. William Douros, West Coast Regional Director, NOAA Office of National Marine Sanctuaries
- Dr. Linda Duguay, Director, University of Southern California Sea Grant
- Dr. James Eckman, Director, California Sea Grant
- Mr. William Lyte, Business Development Manager, Environmental Studies and Permitting, Burns & McDonnell
- Dr. S. Bradley Moran, Program Director, Chemical Oceanography, National Science Foundation
- Dr. Phillip Taylor, former Program Director, Biological Oceanography and former Ocean Section Head, National Science Foundation

In the morning, representatives from each campus provided a brief overview of the coastal and marine research being conducted at their campus. This gave faculty members an opportunity to learn about the projects in which their colleagues at other campuses are engaged, which is instrumental in increasing collaborations among campuses. The research updates also conveyed the broad portfolio of research interests and capacity within the CSU to the representatives from the funding agencies and potential partners. This is critical as we look to strengthen relationships and increase research funding.

Before lunch, we convened a panel to discuss coastal and marine extramural funding opportunities. Dr. Kenneth Coale of Moss Landing Marine Laboratories and Dr. Toby Garfield of Romberg-Tiburon Center for Environmental Studies, San Francisco State University moderated the panel comprising the invited guests listed above. The panel was asked to speak about their respective organizations and the current climate for marine and coastal funding with respect to the unique characteristics of the CSU (size, predominance of undergraduates, faculty obligations, etc.). After lunch COAST members had the opportunity for more in-depth conversations with the panelists through a series of breakout sessions focused on the Sea Grant programs, the National Marine Sanctuaries, NSF funding priorities and opportunities, the private sector and the concept of a "Blue" MBA.

We received excellent feedback on the thematic focus for the 2013 meeting and the opportunity to talk one on one with the invited guests. The 2014 annual meeting will be held on April 24 2014 at the Chancellor's Office in Long Beach–save the date!

> **"The award made all the difference in providing the time I needed to write this proposal."**
>
> *Dr. Katharyn Boyer, Associate Professor of Biology, Romberg Tiburon Center for Environmental Studies, San Francisco State University*



Dr. Mamta Rawat's graduate student, Andrew Strankman, with a flask of cyanobacteria. Andrew is one of the CSU Fresno graduate students supported by Dr. Rawat's NSF award. Image courtesy of Dr. Mamta Rawat, CSU Fresno.

Spotlight on Faculty Research

Recently, Dr. Mamta Rawat (Biology, CSU Fresno) received a $649,625 award from NSF for her proposal *RUI: Thiols in Cyanobacteria*. COAST provided support to Dr. Rawat through the Faculty Research Incentive Program in 2010 to develop this proposal, which was ultimately submitted to NSF Division of Molecular and Cellular Biosciences (MCB) in May 2012. The project began in September 2013 and is five years in duration.

Cyanobacteria (or blue-green algae) are widespread throughout terrestrial, aquatic and marine habitats. They play significant roles in global carbon and nitrogen cycles and are sensitive to environmental perturbations. Cyanobacteria are one of the largest and most important groups of bacteria on earth because, like plants, they can produce their own food through photosynthesis. In fact, the chloroplast within plant cells, which is responsible for photosynthesis, is actually a cyanobacterium living within the plant's cells. It is thought that cyanobacteria are responsible for 20–30% of photosynthesis globally.

Increasingly, cyanobacteria are exposed to a number of environmental stresses from climate change and other anthropogenic impacts. Thiols, small molecules that contain sulfur, play a critical role in protecting cells against stress. A well-known thiol in cyanobacteria is glutathione, which acts as a buffer to maintain a stable intracellular environment and protect proteins. Another thiol, ergothioneine, has been identified in cyanobacteria recently.

This project explores the role of these two thiols, glutathione and ergothioneine, in protecting cyanobacteria against stress, such as oxidative and metal stress in particular, and how these stresses affect cyanobacterial populations. Knowledge of how cyanobacteria respond to changes in their environment may provide insight into how global climate change may affect this very important group of organisms.

CSU Fresno undergraduate and Master's level graduate students working with Dr. Rawat will participate in this project through individual Master's and undergraduate theses work. As many as 10 undergraduate students will be involved during the five-year project. Undergraduate students enrolled in general molecular biology and microbiology courses will participate also. They will enrich and isolate cyanobacteria, physiologically characterize normal and mutant strains, and perform DNA amplification, sequencing and analysis. In Experimental Molecular Biology, an upper division undergraduate course, students will conduct more complex work cloning genes, inserting them into plasmid vectors and creating knockout strains of cyanobacteria to study the effects of the thiols. Students in Nucleic Acids Technology, a graduate course, will learn quantitative PCR, cloning and construction of knockout strains in which the thiol genes have been deleted. Students will present the results of the research to K-12 students as a service-learning component. Additionally, Dr. Rawat will train K-12 teachers through mentored research experiences and an inquiry-based workshop on nucleic acids.

Supporting Student Research

Broadly, COAST aims to support CSU undergraduate and graduate students engaged in marine and coastal related research with CSU faculty members. Often, COAST support allows students to devote themselves fully to their research rather than splitting their time between school and an outside job. This helps them stay in school and attain their degrees more quickly. By requiring each student to work with a faculty mentor, support for students is intended to ultimately benefit faculty members as well.

STUDENT AWARDS FOR MARINE SCIENCE RESEARCH

The goals of the COAST Student Awards for Marine Science Research program are to stimulate student interest in marine-related careers, increase student participation in faculty-mentored research, and provide students with the opportunity to obtain the skills necessary to join a highly skilled, technologically advanced workforce. In AY 2012-13, COAST provided $85,500 to a total of 32 students at nine campuses through this program (Appendix C). Seven undergraduate students each received $1,500 and 25 graduate students each received $3,000.

Several critical themes emerged among the undergraduate award recipients that illustrate the importance of undergraduate research. In all cases, COAST support allowed the students to apply the knowledge and skills they learned in classes to concrete, hands-on scientific research. They were challenged to think critically, creatively and to problem solve. Notably, students indicated that the awards spurred them to become more involved and take personal responsibility for the research projects in a new way and that receiving the award inspired confidence and empowerment. Almost all the undergraduate award recipients plan to pursue advance degrees in related fields.

STUDENT TRAVEL AWARDS

The COAST Student Travel Award program supports undergraduate and graduate student travel to marine, estuarine and coastal-themed scientific meetings and conferences or special thematic sessions of more general scientific meetings to present the results of their research. The goals of the program are to enable students to participate in what is often a transformative experience and to highlight CSU research at a national level. COAST provided $22,765 in travel support to one undergraduate and 29 graduate students from nine different campuses to make either oral or poster presentations at regional, national and international meetings (Appendix D).

CSU Monterey Bay undergraduate student Gavin Leavitt holding a gumboot chiton, Bodega Bay, CA. Image courtesy of Emily Jones, SDSU.

> **"When I heard that I was chosen to receive one of the awards, I was honored and also empowered. I realized that if I put in enough work, I could stand out and be successful."**
>
> *Kevin Amegin, Biology major*
> *Cal Poly San Luis Obispo*

> **My experiences at CSULA, along with the work-study program, have given me the unique opportunity to learn and grow as an intellectual as I pursue my interest in understanding the different mechanisms that shape environmental policies.**
>
> *Anna Benavides,*
> *Anthropology graduate student*
> *CSU Los Angeles*

FEDERAL WORK-STUDY PILOT PROGRAM

The COAST federal work-study pilot program continued during AY 2012-13 at CSU Los Angeles and Humboldt State University, and CSU Dominguez Hills participated for the first time. The goal of the program is to increase the number of federally funded work-study students participating in coastal and marine research. COAST provided support to each campus to serve as the required 25% institutional match for federal work-study funds.

At CSU Dominguez Hills undergraduate student Barbara Ramon worked with Dr. Ana Pitchon on a project funded by California Sea Grant to increase revenue from fishing by developing higher-value product lines. Barbara was responsible for collection and synthesis of data related to regulatory barriers to value-added market opportunities. Her participation in this project helped her acquire skills and knowledge that she otherwise would not have learned through traditional curriculum and that will aid her as she pursues a graduate degree in Marine Policy.

Two CSU Los Angeles graduate students participated in the program. Dr. Kathleen Sullivan in Anthropology advised Anna Benavides, a MA student, who used advanced qualitative ethnographic research methods to investigate the political and social justice aspects of natural resource development. Specifically, she looked at how policy in upland river basins affects ocean resources. S.K. Mamun, an Environmental Science graduate student, worked with Dr. Gustavo Menezes in Civil Engineering. S.K. is interested in the effects of toxins in ground water and coastal environments on organisms. He included physical soil parameters and preferential pathways in fluid transport models in order to more accurately predict the movement of pollutants in unsaturated soils.

At Humboldt State, one graduate student and six undergraduate students participated. Three students, Katie Houle, Michelle Succow and Pamela Ward, worked with Dr. Sean Craig in Biology on questions related to the globally invasive bryozoan species complex, *Watersipora* spp. Collectively, they are looking at genetic differentiation, environmental conditions and larval settlement, all of which provide better understanding of these organisms' successful invasions.

Two students worked with Dr. Matthew Hurst in Chemistry. Pedro Alvaro investigated the capacity of the Arcata Marsh, part of the city's wastewater treatment facility, to remove metals from wastewater and the concentration at which copper in wastewater is toxic to marine organisms. Brenna Callaham examined spatial and temporal variation in nutrient concentrations in Humboldt Bay as well as possible sources and sinks, such as primary production, which supports the local shellfish industry.

Another student, Charles Swanson, working with Dr. Eileen Cashman and Emeritus Professor Dr. Robert Gearheart in Environmental Resources Engineering, is also studying Arcata Marsh and Humboldt Bay. Mr. Swanson is studying the ability of the marsh to remove nitrogen and phosphorus from wastewater. He is also working with Dr. Frank Shaughnessy in Biology on a light-water quality-seagrass model for Humboldt Bay. Dr. Shaughnessy also mentored Torre Polizzi who is applying Specify 6, a software application for museum and herbarium research data processing, to the HSU Sea Weed Herbarium.

Both CSU Los Angeles and Humboldt State University will continue to participate in the work-study program in AY 2013-14, and CSU East Bay and CSU Fullerton will initiate work-study programs in collaboration with COAST.

COAST SUMMER STUDENT INTERNSHIP PROGRAM

Through the COAST Summer Student Internship Program, CSU students work side by side with professional scientists in the field and laboratory on current research projects. As interns, they learn how to handle and sample live fish, raise abalone, collect and record biological and environmental data, conduct experiments, build and maintain field equipment, and perform laboratory analyses. They gain valuable work experience and learn technical skills that augment their education and provide professional development opportunities.

In June, the third group of CSU students started their summer internships. This year eleven students were placed among four different host organizations. Three of the host organizations participated in previous years:

- The California Department of Fish and Wildlife (CDFW; www.dfg.ca.gov/): a state agency charged with managing California's diverse native fish, wildlife, and plant species, and the habitats upon which they depend.
- Pacific Coast Environmental Conservancy (PCEC; www.pceconservancy.org/): a small non-profit organization in Long Beach dedicated to the protection and sustainability of the Pacific coast environments.
- PRBO Conservation Science (PRBO; www.prbo.org): a well-known non-profit organization in Petaluma dedicated to bird, wildlife and ecosystem conservation worldwide.

Marine Applied Research & Exploration (MARE; www.maregroup.org) joined as a new host organization in 2013. MARE is a small non-profit organization in Richmond, CA, that provides technology and offshore operations support for research in deepwater marine environments.

Participation in this program helps prepare CSU undergraduate and graduate students to join a highly skilled, technical workforce. Additionally, students are better able to make informed decisions about STEM related employment or advanced degrees they may wish to pursue. For example, Paolo Iuliano, a Mechanical Engineering undergraduate student at San Francisco State University interned with MARE and spent the summer building, maintaining and repairing remotely operated vehicles (ROVs) for underwater exploration and study. Paolo now plans to pursue a career with underwater robots and feels he is much better prepared to get an engineering job in this field. CSU Monterey Bay graduate student Benjamin Walker interned with CDFW on their Red abalone research project in Bodega Bay studying the effects of temperature and planktonic biodiversity on this highly regulated species. Benjamin applied his knowledge of marine policy from coursework and scientific diving skills to this scientific study and gained valuable skills, contacts and work experience.

The Summer Student Internship Program is made possible by support from California Sea Grant and the host organizations. This year, PCEC provided $4,000 in matching funds and for the second year in a row California Sea Grant provided $10,000. COAST will continue to seek additional support in order to expand the program and offer a broad diversity of internship hosts and experiences for CSU students.

PCEC interns Eliza Hernandez (Cal Poly Pomona) and Kiefer Rodriguez (CSU Bakersfield) worked together to collect samples used in various studies focusing on human impacts to the marine environment. Image courtesy of Jesus Reyes, PCEC.

SUMMER 2013 STUDENT INTERNSHIP PROGRAM HOST ORGANIZATIONS AND INTERNS		
HOST ORGANIZATION	**INTERNSHIP, LOCATION (ALL WITHIN CA)**	**CSU STUDENT, HOME CAMPUS**
California Department of Fish and Wildlife (CDFW)	Abalone Research *Bodega Marine Laboratory, Bodega Bay*	Ben Walker, Monterey Bay Madalyn Walker, Humboldt
	Coastal Salmonid Habitat *Ft. Bragg*	Chetco Jamgochian, Humboldt
	Southern California Sport Fisheries *Los Alamitos*	Lilhac Medina, Long Beach Kimberly Walker, Fullerton
Marine Applied Research & Exploration (MARE)	Marine Engineering *Richmond*	Paolo Iuliano, San Francisco
Pacific Coast Environmental Conservancy (PCEC)	Environmental Toxicology *Long Beach*	Eliza Hernandez, Pomona Kiefer Rodriguez, Bakersfield Sarah Zito, Long Beach
PRBO Conservation Science (PRBO)	Seabird Diet Research *Petaluma*	Esther Haile, Monterey Bay
	Zooplankton Research *Petaluma*	Kimberley McKenzie, Humboldt

Seagulls on Channel Islands.

COAST-UROC UNDERGRADUATE STUDENT SUMMER RESEARCH PROGRAM

COAST and the CSU Monterey Bay Undergraduate Research Opportunities Center (UROC) continued the undergraduate student summer research program initiated in 2012. Five CSU Monterey Bay undergraduate STEM students were placed with COAST faculty mentors at other CSU campuses for a 10-week paid summer research experience. The students had the opportunity to engage in hands-on research of sea slug physiology, behavior, genetics and dispersal; collaborative fisheries research in marine protected areas (MPAs); intertidal primary producer dynamics; and seaweed anti-herbivory mechanisms with leaders in each of these fields. The faculty hosts each had a highly motivated and skilled undergraduate student working in their lab at no cost to them. To complete their research experiences, the students are expected to present the results of their research at scientific meetings within the next 12 months and may author or be included on scientific publications resulting from these projects.

This effort leveraged UROC's U.S. Department of Education HSI STEM and Articulation Program grant, which covered 75% of the cost for each student. COAST contributed $2,000 per student to cover housing and research supplies and recruited the hosting faculty mentors. Through this partnership, COAST was able to support more students than would be possible through COAST funds alone.

This pilot program provided invaluable research opportunities to undergraduate students. In the future COAST will seek external funding to support this type of campus-exchange undergraduate research program on a larger scale. It is an excellent model for exposing students to new ideas and creating a pipeline of students for graduate programs within the CSU.

CSU MONTEREY BAY UROC SUMMER UNDERGRADUATE STUDENT PLACEMENTS

CSUMB UNDERGRADUATE STUDENT	FACULTY HOST	PROJECT
Elizabeth Lambert	**Dr. James Murray** CSU East Bay	Can you see a sea slug sleep, if a sea slug could show sleep? Is the activity of the sea slug *Tritonia diomedea* under control of a hormone, and how do such hormones affect brain cells?
Gavin Leavitt	**Dr. Jeremy Long** San Diego State University	What turns seaweeds on? Herbivore-induced defenses in the brown seaweed *Silvetia compressa*
Joshua Smith	**Dr. Dean Wendt** Cal Poly San Luis Obispo	Fishing and sticking: The impact of MPAs on nearshore rockfish and the development of environmentally benign marine coatings
Ty Wheeler	**Dr. Pat Krug** CSU Los Angeles	Do oceanographic models correctly predict larval dispersal? A genetic test using Caribbean sea slugs
Oliviya Wyse	**Dr. Karina Nielsen** Sonoma State University	What's growing on? Investigations of intertidal algae, macrophytes and surfzone phytoplankton

Working Networks

> **“Not only was it apparent that the students were skilled in the techniques, but they were also patient and supportive teachers. The workshop was well-organized in every respect — scientifically and administratively — as well as fun, instructive and inspiring.”**
>
> *Dr. Andreas Madlung,*
> *Professor of Biology*
> *University of Puget Sound*

COAST’s three active networks were all busy in the last year engaging new members and convening workshops and public forums to share technology and ideas.

ENVIRONMENTAL PROTEOMICS

In December 2012 Dr. Lars Tomanek at Cal Poly San Luis Obispo and his students hosted the Workshop on Comparative Proteomics of Environmental and Pollution Stress at their campus. With support from NSF, USC Sea Grant and COAST, the workshop brought together twelve professors and graduate students from across the country to learn the technology and methodology of environmental proteomics, a method of analyzing how organisms respond to different environmental stresses. In this five-day workshop, participants conducted two-dimensional gel electrophoresis followed by protein identification using a tandem mass spectrometer, which measures the molecular mass of unique protein identifiers called peptides. The students in Dr. Tomanek’s Environmental Proteomics Laboratory led the workshop and were the primary instructors responsible for teaching the proteomic workflow and all associated techniques to the participants.

Workshop participants brought their own samples for use in the workshop and the various projects incorporated include climate change impacts, coral bleaching, fish physiology, ocean acidification effects, and physiology of marine invertebrates including gastropods, limpets and bivalves. Already several participants have successfully applied for follow-on funding based on the data generated during the workshop.

Dr. Tomanek’s lab is one of only three highly specialized environmental proteomics labs in the country that have the technology and expertise for this type of unique and cutting-edge work. An NSF program officer highlighted this workshop at the Society for Integrative and Comparative Biology 2013 Annual Meeting as a leading example of a broader approach to sharing and promoting expertise in a cutting-edge technology, of which NSF wants to see more.

MARINE GEOSPATIAL TECHNIQUES

In January 2013 Dr. Corey Garza at CSU Monterey Bay convened the second Marine Geospatial Techniques Workshop with support from California Sea Grant and COAST. Twenty-two participants attended the two-day workshop at CSU Monterey

Dr. Ivano Aiello of Moss Landing Marine Laboratories demonstrates use of the spatial station laser scanner during the Marine Geospatial Workshop at Point Lobos, CA, January 18 2013. Image courtesy of Dr. Corey Garza, CSUMB.

Bay where they learned about several different marine geospatial technologies and data acquisition techniques, and their application to biological and ecological research questions. The participants included faculty members and their students from San Francisco State University, San José State University, UC Santa Barbara, Cabrilllo Community College, and Monterey Institute of International Studies as well as professionals from California Department of Fish and Wildlife, California Geological Survey, California State Parks, Monterey Bay Aquarium Research Institute, Monterey Peninsula Water Management District, Smith River Rancheria, and Southern California Coastal Water Research Project (SCCWRP).

The workshop followed a field-to-finish format where participants spent a half-day in the field at Point Lobos State Marine Reserve with Dr. Ivano Aiello of Moss Landing Marine Laboratories conducting fine-scale surveys of rocky intertidal zones using a three-dimensional terrestrial scanner. This was followed by one and a half days in the lab processing and analyzing the data and learning about other data collection methods: Dr. Scott Shaffer, San José State University, demonstrated how telemetry data can be used to analyze animal movement, and Dr. Rikk Kvitek, CSU Monterey Bay, presented the visualization and analysis of shallow subtidal data collected along the California coast. Participants left the workshop with greater familiarity with state-of-the-art geospatial tools and technology and new ideas about how to apply these approaches to their own research. The opportunity to network with colleagues and students using or interested in using geospatial techniques was also of significant value to the participants. With sufficient interest, COAST and CSU Monterey Bay will continue to hold these workshops annually.

Graduate students at the first Environmental Proteomics Workshop sponsored by NSF, COAST and USC Sea Grant at Cal Poly San Luis Obispo, December 2012. Image courtesy of Dr. Lars Tomanek, Cal Poly San Luis Obispo.

CALIFORNIA OCEAN DAY 2013

On April 16 2013, COAST hosted the California Ocean Day luncheon in Sacramento for the second year in a row. Ocean Day focuses on ocean health and marine conservation and provides a forum for California's ocean advocacy community to interact with State leaders. The luncheon provided an opportunity to discuss successful marine protected area (MPA) monitoring partnerships with a large and diverse audience. The three speakers, Dr. Liz Whiteman, Program Director for the California Ocean Science Trust and MPA Monitoring Enterprise Director, Dr. Dean Wendt of Cal Poly San Luis Obispo and Dr. James Lindholm of CSU Monterey Bay, spoke to an audience of over 100 people about cost-effective, partnership-based monitoring programs to establish baseline conditions in MPAs and assess change over time to determine the effectiveness of MPA management decisions. The approaches that they discussed include collaborations among State agencies, academic scientists, fishing communities, stakeholder groups and individual citizen scientists. COAST is slated to host the luncheon again in 2014. It's a significant way to connect CSU scientists working on critical issues with an interested and activated audience.

COMMUNICATING SCIENCE

The COAST Policy Network, led by Dr. James Lindholm at CSU Monterey Bay and Dr. Dean Wendt at Cal Poly San Luis Obispo has been planning its first workshop, which will be held in October 2013 at the Cal Poly San Luis Obispo campus. The workshop will focus on helping COAST faculty members understand how to effectively communicate the results of their research to diverse audiences, including policy-makers, managers and the wider public. Participants will learn directly from legislators, legislative committee staff, Executive Branch agency staff, and reporters from multiple media how science informs policy development and how to successfully package their message for maximum impact.

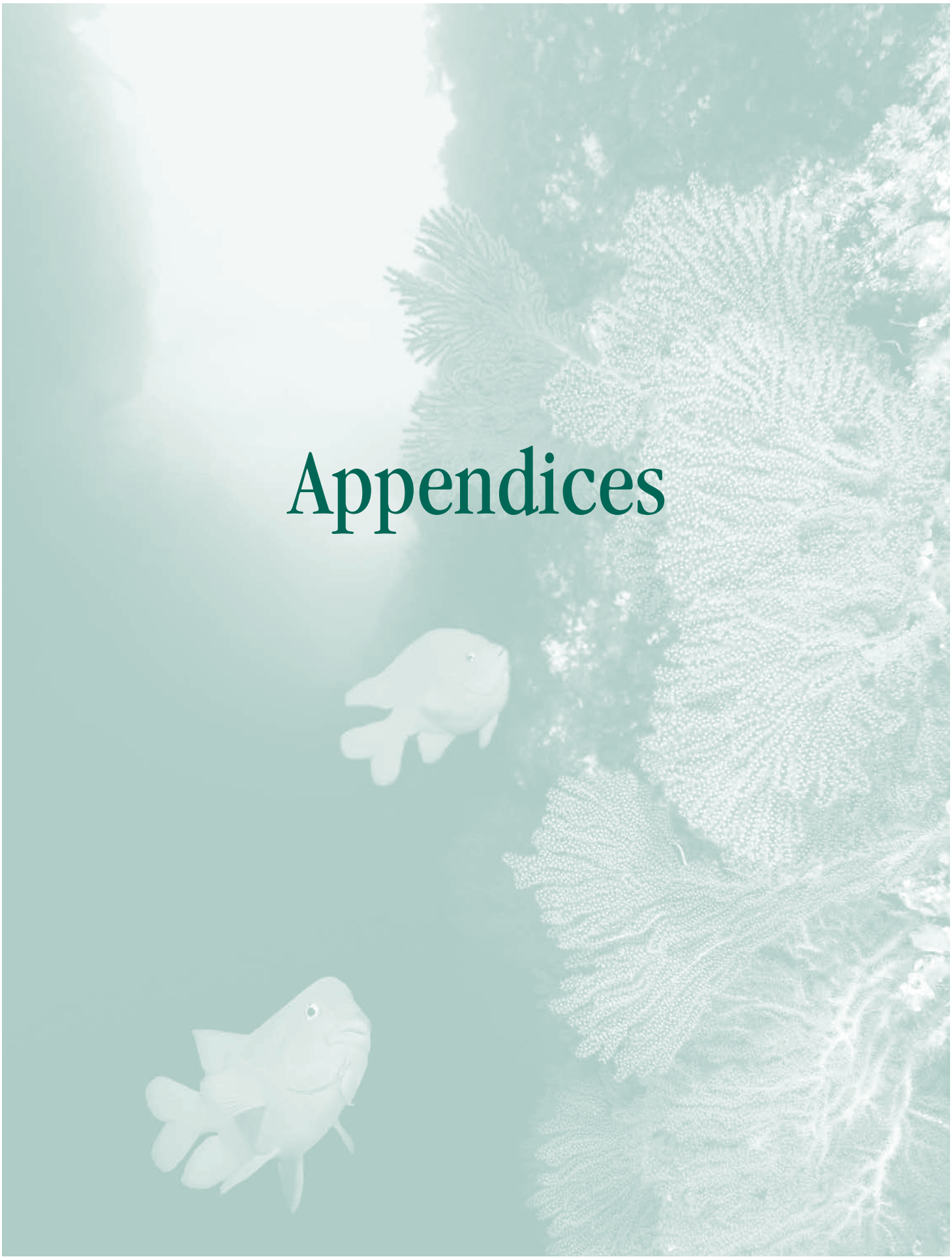
Ms. Christine Robertson, Associate Director of the Institute for Advanced Technology and Public Policy (IATPP) at Cal Poly San Luis Obispo, has been assisting in the planning of this workshop. She has eight years experience working in Sacramento for the Honorable Sam Blakeslee and has drawn on that experience to engage members of the California State Legislature, Chief Consultants of relevant committees, high-level agency staff and members of the media in the workshop.

Looking Ahead

Over the next 12 months COAST will:

- Support faculty members pursuing projects aligned with COAST's strategic goals of raising the profile of coastal and marine research within the CSU and enhancing educational opportunities for students.
- Seek significant external funding to augment the internal funding provided by the CSU.
- Provide support for faculty members preparing proposals to external funding agencies.
- Provide support to undergraduate and graduate students engaged in marine and coastal research.
- Expand the federal work-study programs to CSU East Bay and CSU Fullerton.
- Expand the Summer Student Internship Program and increase cost sharing by host organizations.
- Support the Networks in planning meetings and workshops to engage their members and further their goals.
- Continue to raise awareness of CSU marine and coastal scientists as a primary resource for the best scientific information available to guide and inform policy development.

Appendices



APPENDIX A AY 2012-13 FACULTY RESEARCH INCENTIVE PROGRAM (FRIP) AWARD RECIPIENTS

AWARD RECIPIENTS	PROJECT TITLE
Dr. Nikki Adams Biological Sciences Cal Poly San Luis Obispo	Protein response of sea urchin embryos to environmental stress utilizing confocal microscopy to identify proteins affected by ultraviolet radiation in sea urchin embryos
Dr. Katharyn Boyer Biology San Francisco State University	Getting to the bottom of it: understanding an invasive herbivore's novel role in a vulnerable seagrass system (with Dr. Jeremy Long, San Diego State University-unfunded collaborator)
Dr. Elizabeth Dinsdale Biology San Diego State University	Copper concentration as a selective pressure on genomic content of kelp forest microbes
Dr. Matt Edwards Biology San Diego State University	Biogeography and physiology of rhodoliths at Catalina Island *and* Development of an integrated seaweed-abalone aquaculture system for sustainable resource use and bioremediation (with Drs. Michael Graham and Diana Steller, Moss Landing Marine Laboratories, San Jose State University-unfunded collaborators)
Dr. Antje Lauer Biology CSU Bakersfield **Dr. Sean Craig** Biological Sciences Humboldt State University	Diversity and function of bacteria in human influenced marine fouling communities: using *Watersipora* spp. and associated microbes as a model
Dr. Cheryl Logan Science and Environmental Policy CSU Monterey Bay	Will California's sea mussels be able to adapt to rising temperatures concomitant with climate change?
Dr. Jeremy Long Biology San Diego State University	Sublethal consequences of pollution on chemically-mediated interactions between consumers and their prey. (with Dr. Matthew Ferner, San Francisco State University-unfunded collaborator)
Dr. Jonathon Stillman Biology San Francisco State University	Why mommies matter: elucidating the mechanisms that produce brood-specific responses to ocean acidification in porcelain crabs (with Dr. Brian Tsukimura, CSU Fresno-unfunded collaborator)

APPENDIX B AY 2012-13 COLLABORATIVE RESOURCE SHARING PROGRAM (CRSP) AWARD RECIPIENTS

AWARD RECIPIENTS	PROJECT TITLE
Dr. Sean Anderson Environmental Science & Resource Management, CSU Channel Islands **Dr. Rikk Kvitek** Science and Environmental Policy CSU Monterey Bay	Benthic mapping of Ventura County estuaries: a collaboration between CSUMB's Seafloor Mapping Laboratory and CSUCI's Pacific Institute for Restoration Ecology
Dr. Corey Garza Science and Environmental Policy CSU Monterey Bay **Dr. Ivano Aiello** Moss Landing Marine Laboratories San José State University	Multiscale geomorphic controls over littoral communities in California
Dr. Antje Lauer Biology, CSU Bakersfield **Dr. Sean Craig** Biological Sciences, Humboldt State University **Dr. Lars Tomanek** Biological Sciences Cal Poly San Luis Obispo	Protein expression profiles in *Watersipora* spp. and selected microbial associates in response to copper stress
Dr. Rebecca Lewison Biology, San Diego State University **Dr. Ellen Hines** Geography and Human Environmental Studies San Francisco State University	Creating a spatially explicit risk assessment of fisheries bycatch for coastal marine mammals
Dr. Stephanie Molloy Biological Sciences, CSU East Bay **Dr. Kenneth Coale** Moss Landing Marine Laboratories San José State University	Effect of heavy metals pollution on subsurface sediment bacteria communities in San Francisco Bay
Dr. Mathieu Richaud Earth and Environmental Sciences, CSU Fresno **Dr. Rikk Kvitek** Science and Environmental Policy CSU Monterey Bay	Quantifying shoreline geomorphology and coastal erosion during ENSO and inter-ENSO periods along Morro Bay sandspit, CA, using a vessel-based LiDAR system

APPENDIX C 2012-13 STUDENT RESEARCH AWARDS

CAMPUS	STUDENT	ADVISOR	PROJECT TITLE
Humboldt	Wiley Archibald	Dr. Patricia (Dawn) Goley	Fine-scale haul-out distributions of Pacific harbor seals *(Phoca vitulina)* in Humboldt Bay, CA
	Jasen Jacobsen*	Dr. Jeffrey Abell	Why does low pH, aragonite-corrosive water surface along the northern California coast?
Long Beach	Bonnie Ahr	Dr. Chris Lowe	Movements and habitat use of white croaker *(Genyonemus lineatus)* in the Los Angeles and Long Beach Harbors and the development of predictive models
	Priscilla Miranda	Dr. Jesse Dillon	Sulfur-cycling microbial mats of the Palos Verdes near-shore hydrothermal vents, an analog for deep-sea vents: implications for sulfur biogeochemistry, early earth and climate change
Monterey Bay	Emily Aiken*	Dr. James Lindholm	Native crab, *Cancer gracilis*, may affect the spread of the invasive bryozoan *Watersipora subtorquata*
	Jennifer Bigman	Dr. David Ebert (MLML)	Food web of Monterey Bay: insights through stable isotope analysis
	Alexandria Blackwell*	Dr. Cheryl Logan	Assessment of thermal tolerance and adaptive ability of *Mytilus californianus*
	Hamilton Fennie	Dr. Scott Hamilton (MLML)	Investigating the effects of ocean acidification on juvenile rockfish olfactory abilities and their detection of predators
	Mary McCormick	Dr. Corey Garza	The value of habitat diversity in marine reserves: spiny lobster and sheephead use of the intertidal zone at the Santa Catalina Island MPA
	Carley Turner*	Dr. Jonathon Stillman (SFSU)	Thermal sensitivity of heat shock protein gene expression in newly settled porcelain crabs
Northridge	Michael Schram	Dr. Mark Steele	The effects of simulated size-selective harvesting on a protogynous temperate reef fish, *Rhinogobiops nicholsii*
San Diego	Amalia DeGrood	Dr. Kevin Hovel	How shelter scaling and group size impact survival of the California spiny lobster, *Panulirus interruptus*, within and outside southern California's marine protected areas
	Emily Jones	Dr. Jeremy Long	The influence of herbivore-induced defenses on community and ecosystem processes
	Tye Nichols	Dr. Todd Anderson	Physiological effects of anthropogenic sound on a macrophyte-associated reef fish
	Alterra Sanchez*	Dr. Kevin Hovel	The effects of depth and epiphytes on the growth of the seagrass *Zostera marina*
	Alexandria Warneke	Dr. Jeremy Long	Alteration of chemical defenses by anthropogenic contaminants

* denotes undergraduate student

APPENDIX C 2012-13 STUDENT RESEARCH AWARDS

CAMPUS	STUDENT	ADVISOR	PROJECT TITLE
San Francisco	Darragh Clancy	Dr. C. Sarah Cohen	Examining fusion rates and genetic diversity of an invasive colonial ascidian
	Katherine McLean	Dr. Anne Todgham	Effect of food availability on stress tolerance of juvenile Dungeness crabs
	Morgan Meyers	Dr. Edward Carpenter	Effect of ocean acidification on nutritional quality of phyto-plankton for copepod reproduction
	Mark Russell*	Dr. Vance Vredenburg	Weight loss in marine bird species following oil contamination
	Lauren Scheinberg	Dr. Katharyn Boyer	Feeding preference and population structure of the herbivo-rous amphipod, *Ampithoe valida*: a bicoastal comparison
	Nicole Travis	Dr. Frances Wilkerson	Effective use of a new variable fluorescence probe (PhytoFlash) for evaluation of phytoplankton nitrogen stress in the San Francisco Estuary
San José	Cheryl Barnes	Dr. Rick Starr (MLML)	Reproductive characteristics of California halibut *(Paralichthys californicus)* off central California, with comparisons to the Southern California Bight
	Alexis Howard	Dr. Michael Graham (MLML)	Effects of temperature on sexual competition in kelps: implications for range shifts in foundation species
	Priyadarshini Iyer	Dr. Josh Mackie	*De novo* isolation and characterization of copper-binding proteins in a hull fouling bryozoan, *Watersipora subtorquata*
	Andrea Launer	Dr. Rick Starr (MLML)	Sex- and size-specific segregations of leopard sharks *(Triakis semifasciata)* in an estuarine environment
	Gabriela Navas	Dr. Jonathan Geller (MLML)	Genetic differentiation and age distribution of the Pacific geoduck, *Panopea generosa*, in California
	Catherine Yi	Dr. Scott Shaffer	Age-dependent reproductive fitness of tree swallows
San Luis Obispo	Kevin Amegin*	Dr. Sean Lema	Effects of estuarine 4-nonylphenol contamination on estrogen-mediated pathways in arrow goby *(Clevelandia ios)* of Morro Bay, California
	Michael Garland	Dr. Lars Tomanek	The interacting effects of thermal, pH, and aerial exposure stress on the eurythermal porcelain crab, *Petrolisthes cinctipes*
Sonoma	Jeffrey Sharick	Dr. Dan Crocker	Oxidative stress: A potential cost of breeding in adult male and female northern elephant seals *(Mirounga angustirostris)*
	Derek Somo	Dr. Dan Crocker	Plasticity in rate of development of dive capacity in north-ern elephant seals: effects of variation in body reserves and behavior

* denotes undergraduate student

APPENDIX D 2012-13 STUDENT TRAVEL AWARDS

CAMPUS	STUDENT	FACULTY MENTOR	CONFERENCE	CONFERENCE LOCATION	AMOUNT
Fresno	Temperance Rowell	Dr. Larry Riley	Society of Integrative and Comparative Biology Annual Meeting 2013	San Francisco, CA	$540
Fullerton	Scott Holtz	Dr. Katharyn Dickson	Society of Integrative and Comparative Biology Annual Meeting 2013	San Francisco, CA	$585
Long Beach	Dwight Causey	Dr. Kevin Kelley	Society of Integrative and Comparative Biology Annual Meeting 2013	San Francisco, CA	$500
	Cody Larsen	Dr. Kevin Kelley	Society of Integrative and Comparative Biology Annual Meeting 2013	San Francisco, CA	$496
	Evan Lee	Dr. Kevin Kelley	Society of Integrative and Comparative Biology Annual Meeting 2013	San Francisco, CA	$494
	Katherine Lyons	Dr. Christopher Lowe	2013 Joint Meeting of Ichthyologists and Herpetologists	Vancouver, BC, Canada	$760
	Anastasia Shippey	Dr. Christine Whitcraft	Ecological Society of America	Portland, OR	$1,161
Monterey Bay	Jennifer Bigman	Dr. David Ebert (MLML)	2013 Joint Meeting of Ichthyologists and Herpetologists	Vancouver, BC, Canada	$1,078
	Corina Marks	Dr. Rikk Kvitek	American Geophysical Union (AGU) Fall Conference	San Francisco, CA	$500
	Kristin Meagher	Dr. Jon Geller (MLML)	IV International Rhodolith Workshop	Granada, Spain	$1,000
	Carley Turner*	Dr. Jonathon Stillman (SFSU)	Society of Integrative and Comparative Biology Annual Meeting 2013	San Francisco, CA	$653
Northridge	Barbara Sanchez	Dr. Mark Steele	2013 Joint Meeting of Ichthyologists and Herpetologists	Vancouver, BC, Canada	$1,000
	Brenton Spies	Dr. Mark Steele	2013 Joint Meeting of Ichthyologists and Herpetologists	Vancouver, BC, Canada	$1,000
San Diego	Max Castorani	Dr. Kevin Hovel	93rd Annual Meeting of the Western Society of Naturalists	Seaside, CA	$540
	Alexander Gaos	Dr. Rebecca Lewison	33rd Annual Symposium on Sea Turtle Biology and Conservation	Baltimore, MD	$1,000
	Emily Jones	Dr. Jeremy Long	Benthic Ecology Meeting	Savannah, GA	$550
	Alex Messina	Dr. Trent Biggs	US Coral Reef Task Force Biannual Meeting	Pago Pago, American Samoa	$1,000

* denotes undergraduate student

APPENDIX D 2012-13 STUDENT TRAVEL AWARDS

CAMPUS	STUDENT	FACULTY MENTOR	CONFERENCE	CONFERENCE LOCATION	AMOUNT
San Diego	Chelsea Rochman	Dr. Eunha Ho	Ecological Society of America	Portland, OR	$998
	Jaime Rossiter	Dr. Arielle Levine	Society for Applied Anthropology	Denver, CO	$950
San Francisco	Brittany Bjelde	Dr. Anne Todgham	Society of Integrative and Comparative Biology Annual Meeting 2013	San Francisco, CA	$200
	Darragh Clancy	Dr. Sarah Cohen	Alaska Marine Science Symposium	Anchorage, AK	$1,000
	Christopher Ikeda	Dr. William Cochlan	15th International Conference on Harmful Algae (ICHA)	Changwon Gyeongnam, Korea	$1,000
	Allison Johnson	Dr. Frances Wilkerson	ASLO Aquatic Sciences Meeting	New Orleans, LA	$1,000
	Karen Kayfetz	Dr. Wim Kimmerer	ASLO Aquatic Sciences Meeting	New Orleans, LA	$1,000
	Jamie Lee	Dr. Frances Wilkerson	7th Biennial Bay-Delta Science Conference	Sacramento, CA	$360
	Katherine McLean	Dr. Anne Todgham	Society of Integrative and Comparative Biology Annual Meeting 2013	San Francisco, CA	$200
	Christina Pasparakis	Dr. Anne Todgham	Society of Integrative and Comparative Biology Annual Meeting 2013	San Francisco, CA	$200
	Robert Vogt	Dr. Wim Kimmerer	ASLO Aquatic Sciences Meeting	New Orleans, LA	$1,000
San José	Scott Garbara	Dr. Diana L. Steller (MLML)	IV International Rhodolith Workshop	Granada, Spain	$1,000
	Gabriela Navas	Dr. Jon Geller (MLML)	World Aquaculture Society	Nashville, TN	$1,000

* denotes undergraduate student

The California State University
COUNCIL ON OCEAN AFFAIRS, SCIENCE & TECHNOLOGY

On the cover: CSU Monterey Bay undergraduate student Joshua Smith holding a copper rockfish *(Sebastes caurinus)* on board the commercial passenger fishing vessel *Fiesta* near Piedras Blancas on July 16, 2013. Josh was participating in the CA Collaborative Fisheries Research Program under the mentorship of Dr. Dean Wendt, Cal Poly San Luis Obispo. Image courtesy of Josh Smith, CSUMB.

COAST Annual Report, December 2013

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