

CSU

The California State University

COUNCIL ON OCEAN AFFAIRS, SCIENCE & TECHNOLOGY (COAST)



COAST

Semi-Annual Report

Covering Activities from January 1 2011 to June 30 2011

www.calstate.edu/coast

THE CALIFORNIA STATE UNIVERSITY (CSU) Council on Ocean Affairs, Science and Technology (COAST) is the umbrella organization for marine and coastal related activities within the CSU. COAST integrates system-wide resources and promotes interdisciplinary multi-campus collaborations to advance marine and coastal research and education throughout the CSU and disseminate this information to the public for the development of responsible policy statewide. The scope of COAST includes the ocean, coast and coastal watersheds. COAST's goals are to

- Advance our knowledge of California's natural coastal and marine resources and the processes that affect them.
- Support research related to California's marine, estuarine, and coastal regions.
- Develop innovative solutions to the economic, sociological, ecological and technological challenges that our coastal zone faces.
- Promote environmental literacy to foster stewardship and sustainable use of California's coast.

COAST is a CSU system-wide affinity group supported by contributions from the individual CSU campuses and the Chancellor. Please visit us online at www.calstate.edu/coast to learn more.

2010-2011 Program Highlights

COAST met multiple major milestones in 2010-2011. With a generous contribution of \$500,000 from Chancellor Reed, we were able to implement a number of new initiatives to grow the program significantly. In addition to continuing to offer support to faculty seeking extramural funding through the Faculty Research Incentive Program, we also supported intercampus collaboration and resource sharing through the new Collaborative Resource Sharing Program.

At the same time, we developed several new programs to provide support to marine science undergraduate and graduate students across the entire CSU to conduct research and travel to scientific meetings to present the results of their research. We also launched a new CSU Student Summer Internship Program in conjunction with the California Department of Fish & Game.

In January 2011 we held the first annual COAST Faculty-Student Research Poster Reception at the Chancellor's Office. This highly successful event provided faculty and students from 20 campuses the opportunity to meet CSU Presidents and Trustees and discuss their research with them, and a second poster reception is already being planned for 2012.

All of our new programs will continue in 2011-2012. We look forward to additional growth and development this year and hope you will be part of our efforts!

Increased Extramural Grant Activity

The COAST Faculty Research Incentive Program continues to generate a positive return on investment. During the reporting period, two more grants were awarded to CSU faculty members who received COAST assigned time funding, bringing the total return on investment to date to 6.4:1:

- Sean Craig*, HSU, and Joshua Mackie*, SJSU. National Science Foundation: RUI: *Colonization genetics of globally invasive marine bryozoa: Does adaptation prior or post-introduction determine spread?* \$355,586
- Kathryn Leonard and Bradley Monsma*, CSUCI. W. M. Keck Foundation: CI Stepladder Program for Interdisciplinary Research and Learning (SPIRaL). \$250,000

*Recipient of COAST Faculty Research Incentive Award.

<i>COAST Faculty Research Incentive Program</i>	
ROI=6.4:1	
Invested	\$256,614
Requested	\$8.8 M
Secured	\$1.65 M

In Spring 2011 COAST received applications for assigned time funding through the Faculty Research Incentive Program. Eight awards were made to 12 faculty members at nine campuses. The AY 2011-2012 award recipients are

- Dr. Donald Reed (Geology, San Jose): *Using COAST research to promote ocean science foundation through integrated video podcasting, research data-driven exercises and social media: curriculum development across the CSU system.*
- Anne E. Todgham (Biology, San Francisco) and Lars Tomanek (Biological Sciences, San Luis Obispo): *A global perspective on thermal tolerance limits: transcriptomic and proteomic signals of heat stress in intertidal limpets.*
- Patrick Krug (Biological Sciences, Los Angeles) and Angel Valdes (Biological Sciences, Pomona): *RUI: ARTS: Biodiversity of herbivorous sea slugs: how algal diversity and photosynthetic ability affect rates of speciation and endemism.*
- Misgana Muleta (Civil & Environmental Engineering, San Luis Obispo): *Hydrologic prediction uncertainty analysis to control sedimentation of the Morro Bay Estuary.*
- Rebecca Lewison (Biology, San Diego) and Ellen Hines (Biological Sciences, San Francisco): *Creating a spatially explicit risk assessment of fisheries bycatch: a comparative approach.*
- Karen Crow-Sanchez (Biology, San Francisco): *The evolution of novel morphologies in fishes: the basal and most diverse group of vertebrates.*
- Ana Pitchon (Anthropology, Dominguez Hills) and Steven Hackett (Economics, Humboldt): *Alternative market channels for key California fisheries in a landings constrained environment.*
- Aparna Sreenivasan (Science and Environmental Policy, Monterey Bay): *Analysis of cyanobacteria presence and toxicity in freshwater environments in the Monterey Bay.*

CSU professors Rick Starr (Moss Landing Marine Laboratories) and Dean Wendt (California Polytechnic State University) submitted a full proposal titled *Integrating the MLMA and MLPA - Developing new ways to manage California's nearshore fisheries using catch data from marine protected area monitoring* in collaboration with partners from UC Santa Barbara, Stanford University, California Department of Fish & Game and NOAA National Marine Fisheries Service (NMFS). The proposal was one of three selected for full proposal development from a pool of pre-proposals in the California Sea Grant California Ocean Protection Council (OPC) - Focused Research and Outreach Initiative. If funded, the project will demonstrate how data collected at the scale of marine protected areas (MPAs) can be used in fishery models to inform large-scale fisheries management. The total amount requested was \$720,000 over three years. CA Sea Grant requires 50% match from non-federal funds; COAST committed to provide \$20,000 in match. The funds would be used primarily to support student assistantships, thereby supporting faculty research and student engagement.



A tagged fish is released in a marine protected area. Image courtesy of Tom Mattusch.

Collaborative Resource Sharing

The new COAST Collaborative Resource Sharing Program is designed to foster intercampus collaboration and technology transfer by promoting resource sharing across the CSU. The program allows a PI from one CSU campus to apply for funding for highly specialized analyses, services, or use of unique equipment provided by a different CSU campus. Examples include proteomic analysis, use of autonomous underwater vehicles, seafloor mapping services, and inductively coupled plasma mass spectroscopy (ICP-MS). Awards facilitate 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.

The first round of awards made through the Collaborative Resource Sharing Program went to 17 faculty members and research scientists at nine campuses:

- Newell Garfield (Geosciences, San Francisco) and Mark Moline (Biological Sciences, San Luis Obispo): *Monitoring a channel depth using the Cal Poly autonomous underwater vehicle and integrated equipment.* \$5,300
- Carl J. Carrano (Chemistry and Biochemistry, San Diego) and Andrew Z. Mason (Biological Sciences, Long Beach): *Iron uptake and storage in marine algae and cohabitating bacteria.* \$6,500
- Anne Todgham (Biology, San Francisco) and Lars Tomanek (Biological Sciences, San Luis Obispo): *Protein and gene expression in thermally stressed intertidal limpets: a mechanistic primer to predict the effect of climate change on marine organisms.* \$8,200
- G. Jason Smith (Moss Landing Marine Laboratories, San Jose) and Thomas Savage (Chemistry, Sacramento): *Collaborative sharing of gas chromatography-mass spectrometry resources at Sacramento State for studies elucidating the biochemical pathway to domoic acid.* \$2,777
- Bengt Allen (Biological Sciences, Long Beach) and Lars Tomanek (Biological Sciences, San Luis Obispo): *Proteomic responses of rocky intertidal organisms to thermal stress: predicting changes in community structure and ecosystem function in response to a warming climate.* \$5,000
- Diana Steller (Moss Landing Marine Laboratories, San Jose) and Rikk Kvitek (Science and Environmental Policy, Monterey Bay): *Utilizing the CSUMB acoustic habitat mapping assets to delineate the shallow-water rhodolith beds at Catalina Island, California.* \$5,000
- Sean Craig (Biological Sciences, Humboldt), Joshua Mackie (Biological Science, San Jose) and Frank Cipriano (Biology, San Francisco): *Microsatellite analysis of globally invasive bryozoans (*Watersipora* spp.) introduced to California.* \$4,800
- Danielle Zacherl (Biological Science, Fullerton) and Andrew Z. Mason (Biological Sciences, Long Beach): *Do California grunion, *Leuresthes tenuis*, return to their natal beach to spawn?* \$6,080

Research Support for Undergraduate and Graduate Students

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. For Summer 2011 COAST provided \$88,500 to a total of 59 students at 15 campuses through this program (Table 1). Each of the 10 undergraduate and 49 graduate students received \$1,500. When combined with support provided during the academic year, the total awarded to students through this program in 2010-2011 was \$177,500.

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 \$16,557 in travel support to three undergraduate and 17 graduate students to make either oral or poster presentations at regional, national and international meetings (Table 2).

Due to institutional travel restrictions, a graduate student from California State Polytechnic University Pomona could not complete her trip to La Paz Mexico to present the results of her research at the 44th Annual Meeting of the Western Society of Malacologists. Upon request from her advisor and department, she was permitted to use her travel award to complete a sampling trip to Hawaii with her fellow graduate students and advisor.

Testimonials from AY 2010-2011 COAST Student Marine Research Award Recipients

“In addition to being proud to receive an award that recognizes my contribution to research at SDSU, I appreciate the fact that given these challenging economic times this generous award represents a valuable resource.”

*- Mary Thomas,
SDSU Doctoral Student*

“My COAST experience nurtured my interest in a future career as a marine biologist by providing me with an opportunity to think critically about marine research, as well as developing my ability to plan, problem solve and collect data for scientific research projects. I am very grateful to the COAST program and all of its contributors for this wonderful opportunity”

*- Kellan Korcheck,
HSU Undergraduate Student*

Table 1. COAST Summer 2011 Student Awards for Marine Science Research

Campus	Student*	Advisor	Title
Bakersfield	<i>Kushwinder Gill</i>	Antje Lauer	Identification of antimicrobial epibiotic bacteria associated with <i>Watersipora subtorquata</i> an invasive bryozoan species
Dominguez Hills	<i>Jessica Williams</i>	Ana Pitchon	Bridging the market gap: educating fishermen and the public for sustainable seafood and communities
East Bay	<i>Mike Huynh</i>	James Murray	Photodetection and circadian rhythms in the nudibranch mollusk <i>Tritonia diomedea</i>
	Lucy Ogbu-Nwobodo	James Murray	Infectious microbes in the skin of marine sea slugs <i>Tritonia diomedea</i>
	Nathan Shapiro	James Murray	The chemical defense of the nudibranch <i>Tritonia diomedea</i> as a potential source of novel bioactive compounds
Fresno	Vu Tran	Monika Sommerhalter	Cholinesterase activity in <i>Tritonia diomedea</i>
	Takashi Abiko	Mathieu Richaud	Sediment provenance and dispersal along a tectonically-active coastline: A case study of the Morro Bay littoral cell, California, USA
	<i>John Berriman</i>	Danielle Zacherl	Do California grunion, <i>Leuresthes tenuis</i> , return to their natal beach to spawn?
Fullerton	Laura Elsberry	Jennifer Burnaford	The effects of low tide exposure on two seaweeds from two geographic regions
	<i>Patricia Gonzalez</i>	Jennifer Burnaford	Effects of thermal stress on filtration in native and non-native oysters of Newport Bay
	Kimberly Walker	Danielle Zacherl	Vertical migratory behavior of the Olympia oyster, <i>Ostrea lurida</i> , in a southern California estuary and in the laboratory
	<i>Chris Waterston</i>	Danielle Zacherl	Restoration of Olympia oysters, <i>Ostrea lurida</i> , in Newport Bay, CA
	Tania Sara Asef	Christine Whitcraft	Ecological implications of the genetic structure of the tamarisk invasion in Tijuana Estuary and San Diego Lagoon
Long Beach	Emily Blair	Christine Whitcraft	Active restoration of a southern California salt marsh: determining optimal planting regime based on community structure and maximized habitat cover
	Lindsay Darjany	Jesse Dillon	Characterization of microbial carbon cyclers in a Southern California salt marsh using stable isotope probing
	Erin Schaadt	Jesse Dillon	Biogeographical variation in the diversity of cultivable marine microorganisms along the Pacific Coast of North America
Los Angeles	Thomas TinHan	Chris Lowe	Long-term horizontal and vertical movement patterns of yellow snapper (<i>Lutjanus argentiventris</i>) and leopard grouper (<i>Mycteroperca rosacea</i>) at a spawning aggregation site and no-take marine reserve, Los Islotes, Gulf of California
	Jennifer Aleman-Zometa	Carlos Robles	Landscape disturbance regimes: pattern and process in the mussel bed archetype
	Hanna Koch	Patrick Krug	Life at the edge: a study of the factors controlling local adaptation and setting range limits for the estuarine sea slug, <i>Alderia willowi</i>
<i>*Undergraduate students italicized</i>			

Table 1 continued on page 7

Table 1. COAST Summer 2011 Student Awards for Marine Science Research

Campus	Student*	Advisor	Title
Monterey Bay	Shandy Buckley	Erika McPhee-Shaw (MLML)	The influences of oceanographic conditions on ripple geometry on the Northern California Inner Shelf
	<i>Mark Callaghan</i>	Henrik Kibak	A PCR-based investigation of sample bias in a mussel hybrid zone
	Miles Eric Daniels	Fred Watson	Estimating protozoal removal in wetland systems using a multi-scale model-based approach
	Brynn Hooton	Michael Graham (MLML)	Associations between fishes and the invasive kelp <i>Undaria pinnatifida</i> in Central California
	Sara Hutto	Michael Graham (MLML)	Differential recruitment of <i>Postelsia palmaeformis</i> across substrate types: an intertidal algal facilitation?
	<i>Kevin Johnson</i>	Aparna Sreenivasan	Comparing the abundance and diversity of toxic freshwater cyanobacteria in two Central California coastal lakes
	<i>Heather Kramp</i>	James Lindholm	Habitat associations of the spotted ratfish (<i>Hydrolagus colliei</i>) in the Monterey Bay National Marine Sanctuary
	Tanya Novak	Erika McPhee-Shaw (MLML)	Nitrate transport to coastal Monterey Bay: investigating source inputs from Elkhorn Slough
	Anya Brown	Robert Carpenter	Alteration of oxygen concentrations within interactions of corals and algae: implications for outcomes of coral-algal competition
	Jennifer Gowan	Robert Carpenter	Coral-algal interactions along flow and sedimentation gradients
Pomona	Barbara Sanchez	Mark Steele	The effects of pollution on growth and fecundity of <i>Paralabrax nebulifer</i> (barred sand bass) in southern California
	Dieta Hanson	Angel Valdes	The invasive bubble snail <i>Haminoea japonica</i> , using molecular tools to understand its spread throughout North America and Europe
	Matt Brown	Matthew Edwards	The effects of climate change on herbivore/prey interaction
San Diego	Brenna Bulach	Matthew Edwards	Ocean acidification on California coralline algae
	La Kenya Evans	Matthew Edwards	The bioaccumulation of copper and zinc in giant kelp and the subsequent trophic transfer to grazers
	Ryan Jenkinson	Kevin Hovel	Biogeographical variation in community structure of temperate reefs of the Southern California Bight
	Emily Jones	Jeremy Long	Linking consumer effects with physiological processes
	Christopher Kent Kwan	Jeremy Long	Community-level effects of pollution disruption on chemical communication among marine organisms
John Matthews	Brian Hentschel	<i>In-situ</i> adult-juvenile interactions of the spionid polychaete, <i>Polydora cornuta</i>	
Andrea Pesce	Matthew Edwards	The physiological response of kelp forest macroalgae to climate change	

*Undergraduate students italicized

Table 1 continued on page 8

Table 1. COAST Summer 2011 Student Awards for Marine Science Research

Campus	Student*	Advisor	Title
	Brittany Bjeide	Anne Todgham	Thermal stress impacts on cardiac performance and metabolism of intertidal limpet <i>Lottia digitalis</i> under emersion versus immersion conditions
	Sara Boles	Anne Todgham	Assessment of developing <i>Ostrea lurida</i> larvae performance under global climate change induced stressors
	Christina Buck	Frances Wilkerson	The effects of nutrients and coastal oceanographic processes on phytoplankton in Drakes Estero Marine Conservation Area, CA
	Lina Ceballos	Jonathon Stillman	Developmental effects of ocean acidification on porcelain crab larvae
	Autumn Cleave	Katharyn Boyer	Effects of <i>Limonium ramosissimum</i> on native salt marsh communities in a changing environment
San Francisco	Carrie Craig	Sarah Cohen	Exploring the potential for adverse genetic effects of population decline in the copepod <i>Eurytemora affinis</i> in the San Francisco Estuary
	Gwen Santos	Kathy Boyer	Nutrient dynamics and production in SF Bay eelgrass (<i>Zostera marina</i>) beds: food web and restoration implications
	Elizabeth Sheets	Sarah Cohen	Using a genetic approach to investigate invasion patterns of a colonial botryllid ascidian along the Pacific Coast of North America
	Carissa Shipman	Sarah Cohen	Diversity and host specificity of the endoparasitic copepods (<i>Splanchnotrophiidae</i>) infecting Californian and Philippine opisthobranchs with special emphasis on the molecular and morphological systematics of this copepod family
	Martha Velez	Frank Cipriano	Identification of an accurate sampling technique to detect OTHV-1 in California sea lions
San Jose	Edem Mahu	Kenneth Coale (MLML)	Novel evaluation of biotic impacts to hemipelagic sediments contaminated by off-shore drilling/oil spills
	Carolyn Ewers	Dean Wendt	Characterization of eelgrass (<i>Zostera marina</i>) productivity in a California estuary to help model the effects of sea-level rise on future distributions
San Luis Obispo	Anniken Lydon	Mark Moline	Use of a novel pyrosequencing approach for microsatellite sequencing of laminarian kelp to address sub-population diversity along the California coastline and connectivity between California's marine protected areas
	Timothy Peters	Christopher Clark	Developing a visual tracking system for small marine animal research
	Johanna Weston	Mark Moline	Nitrogen budgets in a coastal estuary
	Joshua Cutler	Daniel Crocker	Measuring foraging success and critical habitat use in diving marine predators
	Preston Malm	Karina Nielsen	Response of amphipod populations of <i>Megalorchestia</i> spp. to macrophyte wrack subsidies on sandy beaches of northern California
Sonoma	Adele Paquin	Karina Nielsen	Patterns of nearshore phytoplankton abundance and composition within a Northern California upwelling cell
	Jill Stokes	Karina Nielsen	Effects of environmental stressors on net photosynthetic rate and carbon gain in the intertidal kelp <i>Saccharina sessile</i>
	Michael Tift	Daniel Crocker	Quantifying the stress response in free-ranging marine mammals

*Undergraduate students italicized

Table 2. COAST 2010-11 Student Travel Awards

Campus	Student*	Faculty Mentor	Conference	Location	Amount
East Bay	<i>Cara Gallagher</i>	James Murray	Society for Integrative and Comparative Biology (SICB) Annual Meeting	Salt Lake City, UT	\$686
Humboldt	Robert Koepfel	Sean Craig	International Conference on Shellfish Restoration	Charleston, SC	\$800
Long Beach	Dwight Causey	Kevin Kelley	Society for Integrative and Comparative Biology (SICB) Annual Meeting	Salt Lake City, UT	\$983
	Claire M. Waggoner	Kevin Kelley	Society for Integrative and Comparative Biology (SICB) Annual Meeting	Salt Lake City, UT	\$1,001
Monterey Bay	Steven Quan	Rikk Kvitek	American Geophysical Union (AGU) Fall Meeting	San Francisco, CA	\$368
	Scott Toews	Corey Garza	40th Annual Benthic Ecology Meeting	Mobile, AL	\$1,000
	Carolyn Rosevelt	Marc Los Huertos	5th International Marine Debris Conference	Honolulu, HI	\$1,000
Pomona	<i>Alexandra Davis</i>	Rikk Kvitek	40th Annual Benthic Ecology Meeting	Washington, D.C.	\$1,000
	Dieta Hanson	Angel Valdes	see text page 5	Maui, HI	\$1,000
San Diego	Ryan Jenkinson	Kevin Hovel	40th Annual Benthic Ecology Meeting	Mobile, AL	\$999
	Christopher Castorani	Kevin Hovel	40th Annual Benthic Ecology Meeting	Mobile, AL	\$1,000
	Collin L. Jones	Todd Anderson	40th Annual Benthic Ecology Meeting	Mobile, AL	\$697
San Francisco	Dana Morton	Todd Anderson	40th Annual Benthic Ecology Meeting	Mobile, AL	\$1,000
	Autumn Cleave	Katharyn Boyer	Bay - Delta Science Conference	Sacramento, CA	\$416
	Brian D. Bill	William P. Cochlan	14th International Conference on Harmful Algae	Hersonissos, Greece	\$1,000
	Tricia Goulding	Sarah Cohen	Society for Integrative and Comparative Biology (SICB) Annual Meeting	Salt Lake City, UT	\$700
San Jose	Christina Buck	Frances Wilkerson	American Society of Limnology and Oceanography (ASLO) 2011 Aquatic Sciences Meeting	San Juan, Puerto Rico, USA	\$988
	Martha Velez	Frank Cipriano	International Marine Conservation Congress	Victoria, BC, Canada	\$1,000
*Undergraduate students italicized	<i>Paul Tompkins</i>	Diana Steller (MLML)	Western Society of Naturalists 2010 Annual Conference	San Diego, CA	\$650
	Cairbre Fanslow	Josh Mackie	Western Society of Naturalists 2010 Annual Conference	San Diego, CA	\$269

Federal Work-Study Pilot Program

In 2010-2011 COAST initiated a pilot project with CSU Los Angeles and Humboldt State University to increase the number of federally funded work-study students participating in coastal and marine research. COAST provided \$5,000 to each campus as the required 25% institutional match.

Two graduate students at CSULA, Steve Resendez and Francisco Pena, participated in the program. Both are graduate students in Mechanical Engineering with Dr. Samuel Landsberger, Department of Mechanical Engineering and Kinesiology. Steve and Francisco are working on the SubBot project, the goal of which is to design submersible robots that can provide real-time online access to data collection and sight-seeing around California's marine and coastal environments. Using robotic camera systems, researchers and visitors can control what they see and capture video of their exploration. The submarines can be equipped with a plethora of underwater sensors, including night vision capability. This work is being conducted with Dr. Julie Kalman, Mr. Ed Mastro and Mr. Larry Fukuhara of the Cabrillo Marine Aquarium.

At HSU, five undergraduate students participated in the program. Environmental Resource Engineering students Adam McGuire and Chuck Swanson worked with Dr. Matthew Hurst, Assistant Professor of Chemistry, and Dr. Frank Shaughnessy, Professor of Biology. Time series water quality data from Humboldt Bay were used to explore links between field and laboratory-based measurements and to understand how light is transmitted through the water column, which has implications for organisms such as eelgrass and oysters. Their research is part of a larger monitoring program of California coastal waters. Oceanography student David Phillip worked with Dr. Jeffrey Borgeld, Professor of Oceanography, to examine suspended sediments from the Eel River during storm events and particulate organic carbon input to the coastal ocean. Another oceanography student, Chris Reinsch, Jr., participated in a broader study of ocean acidification along

the North Coast with Dr. Jeffrey Abell, Assistant Professor of Oceanography. Chris analyzed samples collected along a transect line off Trinidad Head. The results are used by Dr. Victoria Fabry at CSU San Marcos to assess the impact of ocean acidification on commercial shellfish species. Last, Alyssa Guerrero worked with Dr. Sean Craig, Professor of Biology, on the effects of different levels of copper in anti-fouling paints used on boat hulls on marine fouling organisms. Specifically, they investigated the resistance of an invasive bryozoan, *Watersipora* sp., to these copper-based paints.



HSU work-study students deploy a CTD from the R/V Coral Sea. Image courtesy of Humboldt State University.

COAST-CDFG Student Summer Internship Program

COAST and the California Department of Fish & Game (CDFG) developed a summer internship pilot program exclusively for CSU students. Nine students were selected from a pool of 48 applicants. Students worked in the field, laboratory and office with CDFG biologists on a variety of projects including abalone, salmon, sand bass and the scientific collecting permit process. They handled live fish, raised abalone, conducted environmental sampling, and used GIS to visualize data. They learned skills that complement their CSU education and better prepare them to join the workforce. CDFG benefitted from having adequate personnel in the field during a hiring freeze due to the state budget crisis. COAST provided support up to \$1000 per month per student.

COAST-CDFG Summer 2011 Student Interns

(Undergraduate students in italics)

- *Veronica Benavides* (Stanislaus) - Coastal Salmonid Internship, Ft. Bragg, CA
- Nathaniel Bruns (Northridge) - Southern California Sport Fisheries Internship, Los Alamitos, CA
- Autumn Cleave (San Francisco) - Native Fisheries Research Internship, Sacramento, CA
- *Austin Helget* (Sacramento) - Southern California Sport Fisheries Internship, Los Alamitos, CA
- *Carissa Long* (Long Beach) - Coastal Salmonid Internship, Ft. Bragg, CA
- Heidi Lovig (Humboldt) - Coastal Salmonid Internship, Ft. Bragg, CA
- *Athena Maguire* (Sonoma) - North Coast Abalone Research Internship, Bodega Bay, CA
- *Jodie Mazzucchi* (Sonoma) - North Coast Abalone Research Internship, Bodega Bay, CA
- *Elizabeth Parks* (Stanislaus) - Native Fisheries Research Internship, Sacramento, CA



Heidi Lovig (HSU) testing alkalinity. Image courtesy of California Department of Fish & Game.

COAST will continue this partnership with CDFG in 2012 and expand the internship program to include additional partners, such as non-profit organizations like Point Reyes Bird Observatory (PRBO), providing students with a wider variety of host institutions and professional development experiences.

Ballast Water Treatment Testing at the Golden Bear Facility: A CSU-Government-Industry Partnership

The discharge of ships' ballast water is considered the primary vector in the spread of aquatic invasive species. The maritime industry and international, federal and state agencies have made significant efforts to foster the development of commercial ballast treatment systems that will remove or inactivate planktonic organisms from ballast water for the purpose of abating the aquatic invasive species problem. Recently, California Maritime Academy (CMA) and Moss Landing Marine Laboratories (MLML) have teamed with the naval architecture and marine engineering firm, Glosten Associates, Inc. (Seattle WA), to form a Government-University-Industry (GUI) partnership known as the Golden Bear Facility (GBF), presently devoted to shipboard testing of commercial ballast water treatment technologies.

The key ingredient in the GBF partnership is the T/S *Golden Bear*, CMA's cadet training vessel owned by the Department of Transportation, Maritime Administration (MARAD) and operated by CMA. T/S *Golden Bear* remains at dock 8 months of the year in Vallejo, CA where it houses and trains CMA student cadets during the academic year. Every summer, it embarks on an extended 4-month training voyage, providing at-sea cadet training. MARAD has invested over \$1M in a major refit of the ship to allow open-deck installation of large ballast water treatment systems. Prior to the capabilities of GBF, ballast treatment stakeholders such as vendors and federal agencies (e.g., EPA), had to arrange for complicated engine-room installations on volunteer ships in order to test treatment systems. The cost of a typical installation could exceed \$500,000. At GBF, treatment systems can now be installed in two days, literally for the cost of crane rental. Bill Davidson and Rich Muller (CMA) provide overall operation of GBF, Dr. Nick Welschmeyer (MLML) provides science testing and methods development, and Kevin Reynolds (Glosten Associates) provides marine engineering expertise and direct links to maritime industries.

The goals of the GBF partnership are to

1. Provide an effective platform, for the research, development, testing and evaluation of technologies and practices that reduce marine vessel environmental impacts.
2. Advance United States merchant shipping and environmental technology business interests.
3. Develop stewards of the environment through CSU student education, community involvement, and maritime business outreach.

In its first year of operation GBF completed shipboard testing of the Balpure electrochlorination treatment system under working conditions in Busan, S. Korea; Kobe, Japan; Guam, USA; and San Francisco Bay. The test resulted in Type Approval of the Balpure System under German

Administration sponsorship, following International Maritime Organization (IMO) regulatory guidelines. GBF recently completed a national intercalibration of ballast test facilities for the U.S. EPA Environmental Technologies Verification (ETV) program and is now engaged in scheduling new treatment vendors seeking regulatory approval to enter the commercial market. Funding for GBF has been provided by MARAD, NOAA and private maritime industry clients, with support from the California State Lands Commission (CSLC), California's lead agency in the regulation of ballast water.

For more information, please contact Bill Davidson, California Maritime Academy, bdauidson@csum.edu, or Dr. Nick Welschmeyer, Moss Landing Marine Laboratories, welschmeyer@mlml.calstate.edu.



GBF team members and representatives of California State Lands Commission (California's lead ballast water regulation agency) view open-deck installation of the Balpure™ ballast water treatment system on T/S *Golden Bear*. Image courtesy Lynn Takata, CSLC.

First Annual Faculty-Student Research Poster Reception

COAST hosted its first annual faculty-student poster reception at the Chancellor's Office on January 25 2011, following the first day of a Board of Trustees meeting. Faculty and student representatives from 20 CSU campuses were present along with the Consortium Representatives from the Ocean Studies Institute and Moss Landing Marine Laboratories.

Each faculty-student team presented a poster on their research and had the opportunity to interact directly with campus Presidents, CSU Trustees and Chancellor's Office staff. Presidents and Trustees had a chance to meet individual faculty members and students, learn about their research and get a sense of the breadth and depth of marine and coastal related research conducted throughout the CSU.

Following the success of this event, a second poster reception will be held at the Chancellor's Office in January 2012 (tentative). Again, each campus will be invited to send one faculty-student team and will be encouraged to send recipients of COAST funding if appropriate.



San Luis Obispo President Jeffrey Armstrong, graduate student Nate Hall, and Dr. Dean Wendt discuss Nate's research at the first annual COAST meeting January 25, 2011, Long Beach, CA. Image courtesy of COAST.

Fourth Annual System-Wide Meeting

The fourth annual COAST system-wide meeting was held on April 28 2011 at the Chancellor's Office in Long Beach. There were roughly 75 participants including representatives from each of the 23 campuses, Moss Landing Marine Laboratories and the Ocean Studies Institute. Students were invited to participate for the first time; 18 students representing 14 campuses attended. The meeting was held back-to-back with the annual CSU Water Resources and Policy Initiatives (WRPI) meeting in order to minimize travel costs for people attending both meetings and to enhance cross-pollination between the two groups. A joint COAST-WRPI reception was held the evening before the COAST meeting to allow COAST and WRPI members to network in a more social setting.

The all-day meeting began with remarks from Chancellor Reed and President Rollin Richmond (HSU) that focused on the importance of COAST and the CSU in a very difficult economic climate. A brief update from each campus on its COAST-related research and activities was followed by a review of COAST's activities and successes in the last year. The three active COAST Networks—Environmental Effects on Marine Life (EEML), Geospatial Research, Education and Technology (GREAT) and Science-Policy Integration—each presented the need and vision for their group along with current and planned activities.

The lunch hour was dedicated to faculty networking and a student working lunch during which the students provided feedback regarding the new student support programs and how COAST could better support and communicate with students in the future. In response, COAST developed a Facebook page in early June (www.facebook.com/CSUCOAST). The page provides news updates and links to employment, funding and additional educational opportunities geared toward students.

During the afternoon, Network breakout groups convened to determine how they can best serve their constituents. The breakout groups also served to engage faculty members not previously recruited to the Networks. A fourth group met to brainstorm about potential themes for future networks. Ideas that generated significant interest included marine biodiversity and conservation, marine science education and outreach, marine renewable resources, geohazards and coastal disturbances, coastal monitoring, and coastal watersheds. The COAST leadership will work with the members to identify leaders to advance these ideas.

The 2012 annual meeting will be held on April 25 2012 at the Chancellor's Office in Long Beach—save the date!

Stakeholder Outreach and Engagement

COAST was a sponsor of the PRIMO 16-Pollutant Responses in Marine Organisms meeting held May 15-18 2011 in Long Beach, CA. This largely international meeting focuses on the effects of anthropogenic contaminants on marine organisms' health and function. Drs. Zed Mason and Kevin Kelley of CSU Long Beach organized the 2011 meeting and encouraged COAST's participation. As a sponsor, COAST was one of a handful of exhibitors on site, had a color, full-page advertisement inside the back cover of the program, and sponsored a special session, Impacts of Changing Ocean Conditions, which featured a presentation by Dr. Lars Tomanek of Cal Poly SLO. This was a successful outreach endeavor that resulted in increasing awareness of COAST and the CSU. We highlighted CSU marine research, recruited several new stakeholders to the Environmental Effects on Marine Life (EEML) Network, and connected with CSU faculty members and students.



COAST was also a sponsor of Capitol Hill Ocean Week (CHOW) in Washington DC June 7-9 2011. Drs. Toby Garfield (SFSU) and Rhea Williamson (East Bay, now at Humboldt) attended on behalf of COAST. In addition to attending CHOW events they had the opportunity to meet with members of the California delegation during a period when they are specifically focused on marine and coastal issues. COAST will continue to participate in this national event and use the opportunity to bring COAST and the CSU to the attention of our federal representatives.

Outlook for the Next Six Months

Over the next six months COAST will

- Announce funding opportunities for AY 2011-12, including Student Awards for Marine Science Research, Student Travel Awards and Collaborative Resource Sharing Awards. These programs will provide \$170,000 in support to CSU faculty members and students.
- Continue to support the federal work-study pilot programs at CSULA and HSU.
- Plan for the second annual faculty-student research poster reception at the Chancellor's Office in Long Beach in conjunction with the January 2012 Board of Trustees meeting. Each campus will be invited to send a faculty-student team to present the results of their research.
- Be an exhibitor at SACNAS 2011 in San Jose, CA. COAST will be one of several institutions in a marine science block and will provide information on CSU marine and coastal resources and opportunities, with the goal of increasing participation in graduate programs throughout the CSU.
- Support the Networks in planning meetings and workshops to engage their members and further their goals.
- Work with new partners to develop additional options for the 2012 Summer Student Internship Program.
- Coordinate with other marine and coastal organizations to effectively engage stakeholders.
- Provide support for faculty to prepare proposals to external funding agencies.



Trinidad Head Lighthouse, Trinidad California. Image courtesy of Humboldt State University.



The California State University

COUNCIL ON OCEAN AFFAIRS, SCIENCE & TECHNOLOGY (COAST)

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