



The Sea Grant Program at USC is one of the oldest in the country, established in 1972 out of the necessity of managing aquatic natural resources in one of the most intensely populated and developed coastlines in the country. The Southern California culture of the “endless summer” places a unique value on its beaches and coastal ocean. Los Angeles County is home to the largest and busiest commercial port-complex and recreational harbor in the U.S. It is no wonder the region became the ideal laboratory to study the effects of urbanization on our coastlines, and why, in the 1980s, USC Sea Grant first coined the term “Urban Ocean,” a theme that continues to characterize our program’s focus.

Although we are one of the smallest programs, we serve the largest (nearly 17 million in five counties) and most diverse population of any Sea Grant program, with residents speaking more than 140 languages. We concentrate on solving the problems of the urban ocean while recognizing the opportunities for coastal commerce and recreation, and for improving the quality of life in coastal regions such as Southern California.

Our program’s research, outreach and education are closely tied to the needs of this urban ocean environment and its residents. We are dedicated to our role as a neutral broker of science that serves the people, ecosystems and wildlife of such a diverse region; and to our role building capacity and connections across people, resources and knowledge to solve our most pressing problems. We place a high value on our extension, outreach and education efforts, ensuring that research funded by USC Sea Grant makes its way into the public realm; managers and policy makers have the benefit of sound science when making decisions, and educators, students and public have access to cutting-edge science.

The goals in the 2009-2013 strategic plan are aligned with the Sea Grant focus areas and closely linked to the science needs and management priorities of California. The expertise of our staff, combined with our ability to build collaborations across stakeholder groups, puts USC Sea Grant in a unique position to lead efforts on a host of projects from sea level rise adaptation planning for the City of Los Angeles to developing training and educational materials on aquatic invasive species for the U.S. Fish and Wildlife Service. The investments made in research have direct management applications and are advancing scientific knowledge on a range of critical issues: the 37 papers published in this reporting period have already been cited more than 400 times in academic publications.



This summary report focuses on challenges that USC Sea Grant has been particularly effective at addressing over the reporting period from 2010 - 2013. Many of our projects complement and build upon our previous work addressing critical issues such as water quality and healthy coastal economies. Several of our projects have established USC Sea Grant as a leader and key resource on emerging issues such as climate change adaptation and marine protected areas.

USC Sea Grant’s 2009-2013 strategic plan outlines several cross-cutting goals that are important to the urban ocean environment of Southern California. Cross-cutting goals reflect important issues that are linked throughout our five thematic focus areas. For example, developing strategies for planning and adapting to the impacts of climate change is a critical cross-cutting goal since future impacts will affect coastal ecosystems, coastal communities, and seafood availability. Similarly, establishing and monitoring a network of marine protected areas in the region affects sustainable seafood, coastal ecosystems and environmental literacy. Although this report is organized by USC Sea Grant’s five main focus areas, please keep in mind that many of our projects also fulfill our cross-cutting goals for a broader societal impact.

2009 - 2013 Cross-Cutting Goals

<div style="border: 1px solid black; padding: 10px; margin-bottom: 10px;"> <div style="text-align: center; margin-bottom: 5px;"> 1 </div> <p>Sound scientific information to advance understanding of the nature and value of our coastal and ocean resources; to identify ways to conserve and use these resources; and to support evaluation of the environmental impacts and socio-economic trade-offs involved in coastal decision making.</p> </div>	<div style="border: 1px solid black; padding: 10px; margin-bottom: 10px;"> <div style="text-align: center; margin-bottom: 5px;"> 2 </div> <p>Decision-making processes that involve the full range of coastal interests; integrate efforts of public and private partners at the federal, regional, state and local levels; provide mechanisms for establishing common understandings, generating outcomes that balance multiple interests.</p> </div>	<div style="border: 1px solid black; padding: 10px;"> <div style="text-align: center; margin-bottom: 5px;"> 3 </div> <p>An informed public that understands the value and vulnerability of coastal and ocean resources, demands science-based decisions about the conservation, use, and management of these resources, and supports a well-trained workforce to make that a reality.</p> </div>
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Report Contents:	
Focus Area: Hazard Resilience in Coastal Communities	2
Focus Area: Healthy Coastal Ecosystems	5
Focus Area: Ocean and Coastal Literacy	10
Focus Area: Sustainable Coastal Development	14
Focus Area: Safe and Sustainable Seafood Supply	18



Focus Area: Safe and Sustainable Seafood Supply

USC Sea Grant participates in this focus area through soliciting and funding applied research on the viability of coastal and open ocean aquaculture and its potential environmental impacts. We also provide a leadership role by working with stakeholders, for example by co-hosting workshops on aquaculture with the Long Beach Aquarium of the Pacific. Moreover, USC Sea Grant is instrumental in connecting schools and the public with resources and curriculum on the importance of maintaining ecosystem health for a safe and sustainable seafood supply.

Strategic Plan Goal:

- 1 Development of environmentally sustainable coastal and open ocean aquaculture to sustain regional fisheries important for recreational and consumptive uses
- 2 Informed consumers who understand the importance of ecosystem health and sustainable harvesting practices to the future of our domestic fisheries, who appreciate the health benefits of seafood consumption, and who understand how to evaluate the safety of seafood products they buy

In 2013, USC Sea Grant funded a project to test a new type of self-cleaning aquaculture tank design that could greatly improve larval survival rates for three types of fish. Still in the research phase of the study, it has the potential to significantly advance sustainable marine aquaculture in the United States. Results on enhanced larval husbandry techniques will be shared with federal, state and private hatcheries in the U.S. Researchers have also worked with USC Sea Grant's education programs manager to identify a local high school with whom they can continue outreach. Plans are in place to install an aquaculture tank in a classroom where students can raise and release White sea bass and learn about current issues in sustainable aquaculture.

Fisheries managers are faced with the problem of excess bycatch mortality in the sportfishing industry. One such example is juvenile rockfish that are caught, but too small to legally take. They are often just tossed back in the water, however due to barotrauma, they float and cannot descend back to their habitat depth, leading to mortality. Previous USC Sea Grant funded research demonstrated that releasing unwanted rockfish at depth allows the fish to recover from barotrauma and helps to conserve fish stocks. Yet many sport fishermen are not using descending devices and are unaware of the impact of barotrauma on fish.

USC Sea Grant worked with students from Port of Los Angeles High School Environmental Studies program, in partnership with Dr. Chris Lowe from CSU Long Beach, to provide outreach on barotrauma to recreational anglers. The students learned the science of barotrauma and descending devices, experienced sportfishing first-hand, and then developed messaging and an outreach plan for local anglers, including the slogan: Don't Guess, Recompress! Student-led outreach was provided to anglers on local sportfishing vessels, resulting in behavioral changes of

anglers. Outreach was also provided to the school's fishing club and to more than 600 attendees at the Fred Hall Fishing Show as part of NOAA NMFS's booth. (PIER 20841)

California halibut are an important commercial and recreational species, but their populations are depleted from historic levels, as are many other fisheries along the urbanized Southern California coast. Accurate population and gender assessments are extremely important to sustainable management of fisheries, as the greater presence of old, large, fertile female fish usually is an indicator of greater population health and greater recruitment of juveniles for the future population. However, the only method to determine halibut gender was dissection of the fish, resulting in increased mortality in the fishery.

USC Sea Grant funded research to test the accuracy of using portable veterinary ultrasound technology to determine halibut gender. This study found that the ultrasound method of sex determination only resulted in one misidentification of sex (98.8% accurate), proving the method accurate and nonlethal. This technique will enable the California Department of Fish and Wildlife to expand their sex specific data set on California halibut and allow other researchers to conduct sex specific studies using live animals (i.e. tag/recapture studies) that will improve the reliability of the next halibut stock assessment. This study has also contributed to new collaborative research between the California Department of Fish and Wildlife and commercial anglers out of Marina Del Rey, CA, who will be partnering on a new project related to halibut developing methods for citizen scientists to collect essential fishery information. (PIER 19025)

The PI demonstrates visual inspection techniques to students



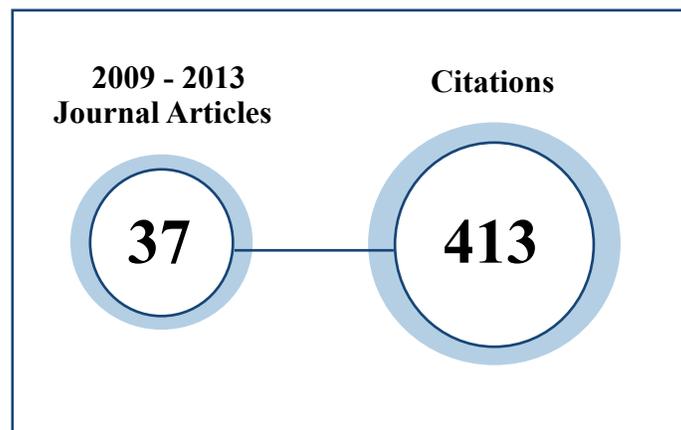
The impacts of pharmaceuticals and personal care products on the marine environment and the safety of seafood are a national concern. Addressing the disposal of pharmaceutical products is critical; however, each state has varying levels of engagement on this issue, and there is little consensus on both the research and effective outreach strategies to change the behavior of consumers and coastal disposal managers. USC Sea Grant joined an initiative initiated by the Illinois-Indiana Sea Grant program to share the results of funded research on this issue nationwide. Collaboration and communication increased the outreach capacity for both network and outside programs, particularly in developing strategies to work with stakeholders on challenging issues such as disposal of pharmaceuticals and personal care products. (PIER 18862)

One effect resulting from pharmaceuticals in coastal waters is endocrine disruption that can affect a variety of fish species including flatfish, surfperch and sculpin. USC Sea Grant funded research that pioneered the use of a cutting-edge technology to determine the extent of endocrine disruption present in fish in Southern California. The new technology – proteomics - maps all proteins expressed in a given tissue, and each protein has its own specific position in the map. All changes in protein expression related to an endocrine disrupting chemical exposure can be seen at one time in a map — especially when compared to the map of a reference fish from a non-contaminated site. Uniquely, proteomics screening has the potential to assess the effects of otherwise undetectable trace contaminants, the synergistic effects of combinations of contaminants, and the effects of still unknown contaminants.

As thousands of protein biomarkers are identified and added into a developing proteomics map screening method, it becomes an increasingly powerful and valuable tool. It is faster and more cost effective than traditional screening methods and the technology has already been shared with environmental managers, policymakers, and in an aquarium exhibit reaching the fish-consuming public. (PIER 17322)



By the Numbers



PIER PRP Program Focus Area Report

University of Southern California Sea Grant

Safe and Sustainable Seafood Supply

Program Focus Area: SAFE AND SUSTAINABLE SEAFOOD SUPPLY

Program Goals

1. Informed consumers who understand the importance of ecosystem health and sustainable harvesting practices to the future of our domestic fisheries, who appreciate the health benefits of seafood consumption, and who understand how to evaluate the safety of the seafood products they buy.

JUMP TO REPORT SECTION

[Full Text of Impacts](#)

[Program Performance Measures](#)

[Objectives](#)

Impacts and Accomplishments toward Program Goals

1. **Program Goal: Informed consumers who understand the importance of ecosystem health and sustainable harvesting practices to the future of our domestic fisheries, who appreciate the health benefits of seafood consumption, and who understand how to evaluate the safety of the seafood products they buy.**

Impact(s)

- o [20841](#) - USC Sea Grant Increases Barotrauma Outreach: Bring that Fish Down!
- o [17322](#) - Environmental Endocrine Disruption in Urban Ocean Fish- Mechanisms, Causes and Public Education

Accomplishment(s)

- o [19025](#) - USC Sea Grant research proves portable veterinary ultrasound is accurate (and non-lethal) for Halibut gender for stock assessments
- o [19020](#) - Sustaining Fishing Communities
- o [18890](#) - USC Sea Grant research proves portable veterinary ultrasound is accurate (and non-lethal) for Halibut gender for stock assessments
- o [18863](#) - Student Stewardship: Don't Guess, Recompress!
- o [18862](#) - Transferring Successful Technologies from the Fish Contamination Network to Understand Impacts of Pharmaceuticals and Personal Care Products on the Marine Environment of Southern California
- o [17547](#) - Sustaining Fishing Communities

[Back to Top](#)

Full Text of Impacts and Accomplishments

20841 - USC Sea Grant Increases Barotrauma Outreach: Bring that Fish Down!

Relevance: Fisheries managers are faced with the problem of excess bycatch mortality in the sportfishing industry. One such example is juvenile rockfish that are caught, but too small to legally take. They are often just tossed back in the water, however due to barotrauma, they float and cannot descend back to their habitat depth, leading to mortality. Previous USC Sea Grant funded research demonstrated that releasing unwanted rockfish at depth allows the fish to recover from barotrauma and helps to conserve fish stocks. Yet many sport fishermen are not using descending devices and are unaware of the impact of barotrauma on fish.

Response: USC Sea Grant worked with students from Port of Los Angeles High School Environmental Studies program, in partnership with Dr. Chris Lowe from CSU Long Beach, to provide outreach on barotrauma to recreational anglers. The students learned the science of barotrauma and descending devices, experienced sportfishing first-hand, and then developed messaging and an outreach plan for local anglers, including the slogan: Don't Guess, Recompress!

Results: Student-led outreach was provided to anglers on local sportfishing vessels, resulting in behavioral changes of anglers. Outreach was also provided to the school's fishing club and to more than 600 attendees at the Fred Hall Fishing Show as part of NOAA NMFS's booth. Several attendees inquired where to purchase descending devices.

RECAP: University of Southern California Sea Grant and a scientist from California State University at Long Beach worked with students to increase the scale and effectiveness of barotrauma outreach to recreational anglers. More than 600 local anglers were reached, and behavioral changes, i.e. using descending devices, were observed onboard fishing vessels.

[Back to Goals](#)

19025 - USC Sea Grant research proves portable veterinary ultrasound is accurate (and non-lethal) for Halibut gender for stock assessments

1. Relevance: California halibut are an important commercial and recreational species, but their populations are depleted from historic levels, as many fisheries have become along the urbanized Southern California coast and most other highly urbanized areas of the world. Accurate population and gender assessments are extremely important to sustainable management of fisheries, as the greater presence of old, large, fertile female fish usually is an indicator of greater population health and greater recruitment of juveniles for the future population. Until this study, the only method to determine halibut gender was dissection of the fish, resulting in increased mortality in the fishery.
2. Response: USC Sea Grant funded research by The Bay Foundation to test the accuracy of using portable veterinary ultrasound technology to determine halibut gender. To reduce stock impact, the study used bycatch from commercial purse seine fleet in Santa Barbara, recreational landings from the Santa Monica Bay as part of the Marina Del Rey Anglers annual halibut derby, recreational landings at the Marina Del Rey Boat Launch, aquaculture stock from Hubbs-SeaWorld Research Institute, and aquaculture stock from the Sea Lab in the Redondo Beach, CA.
3. Results: This study found that the ultrasound method of sex determination only resulted in one misidentification of sex (98.8% accurate). However, it was slightly more difficult to accurately diagnose sex when looking at saved rather than live ultrasound images, due to the added information gained from manipulating the transducer over the gonad. This technique will enable the California Department of Fish and Wildlife to expand their sex-specific data set on California halibut and other researchers to conduct sex-specific studies using live animals (i.e. tag/recapture studies) that will improve the reliability of the next halibut stock assessment. This study has also contributed to new collaborative research between the California Department of Fish and Wildlife and commercial anglers out of Marina Del Rey, CA, who will be partnering on a new project related to halibut (developing methods for citizen scientists to collect essential fishery information).

RECAP: USC Sea Grant funded research proves portable veterinary ultrasound is accurate (and non-lethal) in determining California Halibut gender for stock assessments or tag/release research and has led to a new partnership project between the California Department of Fish and Wildlife and commercial anglers out of Marina Del Rey, California. [Back to Goals](#)

19020 - Sustaining Fishing Communities

1. Relevance: Very little market research or social science has been done on California's fisheries. Many questions stand in the way of managers making decisions on management of the stocks and in the way of anglers themselves making decisions for the future of their businesses. Have traditional processing and market channels become economically dysfunctional? To what extent have regional fishermen, processors, marina operators, and regulators adapted to reduced landings by developing higher value product forms and fostering innovative new market channels? What were the processes that led to those innovations? What are the institutional, regulatory, and other barriers to such innovation? How might lessons drawn from successful (and unsuccessful) product form and market channel innovations in California, Oregon and Washington provide insights for other fisheries and regions of the nation?
2. Response: USC Sea Grant, with California Sea Grant, funded research to address the Pacific Research Priority Area of building a sustainable, regional economy throughout the West's coastal and fishing-dependent communities by identifying innovative responses in key fisheries to heightened restrictions and/or closures. In particular, the research will focus on the use and valuation of marine resources, fisheries management, and the relationships among social, economic and ecological sustainability and resilience of coastal regions.
3. Results: This study has completed the qualitative and quantitative data collection and has completed extensive work on the analysis. The researchers have developed three database that compile: 1) regulations for each of the four targeted fisheries, 2) information on health codes and, 3) historic trends in the four fisheries. These data will allow the researchers to identify which species are seen to be more valuable in terms of economic success in diversified fishing effort, and which species fishers turn to when not fishing for their primary target species. Analyses have found that some regulations inhibit innovation, and that several of these regulations could be easily revised to accommodate fisheries stability in the future. The final analysis will therefore provide recommendations on policy formation in the future in order to enhance rather than limit innovation.

RECAP: USC Sea Grant has funded fisheries research that has almost completed the data collection phase of the study that will analyze how lessons drawn from successful (and unsuccessful) products and market channel innovations in California, Oregon and Washington, and will provide insights in policy development for other fisheries and regions of the nation. [Back to Goals](#)

18890 - USC Sea Grant research proves portable veterinary ultrasound is accurate (and non-lethal) for Halibut gender for stock assessments

1. Relevance: California halibut are an important commercial and recreational species, but their populations are depleted from historic levels, as many fisheries have become along the urbanized Southern California coast and most other highly urbanized areas of the world. Accurate population and gender assessments are extremely important to sustainable management of fisheries, as the greater presence of old, large, fertile female fish usually is an indicator of greater population health and greater recruitment of juveniles for the future population. Until this study, the only method to determine halibut gender was dissection of the fish, resulting in increased mortality in the fishery.
2. Response: USC Sea Grant funded research by The Bay Foundation to test the accuracy of using

portable veterinary ultrasound technology to determine halibut gender. To reduce stock impact, the study used bycatch from commercial purse seine fleet in Santa Barbara, recreational landings from the Santa Monica Bay as part of the Marina Del Rey Anglers annual halibut derby, recreational landings at the Marina Del Rey Boat Launch, aquaculture stock from Hubbs-SeaWorld Research Institute, and aquaculture stock from the Sea Lab in the Redondo Beach, CA.

3. Results: This study found that the ultrasound method of sex determination only resulted in one misidentification of sex (98.8% accurate). However, it was slightly more difficult to accurately diagnose sex when looking at saved rather than live ultrasound images, due to the added information gained from manipulating the transducer over the gonad. This technique will enable the California Department of Fish and Wildlife to expand their sex-specific data set on California halibut and other researchers to conduct sex-specific studies using live animals (i.e. tag/recapture studies) that will improve the reliability of the next halibut stock assessment. This study has also contributed to new collaborative research between the California Department of Fish and Wildlife and commercial anglers out of Marina Del Rey, CA, who will be partnering on a new project related to halibut (developing methods for citizen scientists to collect essential fishery information).

RECAP: USC Sea Grant funded research proves portable veterinary ultrasound is accurate (and non-lethal) in determining California Halibut gender for stock assessments or tag/release research and has led to a new partnership project between the California Department of Fish and Wildlife and commercial anglers out of Marina Del Rey, California. [Back to Goals](#)

18863 - Student Stewardship: Don't Guess, Recompress!

1. Relevance: One of the largest impediments to rockfish conservation is the taking of small fish that experience barotrauma upon being released. A significant number of sportfishers do not realize that using a recompression device and lowering the fish back to depth allows the fish to survive and enhances conservation efforts.

2. Response: USC Sea Grant previously funded research by Dr. Christopher Lowe of California State University Long Beach to investigate survival rates of rockfish when recompressed, and to assess the effectiveness of recompression protocols. Since that time Dr. Lowe has worked with fishing organizations to conduct outreach to sports anglers using a variety of methods. Many anglers are unaware or don't understand the benefits of using a fish recompression device. USC Sea Grant program reached out to the environmental studies program at the Port of LA High School Environmental Studies Program to engage and train high school students in the use of effective communications tools and technology to change angler behavior.

3. Results: A team of 14 students developed a test brochure and distributed 600 brochures at the Fred Hall Fishing Show, a major Southern California venue for fishing tools and technologies. The students conducted outreach on 2 fishing boats, teaching all of the anglers aboard about the importance of using recompression devices and demonstrated proper deployment. They continue working to increase the availability of fish recompression devices in bait and tackle stores, and to make modifications to their communications products. It is expected that in the next year more students will be engaged in Los Angeles and other parts of Southern California, and that additional commercial passenger vessel operators will join the effort.

RECAP: As an initiative to foster understanding of barotrauma in rockfishes and the methodologies for reducing mortality, USC Sea Grant reached out to the environmental studies program at the Port of LA High School Environmental Studies Program to pilot a new program engaging high school students in developing effective tools and technologies to change angler behavior. The pilot effort has been successful in showing the effectiveness of student outreach on both student skills and the sport fisher's understanding of the issues and willingness to make changes in fishing practices. [Back to Goals](#)

18862 - Transferring Successful Technologies from the Fish Contamination Network to Understand Impacts of Pharmaceuticals and Personal Care Products on the Marine Environment of Southern California

1. Relevance: The impacts of pharmaceuticals and personal care products on the marine environment are a national concern. Addressing the disposal of pharmaceutical products is an important and timely concern; however, each state has varying levels of engagement, and there is little consensus on the research and on effective outreach strategies to change behavior of consumers and potentially, of coastal disposal managers.

2. Response: USC Sea Grant's educator joined the initiative initiated by the IL-IN Sea Grant program to share the results of funded research and to help disseminate published findings. She shared with the Sea Grant collaborative the approaches and lessons learned in the public outreach campaign of the Fish Contamination Education Collaborative, which focused on contamination of fish in urban waters.

3. Results: USC Sea Grant communicators shared strategies for publishing research articles and disseminating results to the public and to coastal managers. Partnerships are being formed locally to adapt and implement the curriculum designed by Illinois-Indiana Sea Grant Program.

RECAP: Collaboration and communication with Sea Grant program partners nationwide increases outreach capacity for both network and outside programs, particularly in developing strategies to work with stakeholders on challenging issues such as disposal of pharmaceuticals and personal care products. Practices addressing fish contamination can easily be transferred when addressing other

aquatic issues such as PPCP.

[Back to Goals](#)

17547 - Sustaining Fishing Communities

Relevance: Very little market research or social science study has been undertaken on California's fisheries. Many questions stand in the way of managers making decisions on management of the stocks and in the way of anglers themselves making decisions for the future of their businesses. Have traditional processing and market channels become economically dysfunctional? To what extent have regional fishermen, processors, marina operators, and regulators adapted to reduced landings by developing higher value product forms and fostering innovative new market channels? What were the processes that led to those innovations? What are the institutional, regulatory, and other barriers to such innovation? How might lessons drawn from successful (and unsuccessful) product form and market channel innovations in California, Oregon and Washington provide insights for other fisheries and regions of the nation?

Response: USC Sea Grant, in partnership with California Sea Grant, funded research to address the Pacific Research Priority Area of building a sustainable, regional economy throughout the West's coastal and fishing-dependent communities by identifying innovative responses in key fisheries to heightened restrictions and/or closures. In particular, the research will focus on the use and valuation of marine resources, fisheries management, and the relationships among social, economic and ecological sustainability and resilience of coastal regions.

Results: This study has almost completed the regulations databases, the health codes database, and the historic trends database for the four fisheries of focus in this study. In addition, contacts have been made in all California ports where the target fisheries are landed, and almost 40 interviews with fishermen in the targeted fisheries have been conducted.

RECAP: USC Sea Grant has funded fisheries research for which the data collection phase of the study is nearly complete. The study will analyze how lessons drawn from successful (and unsuccessful) products and market channel innovations in California, Oregon and Washington, and will provide insights for other fisheries and regions of the nation. [Back to Goals](#)

17322 - Environmental Endocrine Disruption in Urban Ocean Fish- Mechanisms, Causes and Public Education

Relevance: Endocrine disruption in urban ocean fish is of great concern in areas like Southern California, but traditional test for evaluating endocrine disruption have been time-consuming, expensive, and dependent on some good guessing.

Response: USC Sea Grant funded unique research done in partnership between academia and a management agency to use a new technology to determine the extent of endocrine disruption present in fish in Southern California.

Results: The results of this project highlight the effectiveness of using proteomics technology in a new capacity - biomarker screening - as a quick, cost-effective and data-rich tool for environmental managers to evaluate environmental impacts of water quality on organisms. This information has already informed the Orange County Sanitation District of changes that could be made to it's regular regional monitoring efforts, and this information is being shared in other venues with managers, policymakers, and even the public who consume the fish through an exhibit in the Cabrillo Marine Aquarium.

RECAP: USC Sea Grant funded research to highlight the effectiveness of using proteomics technology in a new capacity-biomarker screening-as a quick, cost-effective and data-rich tool for environmental managers to evaluate environmental impacts of water quality on organisms, the extent of endocrine disruption of those organisms, and share that information in formal meetings with environmental managers, and policymakers and in an exhibit in a local aquarium for reach the fish-consuming public. [Back to Goals](#)

[Back to Top](#)

Program Performance Measures (2010 - 2013)

Program Performance Measure	Program Plan Target (2010-2013)	Reported	Program Comments
Number of consumers including educators who indicate increased knowledge of nutritional benefits of seafood, safe seafood practices in conjunction with cultural practices in consuming seafood.	260	1,265	2010 - Work completed as part of the NOAA/EPA Fish Contamination Education Collaborative and the partnership with Aquarium of the Pacific Sustainable Seafood Roundtable. Two workshops were held (in Huntington Beach and the Cabrillo Marine Aquarium) coordinated with NOAA/Montrose Settlement on seafood contamination. 2013 - Educators gained knowledge about safe

			and sustainable seafood during educator outreach.
Number of consumers with increased knowledge of nutritional benefits of seafood, safe seafood practices in conjunction with cultural practices in consuming seafood.	260	2,180	2010 - Over 560 participants learned about safe and sustainable seafood through workshops and public outreach. 2011 - USC Sea Grant is a partner of the Fish Contamination Education Collaborative (FCEC). In addition to serving as a community advisor, Sea Grant supports the development of education curriculum, professional development for staff and distribution of angler education materials with Montrose Settlement Restoration Plan partners as well as EPA staff. This year USC Sea Grant helped to revise a lesson in Key to the Sea Educator training. 2012 - 239 teachers and 919 students 2013 - 12 PCEP families learned about safe and sustainable seafood and 70 urban middle school students learned about safe and sustainable seafood choices. 20 high school students learned about and shared with their communities about safe and sustainable seafood as part of the High school marine lab program.
Number of scientists and managers communicated with about coastal and open ocean aquaculture to forward information about opportunities for funding.	20	50	2010 - Broader Impacts of funded Research - Aquaculture USC Sea Grant, along with the three other West Coast Sea Grant programs, co-organized a meeting with industry and academics to understand the impacts of ocean acidification on Pacific shellfish. An initial workshop was held in July 2010, with over 50 attendees.
Number of students who learned about fisheries management through the educational curriculum and modeling tools developed by USC Sea Grant.		60	2010 - What's the Catch? Safe and Sustainable Seafood for Coastal Consumers Teacher workshop and lecture provided educators with the tools and strategies to educate their students about safe and sustainable seafood and how to avoid fish with contamination 2012 - Educators received training in using curricular resources to teach about fisheries resources and the important role of wetlands in supporting healthy fisheries 2013 - Port of Los Angeles high school students worked with scientists, anglers, sea grant and NMFS to develop outreach tools and to provide education on safe and sustainable seafood.

[Back to Top](#)

Program Objectives (2010 - 2013)

Program Objective	Achieved (yes/no)	Program Comments
By 2013 USC Sea Grant will develop standards based education resources for educators and provide workshops to build skills for safe seafood consumption with regard to local fish contamination issues in conjunction with cultural practices.	Yes	2010 - We have already exceeded our anticipated target. 2011 - We have already exceeded our anticipated target.