# URBAN MARINER

USC Sea Grant's Urban Ocean Report
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***Ship to Shore: Linking Science to Policy***

## Loving the Coast to Death

It is no secret that Southern Californians love the ocean, their world-renowned beaches, and the plants and animals that live above and beneath the waves. Millions of Californians and visitors explore the shores each year, enjoying the rocky intertidal zone. During a low tide, you can peek among the rocks and tidepools and find brilliant anemones, sea stars, crabs and other creatures clinging tightly to the rocks, waiting for the returning tide.

Unfortunately, this endless fascination and love of the rocky coastline can cause serious impacts to nearshore ecosystems. Recognizing this threat, the state attempted to protect the rocky seashores of Southern California by designating marine protected areas (MPAs). In Orange County, seven California Marine Life Refuges were created between 1968 and 1970; additional restrictions on recreational collecting and commercial fishing activities in unprotected intertidal areas were added several years later. However, at the time of establishment of these marine protected areas (MPAs), the state did not set up a system to evaluate their effectiveness and use the information to adapt management accordingly.

Professor Steve Murray at California State University in Fullerton has studied coastal marine populations and ecosystems for over 35 years. Dr. Murray's team found that without proper education, signage and enforcement, MPA status unfortunately did little to protect many intertidal organisms, particularly those targeted by collectors on shores accessible to the public. Informed by Dr. Murray's USC Sea Grant funded research, Orange County shoreline communities began to adopt policies to foster the management and stewardship of their rocky intertidal MPAs.


Orange County MPA Council Sign

Visitors in the rocky intertidal in Orange County (Photo: J. Smith)

The cities of Laguna Beach, Newport Beach, and Dana Point, in coordination with local state parks, established positions for shore or reserve managers, who patrol the coast of Orange County during low tides to educate and advise visitors on proper stewardship; they are known as the Orange County Marine Protected Area Council. These managers are now aided by a growing cadre of docents who volunteer their time to educate shore visitors on appropriate tidepool etiquette.

"*Education is often the best enforcement*," says Calla Allison, Marine Protection Officer for Laguna Beach. "*Programs that offer positive and low impact visits to the tidepools, along with consistent and well publicized regulations, and ongoing monitoring and research like Dr. Murray's, are an essential part of the successful regional management plan that the Orange County MPA Council (OCMPAC) is trying to implement*."

**Orange County Marine Protected Area Council**

The OCMPAC is a collaboration of city and county officials, institutional representatives, environmental consultants, academic faculty and nonprofit organization members. Their goal is to set the model for localized implementation of marine conservation efforts through regional communication and cooperation. OCMPAC accomplishments have included county-wide signage, enforcement trainings, teacher workshops, research management and education programs.

For more information visit:
**www.ocmarineprotection.org/**

## At the Helm: From USC Sea Grant

Welcome to the second edition of the Urban Mariner: USC Sea Grant's Urban Ocean Report.

Phyllis Grifman, Associate Director, USC Sea Grant

In the development of Sea Grant's research and outreach programs, we pay close attention to the need for thorough scientific investigation of the many issues relevant to the Urban Ocean. How do we protect and preserve fragile marine ecosystems when millions of people depend upon the ocean for recreation and resources and a wide range of other uses? In the case of Steve Murray's ongoing investigations of anthropogenic impacts on rocky coastlines, we have been able not only to foster important scientific findings, but also to transfer this information directly to coastal and state managers, as well as citizens and school groups visiting the rocky coastline.


Dr. Murray's research revealed that school-sponsored field trips to local tidepools at Orange County beaches were causing great harm to intertidal organisms by trampling, turning over rocks and shells, and disturbing the organisms. Working with the California State Parks, specifically with Crystal Cove State Park in Orange County, we produced a video, "Between a Rock and a Hard Place" to teach visitors how to explore tidepools and enjoy them without causing negative impacts on these fragile environments. This video, along with more structured tidepool education programs developed along the Orange County Coast, has resulted in more educational and less impactful visits to the tidepools and fostered a greater appreciation for marine conservation among K-12 students. Please visit our website for the DVD and to download the video (http://www.usc.edu/org/seagrant/Media/media.html) or watch it on USC Sea Grant's YouTube channel (http://www.youtube.com/user/uscseagrant).

Please contact us with your comments and suggestions: (seagrant@usc.edu).

## In Depth: About the Research

Dr. Murray's team recorded the numbers of people collecting intertidal organisms during low tides for an entire year, witnessing substantial collection activity and trampling, even in protected areas. One person, on average, was collecting during every 10 minutes of low tide; there was no significant difference between unprotected areas and the marine reserves.

Collecting activities on the coast could have more drastic, long-lasting effects than just the simple removal or trampling of individuals. Limpets, trochid snails and urchins are broadcast spawners, releasing gametes (eggs and sperm) into the water. These organisms rely on close proximity of spawning individuals and high concentrations of gametes to increase the probability of fertilization. The larger individuals produce exponentially more gametes and therefore play an important role in producing the next generation. Organisms like the owl limpet even change from male to female as they get older and larger. Humans selectively collect larger individuals: this selection reduces the output of gametes and potentially alters the sex ratios, causing profound effects on population structure. Dr. Murray and Sea Grant Trainee Janine Kido observed this with owl limpets, in locations where human collecting pressure were greater.

Students doing transects in the intertidal (photo: J. Smith)

Dr. Murray's more recent research—on long-term changes in rocky intertidal populations and communities during a period of changes in oceanographic climate and increased urbanization—yields a deeper view of possible community-wide impacts of human disturbance. Dr. Murray and Sea Grant Trainee Aimee Bullard found that macrophyte (seaweeds and seagrasses) community productivity at a highly urbanized site was significantly lower than that of a site less subject to human influence. These primary productivity studies were the first of their kind to be performed on rocky intertidal sites along the urbanized Southern California shore. Further research by Dr. Murray and Lisa Gilbane (see New Horizons section), found that benthic shoreline food webs rely heavily on macrophyte production. Together, both research areas reveal the need for resource management on urban coasts.

## *Scientist's Quarters: About the Researcher*

# Dr. Steve Murray

Dr. Steven Murray at Laguna Beach, CA

Dr. Murray's research over the last 35 years has kept him close to the Southern California coast that he loves so much, but he also is known nationally for his expertise in researching and managing the coastal urban ocean environment.

After receiving his B.A and M.A. from the University of California, Santa Barbara in l966 and l968 and his Ph.D. in 1971 from the University of California, Irvine. Dr. Murray became an assistant professor at California State University, Fullerton (CSUF) in 1971. He received CSUF's highest faculty honor in 2003, its Outstanding Professor Award, and has served as the Dean of the College of Natural Sciences and Mathematics since 2005.

Dr. Murray's scientific expertise reaches beyond his academic career and Southern California to current marine policy and management issues at the state and national level. He has served on many science advisory panels, such as the MPA Federal Advisory Committee (U.S. Departments of Interior and Commerce), the Outer Continental Shelf Federal Advisory Panel (MMS), the Science Advisory Teams for the California Marine Life Protection Act (MLPA) and the Channel Islands Marine Sanctuary, the ASBS (Areas of Special Biological Significance) Science Committee for the State Water Resources Control Board, and the Santa Monica Bay MPA Technical Advisory Committee. Dr. Murray was elected President of the Western Society of Naturalists and the Phycological Society of America. He was recently honored by the Southern California Academy of Sciences as the 2007 recipient of the Wheeler J. North Award for scientific excellence.

For more information on Professor Steve Murray, his lab, and publications, please visit: http://biology.fullerton.edu/people/faculty/steve-murray/

## Loving the Coast to Death

*(cont'd from pg. 1)*

More recent research, funded by USC Sea Grant and the Minerals Management Service (U.S. Department of Interior), focused on long-term changes in rocky intertidal populations and communities over a period of shifts in oceanographic climate and of steadily increasing urbanization of our coastlines. These long-term data sets have made it possible to identify and quantify changes in species abundance and community structure over the last 50 years, and, more importantly, to determine changes due to natural variations in climate and those attributed to human impact. This research is useful for federal and state agencies such as U.S. Department of Interior, California Department of Fish and Game, the California Coastal Commission and the California State Water Resources Control Board, all interested in how these changes may affect monitoring programs in the future and strengthen their ability to determine the impacts of human activities on marine ecosystems.

Students conduct transects in the intertidal (Photo: Susan Zaleski)

Dr. Murray's work is a perfect example of how scientific research and targeted monitoring can help inform and refine management strategies; this is referred to as adaptive management, one of the cornerstones of the Marine Life Protection Act (MLPA) in California. The 1999 act calls for the redesign of California's existing MPAs into a more science-based interconnected network. Dr. Murray has been a longstanding participant in the implementation of the MLPA and currently sits as one of the co-chairs of the South Coast Science Advisory Team, providing scientific advice and evaluation for the stakeholders and policymakers working on the redesign of Southern California's MPAs. Studies like Dr. Murray's have informed the implementation of the MLPA, demonstrating the importance of resource management informed by science. Collaborative and creative solutions to resource protection are indeed possible once a community decides to protect its coastal resources.

***"Sea Grant support allows a researcher to pursue answers to an important and relevant scientific question…I like this kind of work, and so do my students, because I, and they, see a direct connection between their research and its use."***---Dr. Steven Murray

## *Getting Underway: Young Researchers*

In addition to funding and facilitating research and developing partnerships which will ultimately help to address some of the critical issues facing the Los Angeles' urban ocean environment, USC Sea Grant places great importance on development of the next generation of scientists, policymakers, and educators. Below we feature two of Dr. Murray's students, Jayson Smith and Lisa Gilbane, both of whom were influenced by the opportunities for collaboration and policy applications of the Sea Grant funded research in Dr. Murray's lab.

### Dr. Jayson Smith, M.S. Graduate from Dr. Murray's Lab, Currently CSUF Postdoctoral Researcher

Dr. Jayson Smith, (Photo: S. Vogt)

Jayson Smith received his Master's degree in Biology at CSUF as a Sea Grant Trainee in Dr. Murray's lab, assisting in studies on human effects on intertidal populations. His thesis focused on mussel populations; he found that visitor foot traffic and bait removal can significantly reduce the cover of Southern California mussel beds. Jayson went on to receive a Ph.D. in Ecology and Evolutionary Biology from University of California, Los Angeles (UCLA) in 2005. He returned to CSUF as a full time lecturer and postdoctoral researcher, collaborating with Professor Murray. Jayson works to apply research and monitoring in Orange County to an adaptive management system as a member of the Orange County MPA Council (OCMPAC).

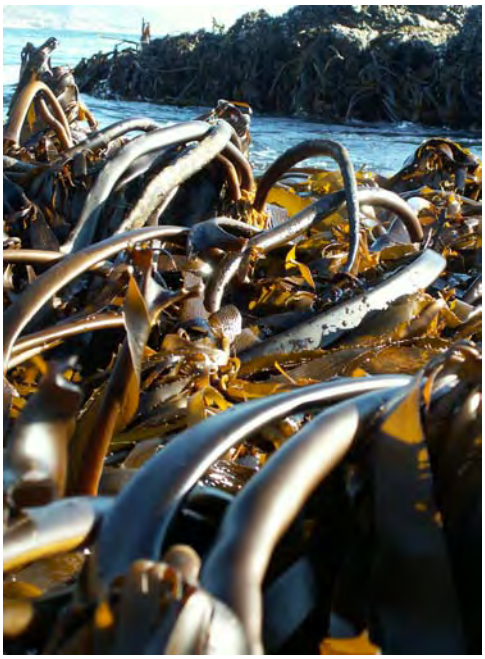
Jayson attributes the development of his career to the experiences that Sea Grant provided him during his early research years. *"I previously believed science and policy were two separate entities only exchanging information whereby the scientist does research and the managers use the conclusions of the research to develop policies."*

Mussel beds (Photo: J. Smith)

"*Through my experiences with Sea Grant and elsewhere, I now see that these two fields cross over and are more closely related. Currently, the scientist plays a more crucial role in interpreting science for use in policy as well as developing management strategies, which balance scientific results with the social implications of the research and subsequent policies*." Additionally, Jayson's work with Sea Grant helped him to learn successful ways to communicate science to managers and decision makers, which he does as an active member of the OCMPAC.

Jayson currently has Sea Grant funding for a joint research project with Steve Murray to investigate the role that invasive seaweeds play in rocky shore trophic dynamics. Here, Jayson and Steve Murray, along with several research students, are determining native herbivore consumption rates and feeding preferences for native and non-native seaweed foods.

For more information on Jayson and his research, visit: **http://biology.fullerton.edu/jasmith/**



Kelp beds (*Eisenia arborea*) in the rocky intertidal (Photo: J. Smith)

**Lisa Gilbane**
**M.S. Graduate of Dr. Murray's Lab,**
**Currently MMS Scientific Researcher**

Lisa Gilbane (Photo: Everett Yee)

As a Sea Grant Trainee in Dr. Steve Murray's lab, Lisa studied the importance of macrophyte (seaweeds and seagrasses) productivity to rocky shore food webs in urban Southern California. Her research was the first study of this kind to be performed on rocky shore populations.

After receiving her Master's degree from CSUF, Lisa managed the marine environmental monitoring and outreach programs for the consortium of major Southern California universities represented by the Southern California Marine Institute (SCMI) in Los Angeles Harbor. In 2008, Lisa was hired by the Mineral Management Service (MMS), and currently works as a biologist with a team of scientists, conducting environmental assessments for current and future energy development on the Outer Continental Shelf along the West Coast and Hawaii.

Lisa's time as a Sea Grant Trainee helped her understand the beneficial interactions of science and policy and led her to the job she has now. "*Working with Steve Murray and with Sea Grant, I saw many examples of how science can be used to direct policy. This experience helped me develop the philosophy that management solutions need to be informed by scientific data and by partnerships with local agencies, enforcement groups, and citizens. Sea Grant provides a neutral place for both sides to come together to get information and make decisions based on the best available science to benefit the community and the environment.*"

In addition to her scientific responsibilities at MMS, Lisa also assists in outreach to students and the general public. She has led several educational seminars on intertidal monitoring and stewardship. According to Lisa, her Sea Grant experience really prepared her to interpret and convey science to non-scientific audiences. She looks forward to continuing her work with MMS in public outreach and applying scientific principles to decision making.

Lisa Gilbane doing educational outreach to a sixth grade class (Photo: Cathy Reznicek)

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