

The Urban Mariner

USC Sea Grant's Urban Ocean Report

Summer 2016



Dr. Sarah Giddings (on the sand) explains how high tide combined with storms can cause damage to infrastructure.

Credit: Astrid Hsu

The Power of the People

Community-based science enriches data gathering and strengthens the relationship between researchers and the public

According to Newton's laws of physics, a person cannot be in two places at one time. This simple fact has severely limited observation-driven science research. A researcher (and perhaps a couple graduate students) only can gather as many data points as they physically can with their own eyes and hands. I'm sure there is not a graduate student out there who has not, at one time, wished she could clone herself!

With the prospect of cloning still a distant pipe dream, some research teams are now turning to community-based science to increase their data-gathering capacity. Community-based science, also referred to often as "citizen science," is a type of research that relies on interested members of the public to be trained to observe and record data points. Projects that need data points across a vast geographic area with many time points can benefit greatly from this type of community-inclusive data gathering. Essentially, in this type of research, more people means more data.

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But what is the quality of this data? That's often the first question from critics of community-based science. The quality of the data depends greatly on two main factors: 1) proper training of all people gathering data; and 2) how much the data collection protocol can be influenced by the variation of the individual people gathering it. In other words, if you design a project that is hard to teach and open to individual interpretation, then you may not get high quality data. However, if you design a project that is easy to teach and has minimal room for human error, then you may be able to harness the ultimate power of the people while still maintaining quality data.

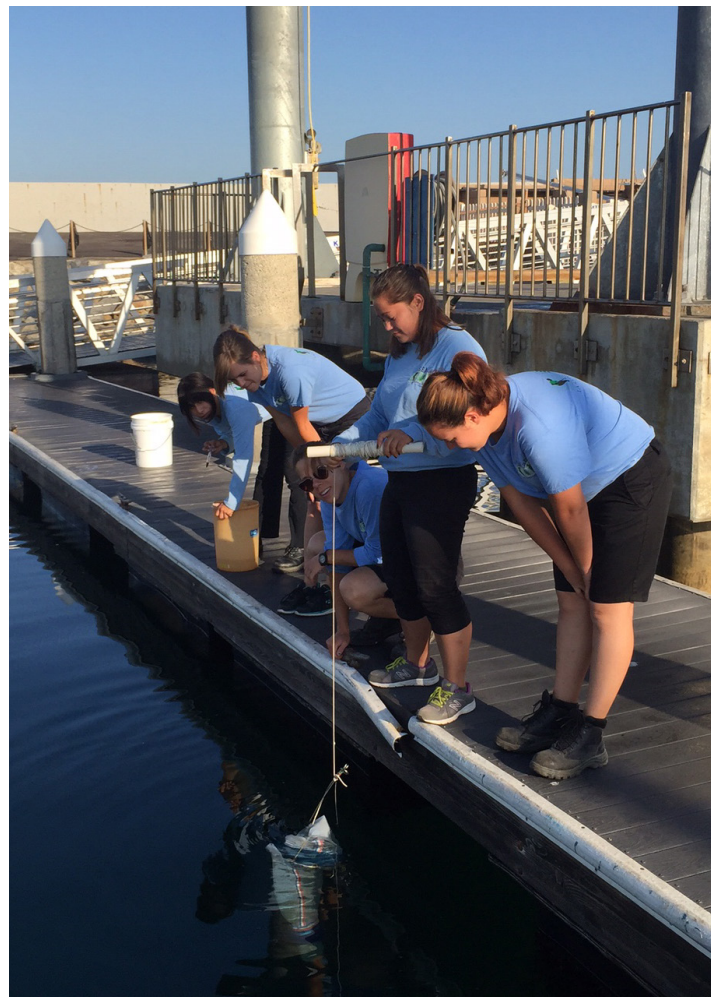
USC Sea Grant has helped fund, organize, and lead a number of community-based science projects in the last five years, and so far these relationships seem to be quite symbiotic; scientists are benefitting from the expanded scope of data coming in from the public, and the public is benefitting from early understanding and support of these ongoing projects.

These projects are bringing together scientists and community members to create opportunities for dialogue and new perspectives around some of our most pressing ocean and coastal issues.

Although there are certainly challenges to conducting community-based science, USC Sea Grant has learned that the benefits can greatly outweigh the challenges. This symbiotic relationship between science and community sets the stage for those often, difficult subsequent steps of translating science into policy, management or behavioral changes. Community "buy-in" can be a significant impediment to translating traditional academically-insulated research science into policy changes and, eventually, community compliance with those changes. In this way, community-based science allows a conversation between researchers, city-planners, resource managers and the public to begin very early on.

The challenges and benefits of marine and coastal community-based science were explored in a first-of-it's-kind symposium, [Citizen Science for Conservation in Southern California](#), held at the Aquarium of the Pacific in Long Beach in February 2016. The symposium covered the vast array of opportunities for community-based marine and coastal science in Southern California, the role of the public in the scientific process, the challenges with data quality, and the role community-science can play in conservation efforts. We expect to see more of these symposiums in the future as this type of research grows!

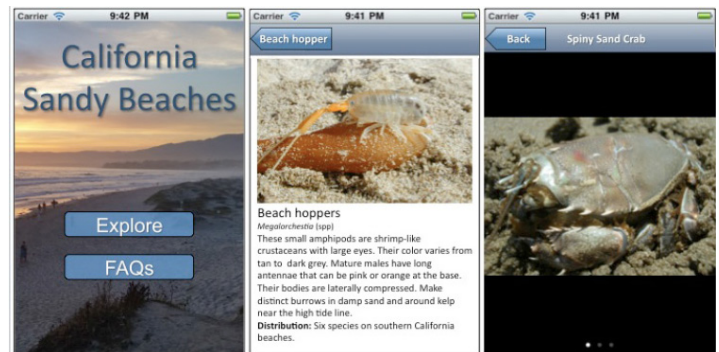
In this sixteenth issue of the Urban Mariner, we explore five of our ongoing community-based science projects—Urban Beach Ecosystem Monitoring, Mobile Beach Erosion Monitoring, Urban Tides Community Science Initiative, HABWatch, and MPA Watch.



Volunteers with SEA Lab collect water samples as part of the HABWatch Community Science Program. Credit: SEA Lab

In Depth: USC Sea Grant's community-based science projects

1 Project: Urban Beach Ecosystem Monitoring



Left: Sandy beach in Dana Point. Credit: USC Sea Grant
Above: Mobile app for All Shore. Credit: All Ashore

USC Sea Grant is funding a community-based science research project being led by co-Principal Investigators, Dr. Karin Martin of Pepperdine University and Jenny Dugan, an Associate Research Biologist with the Marine Science Institute of University of California Santa Barbara. Despite being iconic and universally loved, the white, sandy beaches of urban Southern California suffer from a critical lack of ecosystem information, making it difficult to manage them sustainably. This lack of information is partly due to the vast geographic expanse of the beaches and lack of time series data.

Martin and Dugan have developed a new method for ecological monitoring of sandy beaches. The idea is simple: more people observing means more information. For example, if someone walks a beach at dawn, another person midday, another at sunset and even another in the moonlight, those are 4 time points of data covering almost two tidal cycles. Then, if you can get those data points from many beaches in a region, you start to be able to see patterns you would not be able to see from just two researchers checking a few beaches once a day.

Martin and Dugan have shown that it is possible to develop and implement a protocol for successful sandy beach monitoring by trained, volunteer citizen scientists. They produced a detailed field guide, created a project web site for outreach, including a web portal for data acquisition and database management, and secured a large number of financial and non-financial partners to continue the project and expand the scope of the monitoring in the future.

Preliminary data analysis indicates the species richness, abundance, and biomass of the intertidal community are significantly lower on urban compared to natural beaches. The composition of the intertidal community also differs significantly, with extensive loss of endemic beach taxa and only a small subset of what appear to be resilient species remaining on urban beaches.

For more information: <http://allashore.org>

<http://dornsife.usc.edu/uscseagrant/martin-and-dugan/>



USC Sea Grant is funding a community-based science research project led by Dr. Robert Guza, professor of Integrative Oceanography at Scripps, and Dr. Timu Gallien, a postdoctoral fellow at Scripps. This study is focused on the lack of adequate data on the use of sand berms (barriers) on beaches in Southern California. It is common for management agencies to create sand berms to prevent beach erosion and flooding during storms, high tides and rainfall, but it is much less common for management agencies to track and record the performance of these berms over time. Without more time data on these berms, engineers cannot design better berm models.

The Southern California coast is too vast for one research group to cover, so this project is pilot testing the utilization of community-based scientists in gathering beach erosion data at two heavily used urban beaches: Santa Monica and Seal Beach. The community volunteers are trained to use MoBERM, a mobile platform for data collection that makes it easy for volunteers to record and upload their beach observations. The goals of the project are to use the data gathered by community scientists to help calibrate better models for berm design and to develop a monitoring network with local partners along the Southern California coastline.

The data collected to date confirms that the 2016 El Niño was very energetic, resulting in substantial erosion at San Diego beaches. For example, Scripps Beach lost 0.8-2.5 m (2.6-8.2 feet) of beach elevation between August 2015 and January 31, 2016. On the contrary, some beaches assumed to be eroding, like Seal Beach in Los Angeles, did not erode substantially during the season. Most importantly, the project is proving that citizen scientists are capable of collecting high-quality topographic data using MoBERM. Future plans for this study include deploying MoBERM to alternate locations and processing all data to initialize, calibrate and validate future numerical models for berms.

For more information: <http://dornsife.usc.edu/uscseagrant/guza-and-gallien-2015/>



Top: A volunteer uses the MoBERM tool to collect data in San Diego. Credit: MoBERM project. Bottom: A researcher uses the MoBerm tool to collect data in Seal Beach. Credit: Joe Delgado.



Left: Flooding in the parking lot at La Jolla Shores beach due to extreme high tide. Right: Damage to walking path near Los Peñasquitos Lagoon due to extreme high tide and winter storms. Credits: Dr. Sarah Giddings

The Urban Tides Initiative is USC Sea Grant's community-based science effort to document current tidal lines, beach erosion, and coastal flooding in Southern California. The initiative has designated a series of beach and wetland locations where the public can take photographs of changing tides, erosion, and flooding. Collectively, these photos are helping researchers, government leaders, and community members to visualize current flooding risks, offering a glimpse of what future sea level rise will look like in our beach communities. Urban Tides has already drawn interest and participation from a variety of coastal residents who have observed changes to their beaches and want to better understand the impacts of climate change and severe coastal storms like we have experienced recently with El Niño.

Researchers determine the water level from each photo and use it to help ground truth and calibrate scientific models that project flooding and erosion due to sea level rise and coastal storms. These models are critical tools to help communities adapt to rising seas and protect vulnerable infrastructure and people along our coast.

Urban Tides is a unique way to engage communities in meaningful science, increase ocean and climate literacy, and effectively invite more voices into the discussion of how we can adapt to rising seas.

USC Sea Grant has worked hard to make this project accessible and fun for community members. With either a camera or a phone, a person snaps a picture following some simple guidelines, and then uploads the photo through the Urban Tides web portal. An iPhone app (Android app coming very shortly) further facilitates the quick and easy data entry. Urban Tides evolved from an initial photo contest in 2015 into a unique platform for ongoing data collection and collaboration.

The effort also includes a lesson plan focused on sea level rise and king tides to help schools build the project into their curriculum. Urban Tides "beach walks" are held throughout the year along the Southern California coast. These walks are designed as opportunities for volunteer training, to

take photographs together, and to bring together scientists, residents, students, and managers to spark conversation about our changing coastline.

We have many partners helping to make Urban Tides a success, including researchers at U.S. Geological Survey, Scripps Institution of Oceanography, and the Southern California Coastal Ocean Observing System.

For more information:

<http://dornsife.usc.edu/uscseagrant/urban-tides-initiative/>



This video slideshow highlights images from San Diego to Malibu that community members contributed to Urban Tides in winter 2016:

<https://vimeo.com/163587797>

4 Project: MPA Watch - marine protected area monitoring



Left: MPA Watch volunteers collect data in Santa Monica Bay with LA Waterkeeper. Credit: Tom Boyd

MPA Watch is a community-based science program that empowers stewardship of California's coastal and ocean ecosystems by involving local communities in marine protected area (MPA) monitoring. The program was created by Heal the Bay and USC Sea Grant provided the development funding for this program in 2012. It has now been adopted statewide with 10 nonprofit organizations managing local MPA Watch programs. MPA Watch trains volunteers to observe and collect unbiased and consistent data on human uses of coastal and marine resources both inside and outside of MPAs. For example, volunteers are trained to use compasses to be able to identify the MPA

boundaries and to be able to identify consumptive activities like lobster fishing and shore fishing, as well as non-consumptive uses like SCUBA diving and wildlife watching. LA Waterkeeper also participates in MPA Watch, conducting on-the-water outreach and education trips to monitor human uses of two MPAs within Santa Monica Bay.

Statewide, more than 13,000 surveys have been completed to date. This data compliments data collected by official monitoring groups, resource managers, scientists, and the California Department of Fish and Wildlife to aid MPA evaluation and adaptive management.

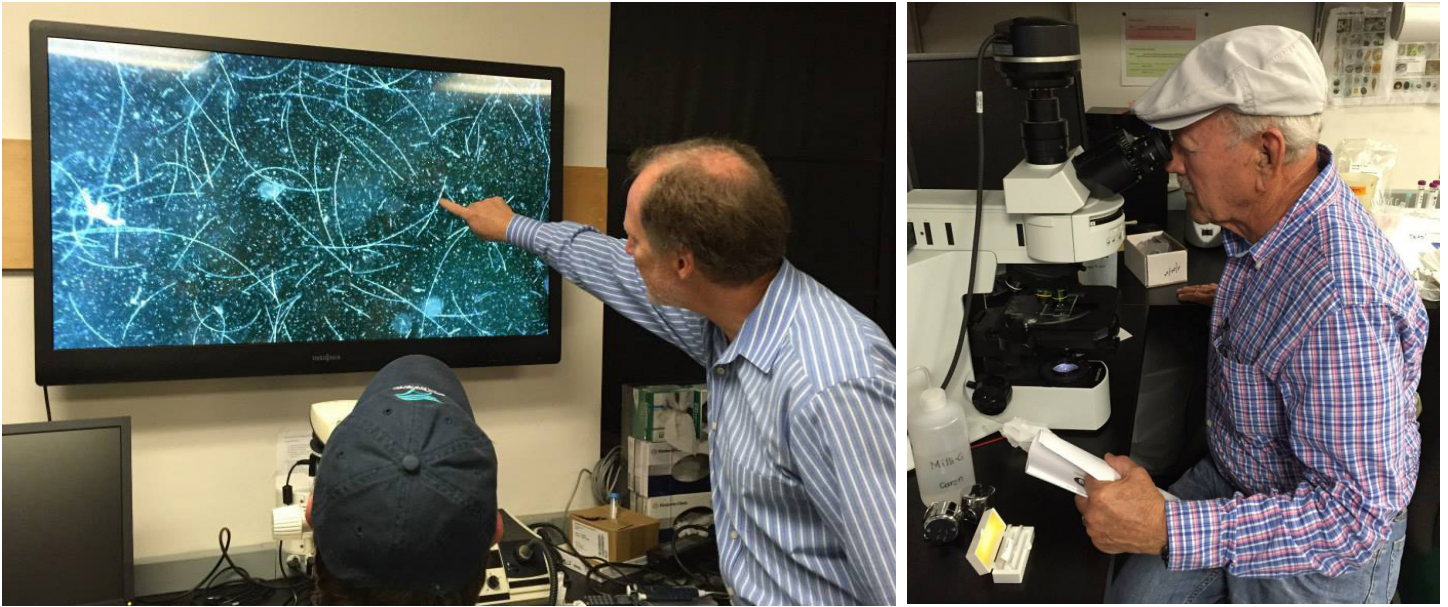
For more information:

<http://www.healthebay.org/get-involved/volunteer/mpa-watch>

<https://lawaterkeeper.org/mpa-watch/>

<http://www.mpawatch.org/site>

5 Project: HABWatch - harmful algal bloom monitoring



USC Professor David Caron trains HABwatch volunteers how to identify species of harmful algae. Credit: USC Sea Grant

One of USC Sea Grant's longest running community-based science programs is HABWatch, which we have sponsored for 5 years along with the Center for Ocean Science Education Excellence West (COSEE-West) and the Southern California Coastal Ocean Observing System (SCCOOS). HABWatch is a network of scientists and volunteers from science centers, aquaria, marine sanctuaries and schools in Southern California who have been trained to monitor their local waters for harmful algal blooms (HABs). Since 2000, there have been numerous harmful blooms in California and 3-4 mass mortality events attributed to HABs where hundreds to thousands of marine mammals and birds have died.

All HABWatch participants are trained to collect water samples, and observe and identify harmful species of algae, such as those that produce toxins leading to fish kills or contaminated seafood. The volunteers are also trained to input the data into a user-friendly web portal designed by USC Sea Grant which is shared directly with the lab of Dr. David Caron of USC, the lead investigator and researcher of HABWatch. One of the critical components to studying HABs is timing, and Dr. Caron and his research team cannot monitor the vast Los Angeles

County coastline continuously. Having volunteers collecting and uploading data often alerts Dr. Caron's lab to changing conditions or the presence of harmful species before a full bloom occurs, allowing the lab to dispatch additional testing teams and supplies to the location in a timely manner.

HABWatch is truly a symbiotic relationship, with both scientists and the public mutually benefitting. The more data coming in to Dr. Caron, the better he can predict harmful blooms, and the sooner he can warn the public about any health concerns of consuming contaminated seafood or swimming in contaminated water. Additionally, HABWatch has generated a network of people who are informed about HABs and can educate others when a HAB is occurring. The same science centers, aquaria, schools and other volunteers who collect HABWatch data can help disseminate the warnings of a HAB when Dr. Caron's lab makes a positive identification.

To learn more about HABWatch, including access to the training videos and presentations:

<http://dornsife.usc.edu/uscseagrant/habwatch/>

First Person

Linda Chilton: Why I'm Passionate about Community-Based Science



Check out an ABC7 interview of USC Sea Grant's Linda Chilton on the Urban Tides Initiative: <https://vimeo.com/148557960>

As USC Sea Grant's Education Programs Manager, I am involved in many community-based science initiatives -- HABwatch, Urban Tides Community Science Initiative, LiMPETS, MARINe, Bioblitz, Grunion Greeters, MPA Watch, Kelpwatch and iNaturalist. For many of these initiatives I recruit and train participants and bring scientists and members of the community together to provide training and support. Over the years I've observed that participants are most engaged and participate in those projects related to their own community because they can see their own input making a difference in areas that they care about.

For students, community-based science is a critical education element to develop science literate community members who are informed about and understand their surroundings. They can identify what their concerns are in their own communities, raise awareness of managers and policy makers, and become informed voters and decision makers.

It is energizing to take what you've learned and then to teach others and engage them or inspire them to participate. I see this happen often when we are doing walks or providing training, when someone not part of the group comes up and wants to know what is happening. The participant in the program then becomes the teacher, reaching out and sharing why what they are doing matters and how it is done.

We often work with groups of people who don't feel they have much access at the table for discussing

"For communities, locally-based science projects provide empowerment."

issues but, they know that through community-based science activities they can be better informed and thus more confident being part of the discussion.

For people who want to get involved in community-based science in the Los Angeles area, there are many local groups that are good sources of information and opportunity. I collaborate with many of them, such as Los Angeles County Natural History Museum, LA Waterkeeper, Heal the Bay, National Park Service, Channel Islands National Marine Sanctuary, Global Learning and Observations to Benefit the Environment (GLOBE) Program, Southern California Aquarium Collaborative, Audubon Society, California Naturalist Program, Montrose Settlement RP Angler outreach program, and of course, USC Sea Grant. There are many, many others – I suggest people find an area, issue or problem that interests them, and seek opportunities at the many non-profit organizations in the Los Angeles area.

I encourage you to take time to watch, observe and learn in order to get to know the environment and recognize the changes that are occurring - you never know what you will find.

Interview

Brie Iatarola: Ph.D. student, avid surfer, and community science volunteer

One way to explain community science is that it is a “conversation” between the public and research scientists. And this is exactly the word that Urban Tides Community Science Initiative volunteer, Brie Iatarola, uses to describe her experience with the initiative in San Diego.

USC Sea Grant: Hi Brie. Thanks for talking with us. Can you tell us a little bit about your background?

Brie: I was born and raised in Tucson, Arizona, and studied journalism at Arizona State University. I moved to San Diego in 2005 to surf and ended up back in grad school four years later. I have a master’s degree in Latin American Studies from UC San Diego.

USC Sea Grant: And now you are getting your Ph.D?

Brie: Yes, I am a doctoral candidate in UCSD’s Communication Department. My research examines the complexities of coastal development and environmental politics, with a focus on San Onofre State Beach and the “Save Trestles” campaign.

USC Sea Grant: How did you first hear about the Urban Tides Community Science Initiative?

Brie: I first heard about Urban Tides via social media.

USC Sea Grant: What made you want to participate?

Brie: I wanted to participate for many reasons, the first being that I care about the ocean and consider it my second home. I am on board with Urban Tides’ goal to create a repository of visual data for scientists, and I think this is a great way to keep a conversation going about the short- and long-term impacts of beach erosion, extreme tides and El Niño.

USC Sea Grant: A conversation is a great way to describe this type of initiative, at least that’s one of the goals. Do you feel like that conversation has been occurring between you and scientists?



Urban Tides Initiative volunteer Brie Iatarola.

Brie: Yes, I think it’s great when scientists are willing to collaborate with the public and invite them into their “labs.”

“It is even better when universities become the intermediary to share knowledge because it confirms education and on-the-ground observations are valuable.”

I think it is so interesting that a simple photo from my phone and brief notes about my observations can be used to create models that help scientists better understand the environmental effects of

El Niño. I actually received some feedback on my photos from an oceanographer at USGS, which makes me happy that the database is being utilized.

USC Sea Grant: That's great. And you haven't had any trouble with the technology for submitting photos?

Brie: No trouble. Taking photos with my phone and submitting them via the "Liquid" app has been easy.

USC Sea Grant: What locations have you been photographing since joining Urban Tides?

Brie: Once a week I drive to San Onofre State Beach, park at Cristianitos, walk down the Panhe Trail, and make my way toward Trestles. Five surf breaks make up Trestles, and I am photographing three of them: Cottons (which technically borders San Clemente State Beach), Lower and Middles.

USC Sea Grant: What have you noticed since starting to photograph these locations?

Brie: It's clear that these major west-northwest swells and windy days that we have been experiencing this winter are having a field day

with the slope of the sand. Beach erosion is hard to ignore when I walk. I began taking pictures in early January right after a major El Niño storm in San Diego. There had been some mild flooding south of Middles, but walking along the beach at mid-tide wasn't too difficult. Since then, there have been some weeks where the sand is at such a slope that I have to move to higher ground so I don't topple over as I walk to the breaks.

USC Sea Grant: Any other observations in San Diego as a resident and surfer?

Brie: Blacks, one of my favorite surfing spots, is a living example of how El Niño is affecting Southern California's coast. UC San Diego closed the main road for repairs for a week in early March due to damage and collapse sustained during winter storms and tidal surges.

USC Sea Grant: What's one thing you have learned since participating in the project?

Brie: The main thing I have learned is that even though San Diego County has not experienced much (or enough) of the El Niño rain, environmental phenomena such as cliff failures



San Onofre State Beach. Credit: Brie Iatarola

and closing estuary mouths are taking a toll on our beaches.

USC Sea Grant: It seems that in addition to your interest in science, your personal connection to the ocean has helped fuel your interest in this project.

Brie: Each time I take a photo, I wonder how Trestles will look a decade from now. When I look at the photos that other volunteers are submitting for the Urban Tides Project, I can't help but feel little pangs of worry and sadness about the fate of our low-lying coastal areas.

USC Sea Grant: But you still seem hopeful?

Brie: This initiative reassures me that I am contributing to a project that future scientists can use to help understand our ocean's past. Plus I have a 7-year-old son, so this initiative has given me a cool chance to teach him about seeing the ocean from the perspective of a citizen scientist.



San Onofre State Beach. Credit: Brie Iatarola

USC Sea Grant: Just for fun and to end on a lighter note, what's your favorite sea creature?

Brie: Ooh, favorite sea creature is definitely a bottle-nosed dolphin. I think I was one in a past life, haha!

About USC Sea Grant

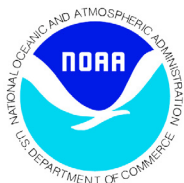
USC Sea Grant contributes to solving the problems of the Urban Ocean, while recognizing the opportunities for coastal commerce, recreation and improving the quality of life in coastal regions. USC Sea Grant has served Southern California since 1972, funding research, communicating research results to government agencies and community stakeholders, and providing information about marine resources, recreation and education to the public. We are one of 33 Sea Grant programs in coastal and Great Lake states administered through the National Oceanic and Atmospheric Administration (NOAA).

This Urban Mariner is written by Charlotte Stevenson with editorial assistance from Holly Rindge and Phyllis Grifman.

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