The Coastal Society

TCS Bulletin
Volume 33 (3) 2010

Progress in Marine Debris Research and Prevention: Part I

By Sherry Lippiatt, Courtney Arthur, Carey Morishige, and Kris McElwee

Unlike many environmental issues, marine debris is a vivid, tangible form of ocean pollution. The ubiquity of the issue and the efforts of several nongovernmental organizations have led to recent media attention, particularly to open-ocean debris. Marine debris has been widely recognized as more than just an eyesore since the 1970s, when researchers began to document the risks of entanglement and ingestion to seabirds and marine mammals (reviewed in Laist, 1986), and the occurrence of plastic particles in surface waters (Carpenter and Smith, 1972). Marine debris research is unique in that it is multidisciplinary by necessity, often serves as a sidebar to a scientist's primary expertise, is easy to conceptualize, engages public interest, and can have significant policy implications. In this two-part article, we will examine advancements in research and prevention strategies and provide a brief look at some of the important work that remains, beginning with marine debris monitoring and assessment, derelict fishing gear, and plastics.

Soon after the emergence of marine debris research and assessment, monitoring was recognized as a necessary first step in addressing the scope, sources, spatial and temporal variability, and impacts of debris. A number of valuable studies have been completed to assess shoreline, pelagic, and benthic debris densities in discrete regions, but a comprehensive global picture of debris types, abundance, and distribution does not exist (see NRC, 2009). The National Marine

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Our Coasts - The Frontline of Climate Change

By Donna Wieting

Not long ago, our Office of Ocean and Coastal Resource Management (OCRM) videotaped interviews with several state Coastal Zone Program and National Estuarine Research Reserve managers. They were from different parts of the country, managing different ecosystems and levels of human uses. We asked them "What are the biggest challenges facing your coastal area?" Their answers varied to some extent, except for one. They all said climate change was one of their most pressing challenges.

That answer did not come as a surprise to us in OCRM. OCRM provides national leadership, strategic direction, and guidance to state coastal management and reserve programs in the 34 coastal and Great Lakes states, territories, and commonwealths. That leadership role has increasingly focused on helping states make investments that will prepare their coastal communities for climate change. In the past year, that role has received new support from the highest levels.

On the Frontline

It's not news that our coastal communities are on the frontline of climate change. Climate change impacts on coastal areas around the country have been increasingly evident--sea level changes, erosion, stormwater runoff, water quality, invasive species, ocean acidification and more intense storms.

The Coastal Zone Management Act, which OCRM administers, recognized the impact of

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climate change back in 1990, when the original 1972 act was amended to include: "Because global warming may result in a substantial sea level rise with serious adverse effects in the coastal zone, coastal states must anticipate and plan for such an occurrence." It goes on to specifically call for states to protect coastal resources and lives from impacts of climate change.

More recently, from the Administration down, policy experts, researchers, coastal managers, and decision-makers in coastal communities around the country have shown a new level of commitment to mitigating and adapting to the effects of climate change on our coastlines. In July, the Ocean Policy Task Force appointed by President Obama released its final recommendations. One of them calls for strengthening resiliency of coastal communities and their abilities to adapt to climate change. And, for the first time in its history, the National Oceanic and Atmospheric Administration (NOAA) is making resilient coastal communities and economies that can adapt to the impacts of hazards and climate change one of four long-term priority goals in its Next Generation Strategic Plan, http://www.ppi.noaa.gov/ngsp.html.

- Global sea level rise is largely attributable to the thermal expansion of the oceans and the melting of glaciers and polar ice sheets resulting from a warming atmosphere (Karl et al. 2009).
- Global average sea level rose 1.7 mm/year in the 20th century and 3.1 mm/year between 1993 and 2003 (IPCC 2007b).
- Recent estimates are that a sea level rise of nearly 20 inches by 2100 would cause $23-170 billion in damage to U.S. coastal property (Ruth et al. 2007).

Connecting to the Coast

NOAA is in a unique position to connect national climate change policy, science, and how-to assistance to the folks who have the day-to-day responsibility of dealing with changing sea levels and eroding beaches. NOAA is creating the new NOAA Climate Service, a major program that will help meet the rapidly growing public demand for information about climate, the changes underway, and the resulting impacts.

National Estuarine Research Reserves are establishing themselves as "sentinel sites," to understand the impacts of climate change on coastal ecosystems. Credit: NOAA

OCRM will work with the Climate Service to deliver information to coastal managers that can be used for their own planning and decision-making. Some of that information will come from the OCRM-funded National Estuarine Research Reserves System System-Wide Monitoring Program (SWMP). Reserves in the system are establishing themselves as "sentinel sites," connecting SWMP to NOAA's ecological and geospatial monitoring capacities to understand the impacts of climate change on coastal ecosystems. These "sentinel sites" should lead to improved predictive models for coastal habitat and community resilience planning.

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OCRM also connects coastal and reserve managers to technical information they need to help their communities plan for climate change. For example, in response to coastal managers' requests for NOAA guidance on climate change adaptation planning, OCRM developed the just-released online publication "Adapting to Climate Change: A Planning Guide for State Coastal Managers." The guide contains science-based climate change information and steps for setting up a planning process, assessing vulnerability, devising a strategy, and implementing the plan. It also includes techniques already being used successfully by coastal managers to address other management issues such as hazards and habitat loss. The guide is posted at http://coastalmanagement.noaa.gov/climate/adaptation.html.

Looking Ahead

Like the coastal managers who identified climate change as one of their major challenges, NOAA and OCRM have made climate change a top priority. But it will take a network of coastal stakeholders to meet the challenges of climate change.

We need better science, observation, and communication to give states and communities the information they need to make informed decisions about risks and cost. Coastal citizens and business owners need to let policymakers know about the implications of climate change for their livelihoods and daily lives. Regional collaborations should encourage the policy and budget support that will be needed to help coastal communities plan for climate change.

Climate change will drive many national and local decisions in the coming decades. Nowhere will it be more important to consider than on our coasts.

More information on OCRM climate change activities -http://coastalmanagement.noaa.gov/climate.html.

The coastal manager interviews: http://oceanservice.noaa.gov/news/features/aug10/climatechange.html

Climate change projections for the coasts -

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Hybrid shoreline stabilization structures that employ marsh plantings and low rock sills (to protect the vegetation) can help stabilize eroding banks. Credit: NOAA

Storm surge on a Louisiana highway shows the potential effects of rising sea levels. Credit: NOAA

Walrus Again Forced to Flee Melting Arctic Sea Ice

For the third time in the past four years Walrus again find themselves forced onto land due to retreating sea ice. Recent reports from the US Geological Survey have shown between ten and twenty thousand Walrus have congregated in a "dense clump" at Point Lay, Alaska. Forced onto land, feeding becomes more difficult and raises concerns that the easily spooked animals will stampede, say wildlife experts. With adult female Walrus typically weighing in at about one ton, the risk is greatest for the younger members of the group. Last year 131 Walrus were trampled when they sought shelter from retreating ice along the shore of Icy Cape, Alaska. Most of the animals killed were juveniles. Similar reports of deadly stampedes have also been reported in the Russian Arctic. In response to the propensity of Walrus to be easily frightened, a buffer zone has been suggested by the Fish and Wildlife Service (FWS), asking ships to maintain a distance of one-half mile from the coast and airplanes to maintain an altitude of at least 1500 feet and lateral distance of one-half mile. The FWS is in the process of considering protecting the Walrus under the Endangered Species Act and must decide whether or not to proceed with listing by January of 2011. Excerpted from Global Warming is Real.

Green algae, scenedesmus. Microphotograph by G. Fahnenstiel

http://www.globalwarmingisreal.com/blog/2010/09/16/walrus-again-forced-to-flee-melting-arctic-sea-ice/

Ocean Life Support Dwindling

Phytoplankton, which are responsible for half of the world's primary production and are the basis of all marine ecosystems, have been declining for more than 100 years, perhaps the result of rising sea temperatures, according to a study published in this week's Nature -- a cause for concern about the health of the Earth's oceans. "It is troubling," said marine scientist David Siegel of the University of California, Santa Barbara, who was not involved in the research. With data dating back to the late 1800s, "this paper finds a long-term trend that's huge," he said. "The phytoplankton community has undoubtedly been changing." Through photosynthetic activities, phytoplankton reduce atmospheric carbon dioxide. Satellite data from the last few decades has suggested that phytoplankton might be on the decline. Excerpted from The Scientist. http://www.the-scientist.com/blog/display/57576/#ixzz10DYLyjkb

Blue Carbon

Mangrove swamps, salt marshes and eelgrass bed ecosystems are very efficient at storing carbon, due to uninterrupted sedimentation and burial of organic debris, the formation of deep roots by plants and the primary production of bacteria, algae, and diatoms which add carbon continuously to the sediment. The Blue Carbon report of 2009, compiled in collaboration with the Food and Agricultural Organization and the United Nations Educational, Scientific and Cultural Organization, assesses the carbon capturing potential of the marine environment and the impact of marine degradation on climate change. It also outlines the way markets might begin paying developing countries for conserving and enhancing the marine environment's carbon capture and storage services and the links between healthy oceans and adaptation to climate change. Another important report is the Management of Natural Coastal Carbon Sinks, by the International Union of the Conservation of Nature, also issued in 2009. Excerpted from EUCC News, August/September. http://www.grida.no/publications/rr/blue-carbon/ and http://cmsdata.iucn.org/downloads/carbon_managment_report_final_printed_version_1.pdf

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Debris Monitoring Program (NMDMP), implemented from 1996 to 2007, was the first major assessment of shoreline debris in the United States; it concluded that population, land use, fishing activity, and oceanic current systems all drive changes in debris density at the regional scale (Sheavly, 2007; Ribic et al., 2010). The variability in debris distribution and the logistics of sampling vast coastlines and oceans have limited global estimates of debris types and abundance (Ryan et al., 2009). Additionally, the need for standardized, statistically rigorous methodologies for analyzing debris density has been recognized (Cheshire et al., 2009; Arthur et al., 2009; Ryan et al., 2009). In the future, successful standardized monitoring programs will provide a basis for the creation of risk assessment and management strategies to reduce and prevent the impacts of marine debris.

Entangled seal. Credit: NOAA Pacific Islands Fisheries Science Center

In certain regions, derelict fishing gear (DFG) comprises a large portion of marine debris and can pose a major threat to marine life (e.g., in the Northwestern Hawaiian Islands; Donohue et al., 2001). DFG can smother habitat, pose a hazard to navigation, entangle and potentially kill marine wildlife, and continue to fish indiscriminately, or "ghost fish" (reviewed in NRC, 2009). Ghost fishing is suggested to have significant impacts on target and non-target species in a number of fisheries (see Matsuoka et al., 2005). In addition, entanglements of threatened and endangered marine species were noted as early as the 1970s (Bourne, 1977). Donohue and Foley (2007) documented a relationship between observed Hawaiian monk seal entanglements and El Niño events, attributed to oceanographic influence on the distribution of debris. Ongoing efforts to improve detection of pelagic DFG using oceanographic models, satellite imaging and aircraft-mounted remote sensing equipment may enable location of DFG at sea (Pichel et al., 2007). Further advancements will provide a mechanism for preemptive removal of DFG from the open ocean before it migrates into sensitive environments, such as shallow coral reefs.

The same innovations in materials science that led to the development of more effective and durable fishing gear paved the way for the "disposable" culture of today. Increased global consumption and production of plastic since the 1950s, paired with improper disposal and recycling failures, have contributed to plastic accumulation in the marine environment (Thompson et al., 2009). The appealing properties of plastic (low molecular weight, durability, low production cost) also make these materials a problematic and persistent pollutant. Plastic debris gained notoriety when items were found in the stomachs of seabirds, which may mistake floating plastics for food (Kenyon and Kridler, 1969). Unlike other materials, plastic debris does not mineralize into the carbon and hydrogen backbone over meaningful timescales in the marine environment, but rather degrades into smaller and smaller pieces. Microplastics (plastic particles < 5 mm, including degradation products, pre-production pellets, and cosmetic exfoliants) have been found in surface waters of the open ocean, on beaches, and in sediments. Studies have shown that microplastics are ingested by a number of invertebrate species (e.g. Thompson et al., 2004; Browne et al., 2008; Graham and Thompson, 2009). In addition to physical impacts from ingestion, a link between persistent organic pollutants and microplastics has been hypothesized since the 1970s (Carpenter

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The Fifth International Marine Debris Conference

The Fifth International Marine Debris Conference (5IMDC) will take place March 20-25, 2011, in Honolulu, Hawaii. The previous four conferences, held between 1984 and 2000, developed recommendations on how to address this ecologically and economically important issue. Some recommendations were implemented, while many others were identified as persistent issues at conferences and meetings over the past 25 years. The 5IMDC is intended to reinvigorate our efforts, provide new tools and information, and inspire innovation. Our success relies on sharing across borders—building upon successes, taking away lessons from others' experiences, and working towards common goals. Participants should expect innovative sessions and workshops, an ambitious agenda, and every opportunity to share and learn from the experiences and passion of others. With a variety of tracks, themes, and session types, the 5IMDC will better position us to move forward, globally and locally, in combating the economic and environmental impacts of marine debris. Visit 5IMDC.org for more information.

et al., 1972). However, a number of unknowns still remain, including the degree to which microplastics may serve as a source of and transport mechanism for organic contaminants and the risk of exposure to organisms (Arthur et al., 2009). Further research investigating the degradation and fate of plastic debris is necessary in order to determine the risk associated with microplastics and associated contaminants. Moret-Ferguson et al. (in press) report a decrease in the occurrence of industrial plastic pellets in the surface waters of the North Atlantic between the 1990's and the 2000's. A shift from pre- to post-consumer plastic debris (also observed in seabird ingestion studies, see Ryan et al., 2009) may indicate the success of industry initiatives to reduce accidental loss and a need for improved waste-management practices.

Microplastic Debris. Credit: NOAA Marine Debris Division

Marine debris research is inherently complex; various types of debris exist, each of which will harm habitats, organisms, and regions in distinct ways. Although marine debris has been recognized as an environmental issue for decades, a good understanding of the quantity, distribution, sources, points of introduction, and the debris life cycle does not exist. However, a great deal of useful research has been completed, and as the field becomes increasingly interdisciplinary it will become necessary to prioritize research, removal, and prevention efforts to attain the greatest reduction of impacts. Furthermore, resource managers can use this knowledge in developing adaptive management strategies. Stay tuned for the second part of this two-part article (in the next issue of the Bulletin), which will discuss on-the-ground outreach, partnership, and prevention activities and how effective policy changes can help mitigate the impacts of marine debris.

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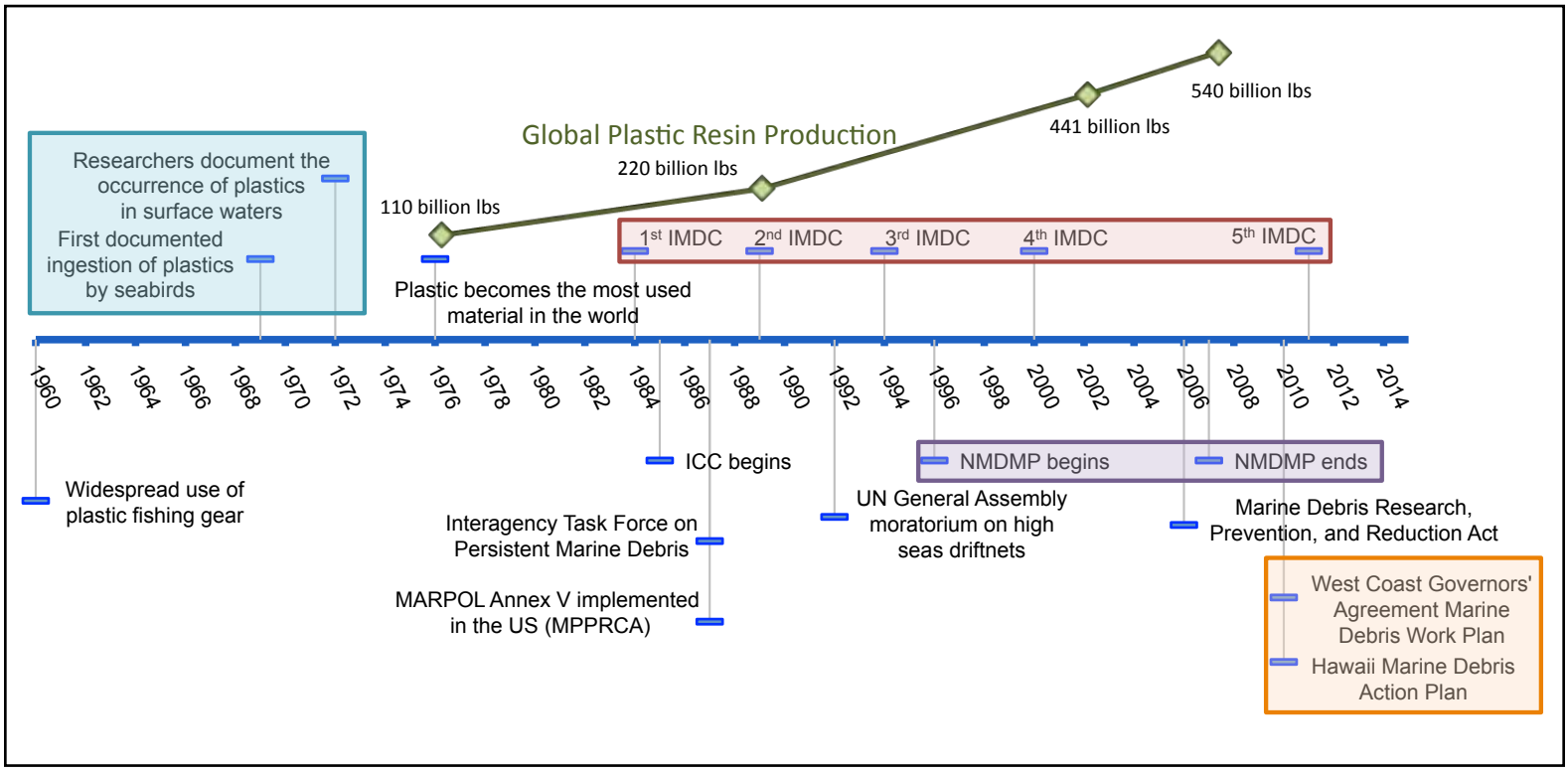

Figure 1 is a timeline of significant events in marine debris research and assessment, plastics use and production, and legislation. The transition to synthetic and non-degradable fishing gear was fairly widespread by the 1960s (MacFadyen et al., 2009). The late 1960s to early 1970s marked the first documented ingestion of plastics by seabirds (Kenyon and Kridler, 1969) and study on plastic debris in surface waters (Carpenter and Smith, 1972). Globally, plastic resin production steadily increased from 1976 to 2007 and plastic became the most used material in the world in 1976 (industry statistics from PlasticsEurope and the American Chemistry Council). International Marine Debris Conferences (IMDCs) were held in 1984, 1989, 1994, and 2000. The Fifth IMDC will be held in March 2011 in Honolulu, Hawaii (see textbox). The Ocean Conservancy's International Coastal Cleanup (ICC) has been held annually since 1985; September 2010 marked the 25th anniversary of the ICC. The National Marine Debris Monitoring Program (NMDMP) ran from 1996 to 2007, marking the first major assessment of shoreline marine debris in the U.S. In 1987, the White House Domestic Policy Council formed the Interagency Task Force on Persistent Marine Debris. That same year, the passage of the Marine Plastic Pollution Research and Control Act (MPPRCA; 33 U.S.C. §§ 1901 et seq.) implemented MARPOL Annex V, banning plastic pollution from U.S. ships (Navy ships excluded) everywhere and from most other ships in the U.S. exclusive economic zone. In 1992 a United Nations General Assembly resolution (46/215) proposed a moratorium on high-seas drift-net fishing. In 2006, the Marine Debris Research, Prevention, and Reduction Act (33 U.S.C. §§ 1951 et seq.) established the NOAA Marine Debris Program and revived the Interagency Marine Debris Coordinating Committee. The West Coast Governors' Agreement on Ocean Health Marine Debris Work Plan and the Hawaii Marine Debris Action Plan were released in 2010 to address the impacts of marine debris in those regions.

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TCS Student Chapters

DUKE UNIVERSITY
This past June, eight Duke University Masters' and Ph.D. students studying coastal environmental management were able to attend TCS22 in Wilmington, NC. Three students had the opportunity to make oral presentations or present posters on their work. This allowed them to share their current projects and learn what others were working on. All the students benefited from being part of a great networking and professional development event, including sitting in on panels and press conferences regarding current marine issues such as the BP oil spill in the Gulf of Mexico. We were especially pleased to be involved in the planning process of the conference and to help develop ideas for student activities at the conference, such as the evening student social. Meanwhile, our summer efforts have been dedicated to the planning and organization of the 10th Annual Neuse Riverkeeper Sprint Triathlon, raising money to support the Neuse Riverkeeper. This event occurs in mid-September; details will be presented in the next issue of the Bulletin!

EAST CAROLINA UNIVERSITY
The ECU Chapter is back from summer fun and/or research and held the first meeting of the semester on August 27th. We captured the new cohort of Coastal Resources Management students as they completed their first seminar and bagged nine new members. We are pursuing the concept of adopting a coastal community to apply our various skill sets. ECU has purchased new software to keep the student groups organized so we are all learning OrgSync and revamping our website accordingly. We have plans for speakers at our monthly meetings and last year acquired funding to bring a major film to campus; we have tentatively scheduled "Sun Come Up" about the relocation of some of the world's first environmental refugees.

UNIVERSITY OF RHODE ISLAND
On September 19th, URI TCS members participated in the Coastweeks Coast Run 5K Road Race for Student Scholarships in Narragansett, RI. Hosted by RI Sea Grant, the race raises money for scholarships and research projects. The Coast Run is part of the 29th annual nationwide Coastweeks, which is celebrated this year from September 16 to October 13, 2010. Our chapter is also proud to announce that we have created a chapter website that individuals (once approved) can visit to read and post items: http://www.uritcs.org.

6th International Conference on Marine Waste Water Discharges and Coastal Environment
October 25-29, 2010, Langkawi, Malaysia
http://www.mwwd.org

Ocean Renewable Energy Group (OREG) 2010 Annual Conference
October 27-28, 2010, Vancouver, British Columbia
http://www.oreg.ca/index.php?p=1_41

3rd International Conference on the Management of Coastal Recreational Resources
October 27-30, Grosseto, Italy
http://www.um.edu.mt/iei/mcrr3-2010

AWRA Annual Water Resources Conference
November 1-4, 2010, Philadelphia, PA
http://www.awra.org/meetings/Philadelphia2010/index.shtml?!

Renewable Ocean Energy & the Marine Environment
November 3-5, 2010, Palm Beach Gardens, FL
http://www.ces.fau.edu/coet

8th Marine Law Symposium
Taking Stock: The Magnuson-Stevens Act Revisited

November 4-5, 2010, Roger Williams University School of Law, Bristol, RI
http://law.rwu.edu/academics/institutes-programs/marine-affairs-institute/symposia

Ecosystems 2010: Global Progress on Ecosystem-based Fisheries Management
November 8-11, 2010, Anchorage, AK
http://seagrant.uaf.edu/conferences/2010/wakefield-ecosystems/index.php

Preparing for Climate Change: Science, Practice and Policy
RAE's 5th Annual Conference and Expo on Coastal and Estuarine Habitat Restoration
November 13-17, 2010, Galveston, TX
www.estuaries.org/conference

International Seminar about Bridging the Gap Between Science and Coastal Management
November 24th-26th, 2010, Texel, The Netherlands
http://www.eucc.net/texel2010/

National Conference for Science, Policy and the Environment: Our Changing Oceans
January 19-23, 2011, Washington, DC
http://ncseonline.org/conference/Oceans/

24th Annual National Conference on Beach Preservation Technology
February 9-11, 2011, Jacksonville, FL
http://www.fsbpa.com/techconference.htm

International LIDAR Mapping Forum
February 7-9, 2011, New Orleans, LA
www.lidarmap.org/conference

The Fifth International Marine Debris Conference
March 20-25, 2011, Honolulu, HI
www.5imdc.org

Coastal Geotools 2011
March 21- 24, 2011, Myrtle Beach, SC
http://geotools.csc.noaa.gov

SAMPAA 7-The Evolution of Protected Areas: Renewing our Passion and Purpose
April 7-11,2011, Banff National Park, Canada
http://www.sampaa.org/meetings/conference-2011

ICS2011 - 11th International Coastal Symposium
May 9-14, 2011, Szczecin, Poland
http://www.ics2011.pl/

Solutions to Coastal Disasters
June 25-29, 2011, Anchorage, AK
http://content.asce.org/conferences/cd2011

2nd International Symposium on Integrated Coastal Zone Management
July 3rd – 7th, 2011, Arendal, Norway
www.imr.no/iczm

Coastal Zone 11
Winds of Change: Great Lakes, Great Oceans, Great Communities!!
July 17-21, 2011, Chicago, IL
Call for abstracts, due October 8, 2010
http://www.doi.gov/initiatives/CZ11/index.htm

EMECS 9: Managing for Results in our Coastal Seas
August 28-31, 2011, Baltimore, MD
Call for abstracts, due January 14, 2011
www.conference.ifas.ufl.edu/emecs9

TCS22: A Student's Point of View

Ariana Marshall

Before I left for The Coastal Society's 22nd biennial conference in Wilmington, NC, I decided that sharing my thoughts on my conference experiences with my peers was long overdue. I'd shared snippets before from TCS21 but I knew that I'd have to take notes at TCS22 with the intent to share much more. This being my second TCS conference and 8th conference as a graduate student, it was a wonderful opportunity, for which I am grateful. However, it opened my eyes to the apparent lack of representation from more students like myself. I hope that through sharing my experiences, others can build upon them.

Here I should define what I mean by "like myself" and why representation is important to me. First, I represent Barbados—and we Barbadians are outnumbered in the United States as compared to other Caribbean nationalities. Since we share similarities with other Caribbean nations, I therefore willingly and proudly represent the Caribbean. There are certain stereotypical expectations of "people from the islands," that I humbly hope to challenge. However, all stereotypes are not negative. At a gathering I attended, Dr.Freeman Hrabowski, president of the University of Maryland, Baltimore County, praised the achievements of Caribbean students and emphasized that all nationalities and ethnicities of students should strive to understand and share our methods for success in order to reach even higher heights collectively. This is especially important considering many of our islands are already experiencing climate change impacts; more Caribbean students should be sharing their research experiences at conferences like TCS22.

I also define 'like myself" by my physical identity, in particular by my racial identity. Although many of us hold to the moral precept that we should not judge one another by the color of our skin, we must accept that we all begin quickly estimating what to expect before someone new even opens their mouth. It's our resistance to accepting that our initial judgment may be wrong that leads us to premature and prejudicial decisions which are truly the foundation of many of the world's issues. This is particularly important, considering that climate change is disproportionately affecting minorities.

A more recent representation I've assumed is that of a student at a Historically Black College and University (HBCU). I value how my HBCU experiences are continually motivating me towards formulating and achieving my goals. Having also had the opportunity to attend a non-HBCU, I realize that there are benefits as well as disadvantages at every university. I think that the legacy of societal contributions made by HBCUs is sometimes not recognized. There may be some misunderstandings about them as well; they carry rich historical and political traditions of which many may be unaware.

Panel Presentation

At TCS22, I heard few presentations referencing the culture of the conference location, Wilmington, NC, and none which specifically referenced the Gullah-Geechee culture whose most northerly limit is in Wilmington, NC. While preparing for my panel, I noticed that even though the Gullah-Geechee language, music, crafts and relationship with the land have been extensively studied by anthropologists and sociologists, I found few studies at the science-culture interface. This is surprising, as this intersection is being addressed within the Native American culture and that of other indigenous peoples further north.

Our panel, entitled "Climate Change Adaptation through Land Use Management: The Context of Environmental Justice," drew only a half-full room, but the audience was engaged and quite lively. Dr. Shereitte Stokes and I presented our research; unfortunately, our 3rd panelist was unable to attend. Questions we were prepared to pose to our audience to encourage discussion included:

- How can indigenous peoples and ethnic minorities be further engaged in coastal management issues more broadly?
- Is there a desire to engage indigenous peoples and ethnic minorities?
- At what stage in coastal management decision making is involvement meaningful; what has occurred in the past?
- Why hasn't the Gullah-Geechee community been involved in many of the major reports we've found on indigenous communities?
- Are we still leaving humans out of climate change studies?
- How do we get minorities more involved in climate justice issues? Do indigenous peoples and ethnic minorities want to be involved in climate justice issues?

However, our audience responded with comments and questions addressing these concerns before we ever posed them. We were strongly encouraged to continue pursuing this area of research, including the understand-

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Caribbean school children on a coastal zone management fieldtrip with park staff. Credit Karlyn K. Langjahr

ing that communities should be fully engaged in the process, with results returned to those communities in a meaningful form.

The TCS conferences develop two types of networks. Firstly there is the more formal network; those people with whom you might publish, or who might direct you to funding appropriate for your work, or guide you towards career opportunities. Secondly there is a less formal network of people who become familiar enough with your name to more readily respond to future email requests. I appreciate both of these networks and believe that The Coastal Society creates a great platform for developing both. To those of you I met; I truly enjoyed our conversations. I appreciate both your interest and contributions to coastal management.

One stirring result of TCS22 is a new effort on the Society's part. Recognizing a need to address the lack of diversity in TCS, President Jeff Benoit has encouraged the TCS Membership Committee to develop an action plan for improving TCS. Lead by Tali MacArthur, a group has recently begun tele-meeting; we're very excited about this new focus. Please be sure to contact Tali (Tali.MacArthur@dep.state.nj.us if you would like to be part of this effort.

I hope that in some way my sharing this with you can inspire you by taking you to some information with which you weren't previously familiar, or by encouraging you to ask new questions. The good news for all of us in the Southeast region is that TCS23 (2012) will be in Miami, FL so I hope to see you there!

Ariana Marshall is a Ph.D. candidate in the Environmental Sciences Institute at Florida Agricultural and Mechanical University, Tallahassee, FL. Travel to TCS22 was funded through the NOAA Environmental Cooperative Science Center. For her dissertation, she's focusing on climate change adaptation and coastal development policy under the advisement of Dr. Marcia Allen Owens.

Goose Creek State Park, NC. Credit: Shona Paterson

Coastal Management Journal

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Make check payable to The Coastal Society, and mail it with your application to: PO Box 3590, Williamsburg, VA 23185. To pay by credit card, please use the online application at: www.thecoastalsociety.org/membership2.html.