Keynote Speaker:

Dolphins and daiquiris: Integrating Coastal Research, Ecotourism and Environmental Education in the Caribbean
E.C.M. Parsons

Presentation:

Involving Students as Researchers in Tropical & Temperate Ecosystems
Dan Bisaccio

Panels:

Ecotourism: The Impacts and Educational Components in Coastal Systems

Megan Draheim, Krista Muller, Sharon Young

Marine Mammal Tourism Survey in Bayahibe, Dominican Republic
Megan Draheim

Residents of Bayahibe, Dominican Republic, became concerned about their local dolphin population when, in 2002, eight bottlenose dolphins were captured for a local dolphinarium off the coast of Bayahibe and the Parque Nacional del Este (Eastern National Park). This happened although little was known about the population and capturing these animals was illegal under Dominican law. In response, the *Proyecto Amigos de los Delfines* collaboration of local and international NGOs, universities, and local tourism offices was established to learn more about the local dolphin population and establish conservation efforts in the region. In the summer of 2007, a survey of tourists in Bayahibe was conducted to assess the potential interest in sustainable marine mammal tourism in the area.

The results indicate that tourists have a high concern for dolphin conservation. The majority of respondents would prefer to see dolphins in the wild, rather than in captivity, and agreed that they would be more likely to visit a Caribbean country that has a strong commitment to whale and dolphin conservation. Conversely, the majority of respondents said that they would be less likely to visit a Caribbean country that hunts or captures whale or dolphins. Most participants felt that the DR's dolphins were a national treasure. Most respondents did not plan to see dolphins in captivity while they were in the Dominican Republic; however, the majority of respondents would be interested in going on a dolphin-watching trip while in the DR.

When asked about specific elements of a dolphin-watching trip, most respondents felt that not disturbing the dolphins, having an educational component of the trip, having trained tour guides, and using a company that works on local dolphin conservation efforts was very important. A slightly smaller majority of respondents felt that using a locally owned and operated tour company was also important.

Community Involvement in the Conservation of Marine *Tucuxi* Dolphins In Southeastern Brazil

Krista Muller

In recent years, there has been an increase in concern worldwide over the potential impact that anthropogenic noise created by boat traffic may be having on marine mammal populations. Previous research has shown that many cetacean species respond behaviorally to the presence of this type of disturbance. Typical reactions include avoidance, shortening bouts of feeding, conducting longer dives and altering travel behavior. In Brazil, cetacean research has generally focused on site fidelity, photo identification and population sizes. Few studies have addressed the effects that boats may be having on the region's whale, dolphin and porpoise populations.

From July to October of 2006, research was conducted in the Cananéia estuary of southeastern Brazil in order to determine if interactions with boats caused short-term behavioral reactions in a local marine tucuxi dolphin (*Sotalia guianensis)* population that conduct specialized beach hunting behaviors.

Behavioral observations were conducted for 38 days using both land and boat platforms at two beaches where tucuxi forage daily and boats frequent the waters. Individual dolphin follows were conducted for approximately 182 hours and provided data on respiration rates as well as dive times for adults, calves and newborns. The continuous sampling method was used to record behaviors such as diving, traveling, resting and socializing. Boat presence/absence was recorded while observing tucuxi and environmental data was collected hourly during the study periods. An experimental boat was also used as a control to determine if boats were the only variable causing behavioral changes in the dolphins.

Results of this study determined that all boats in the research area, whether experimental or not, caused a significant difference in the dive times and respiration rates of beach hunting marine tucuxi individuals and mother-calf pairs.

As part of the effort to involve the local community in the conservation of this top predator, a local boat captain was hired to man the experimental boat used in this study and the researcher taught two undergraduate students from UNESP Rio Claro how to collect dolphin behavioral data. Biological and conservation information pertaining to the species was presented to the local fishermen, government officials, schools and teachers. The researcher also helped teach ten local high school students how to conduct dolphin necropsies for biological sampling and worked with elementary school students and teachers to reconstruct a dolphin skeleton that will be exhibited in the school for educational purposes. Finally, the baseline information collected during this study will be used in future research when comparing behaviors and respiration times of individuals found throughout the estuary and to help implement regulations and management policies for the whole tucuxi dolphin population within the estuary.

Loving and Leaving: How to Encourage Positive Ecotourism Experiences
Sharon Young

The public fascination with marine mammals has led to an increasing ecotourism industry in the U.S. and worldwide. This includes whale watching, seal watching and “swim-with” programs for dolphins and manatees. Other activities, including feeding marine mammals, touching them or harassing them are illegal in the U.S. While there are compelling arguments to be made for exposing the public to animals in the wild and educating them about conservation, there is a growing body of evidence that even well-intentioned interactions can be harmful. Whale watch boats have hit and injured whales. Feeding of dolphins has been linked with reduced survival of offspring. Swimming with wild dolphins in some areas disrupts normal resting cycles. This presentation will address the some of the ways in which we can encourage a positive educational experience while minimizing adverse impacts on animals and will provide examples of the consequences of failing to be precautionary.

Current Issues in Coastal Management and Marine Protection

Christine Feurt, Christopher Hawkins, Todd McConchie

The National Estuarine Research Reserve System – Linking Research, Education and Stewardship to Achieve Coastal Management Goals
Christine Feurt

An outcome of the US Coastal Zone Management Act of 1972, the National Estuarine Research System (NERRS) is a unique collection of marine protected areas created by federal, state and community partnerships. The twenty-seven NERRS sites, representing distinct coastal biogeographical regions of the United States, and Puerto Rico encompass more than a million hectares of estuarine, wetland and upland habitats. Each reserve integrates environmental monitoring and research with a comprehensive program of education to foster stewardship of coastal systems.

The Coastal Training Program (CTP) of the NERRS has become a proving ground for new education and outreach methodologies with a fundamental goal of putting science to work. Each regionally adapted Coastal Training Program aims to enhance the capacity to use scientific information as a basis for decision-making and increase networking and collaboration among coastal decision-makers.

This presentation focuses on the Coastal Training Program implemented at the Wells, Maine NERR where municipal land use decision-making and the implications of those decisions on water quality and habitat are key focus areas. For the past six years the Wells NERR CTP has experimented with an adaptation of community based ecosystem management based upon an interdisciplinary blend of Collaborative Learning and cultural models theory and methodology.

The *Protecting Our Children's Water* project uses ethnographic knowledge of stakeholders and institutional barriers to science translation and progress on

watershed management goals to create and maintain a collaborative knowledge network.

The Collaborative Learning approach provided the procedural framework for collaborative development of priority actions and evaluation of progress or improvement in watershed conditions. Ethnographic knowledge of the complexity of municipal water management revealed a complex system where seven *ways of knowing* or types of knowledge interacted within a "Kaleidoscope of Expertise." This knowledge informed the design of training programs that functioned as a tool for adaptive management of coastal systems.

Coastal Resource Management in the 21st Century: Towards Legal and Comprehensive Management Frameworks
Christopher Hawkins

Current and historical coastal resource management (a term which encompasses use, protection, preservation, and conservation) has been underpinned by a Progressive Era model, in which individuals are, in general, trained as disciplinary experts in the biophysical sciences to manage for biophysical parameters. This biocentric approach, while often ecologically correct, results in management plans that do not reflect the entire range of values – from preservation to use – that are found in the legislation that called for them. This management-society disconnect can be viewed as a main cause of, and contributing factor to, the current era of litigation and conflict that coastal marine resource managers face. It can be seen in nearly ever aspect of how we manage coastal marine resources, from how we include public management preferences to how we understand and manager for society's needs and from the construction of our science and research plans to the implementation of our education programs.

One obvious symptom of our current paradigm is that while social and economic factors are often stated to be the determinates of success with regard to coastal management activities, very little funding or attention is paid them in the applied research and science aspects of coastal management plans. Sound public policy and education is a product of an integrated understanding of management, one that adequately considers social, political, economic, and ecological attributes. Until our coastal resource training and management paradigm matches pace with our social values, we will contend with a natural resource public policy paradox, in which some in the public domain view resource managers as the group most responsible for environmental degradation.

Anthropogenic Noise and Marine Species
Todd McConchie

The ambient noise levels in the ocean are increasing, with much of the increase as a result of anthropogenic noise. Anthropogenic noises arise from a variety of sources including transportation and shipping, dredging, construction, oil, gas, and mineral exploration, sonars, explosions, and ocean research activities. Subsequently, marine mammals are being exposed to higher levels of noise. Some of the effects of the increase in noise levels include a decrease in the ability

to communicate, re-organization of energy budgets, gross behavioral disturbances, physiological stress and possibly death. However, not all marine species appear to be affected by sound in the ocean in the same way, making the evaluation of the effects of noise in the marine environment a complicated process. Currently, many of the consequences of an increase in sound levels are known, but the mechanism through which the sound affects marine mammals is not known. This presentation will introduce some of the topics involved with an increase in sound levels in the ocean and will also address how some marine mammal species may be affected by noise. The hope is to foster discussion about some of the issues surrounding marine ecosystems in New England and tropical waters relative to sound.

Human Impacts on Coastal Systems

Karen Cangialosi, Meg Domroese, Karin Jakubowski

Coral reef monitoring in Provodenciales, Turks and Caicos Islands

Karen R. Cangialosi

I am developing a coral reef monitoring program on the island of Provodenciales, Turks and Caicos Islands in the British West Indies through connection with the organization Reefcheck. Reefcheck is a volunteer network of teams throughout the world that consist of scientists, students, and local residents who all take part in the organization and execution of an annual reef survey at a particular site. This data is then input into a global database where it can be analyzed to reveal long term trends and global patterns in the health of coral reef systems. Long-term data that has been collected by this system has revealed important global trends such as the increase in coral bleaching and this phenomenon as an indicator of global warming. Many other human impacts on reef systems have also been uncovered such as critical declines in numerous reef fishes and invertebrates such as the Caribbean spiny lobster from severe overharvesting, increased algal cover from sewage pollution leading to coral declines, and sharp decreases in the sea urchin *Diadema* in the Indo-Pacific indicating ecological destabilization. Through collaboration with local residents of Provodenciales, students from the United States not only get to be involved first-hand in coral reef conservation efforts, but have the opportunity to learn about both the natural environment and local culture of Provodenciales. Such international collaborative efforts are key to conservation efforts.

Promoting Participation in Marine Biodiversity Conservation in The Bahamas

Meg Domroese

How can we integrate research and education to minimize negative impacts by humans on marine and coastal ecosystems? This presentation will discuss what research in The Bahamas indicates about physical, biological, economic, and cultural processes affecting reef ecosystems and describe the role of education and outreach efforts to help minimize negative human impacts on these systems. The recently published *Treasures in the Sea: Our Bahamian Marine Resources* provides educators in The Bahamas with tools to incorporate marine conservation concepts into their curriculum by focusing on some of the country's most culturally and economically important marine species. Following initial training workshops in

July 2007, teachers have led workshops in their schools and are implementing activities with students. Another initiative that will take place during the next year is a symposium convening decision-makers in governmental and non-governmental agencies in The Bahamas to discuss research findings. These experiences can serve as examples for broader discussion of progress and challenges in linking research and education to promote conservation of marine biodiversity.

How to Bring Tropical Coastal Ecology to the Classroom: Ideas and Examples

Dan Bisaccio, Whitney Dorer, Cliff Lerner

Authentic Student Research: Community Similarity Between and Tropical & Temperate Ecosystems

Dan Bisaccio

Coral Reef Ed-Ventures: A Marine Environmental Education Program for Schoolchildren in Belize, Central America

Whitney Dorer

Coral reefs, with their beauty and diversity of life, are fascinating to people of all ages. Healthy, well-managed reef systems are of great importance to coastal communities in many tropical countries. However, local knowledge of reef ecosystems and their conservation may be limited, and the study of coral reef natural history commonly is not part of school curricula. Nonetheless, coral reefs are an ideal topic for teaching young schoolchildren about fundamental oceanographic, ecologic, and conservation principles. As an outgrowth of a multi-year research program to monitor the health of coral reefs in Belize, and in cooperation with the Hol Chan Marine Reserve on Ambergris Caye, students and faculty from Smith College initiated the Coral Reef Ed-Ventures Program in summer 2000. Now in its eighth year, Smith student teachers and up to 60 Belizean schoolchildren from San Pedro, ages 7 to 11, participate in an intensive two-week summer program to learn about coral reefs.

The goals of the program are to increase understanding of a healthy reef ecosystem, to explore how various organisms interact within the reef, and to develop an appreciation for threats to the reef and how to conserve reef resources. The curriculum emphasizes a methodology of critical thinking and inquiry-based science learning – helping children develop observation and recording skills is an integral part of active, hands-on classroom and field trip-based learning experiences. Lessons focus on marine science with a multi-disciplinary and multi-arts approach. Pre-and post-program questionnaires, completed by the children, are used as assessment tools. Upon completion of the program, students present a reef conservation performance for their parents and the community, illustrating what they have learned. Each child is awarded a Coral Reef Expert card at the Ed-Ventures graduation ceremony.

Coral Reef Ecology
Cliff Lerner

The extensive degradation of reef ecosystems has been widely noted in the scientific literature as well as in popular media. For 17 years, Keene H.S. biology students have been exploring a relatively pristine portion of the Belize barrier reef system in an attempt to better understand this environmental issue. They spend 5-6 days each April monitoring a series of patch reefs off of South Water Caye in Belize, Central America.

Each group of students is responsible for mapping one discreet section (2-3 meters) and identifying all of the coral species as well as other invertebrates and fish that inhabit the reef. They look for evidence of damaged or diseased coral and their detailed observations help them understand the complex symbiotic relationships found on the reef. They also visit with local students and other Belizeans to appreciate the way different cultures have utilized this resource in positive and negative ways. In this session I will explain our methods and show slides of the reef that we study. I will also provide suggestions to other teachers interested in establishing their own program in the tropics.

Beyond the Classroom-Advocacy, Outreach and Citizen Science (Three concurrent talks)

Beyond the Classroom: Advocacy, Outreach and Citizen Science
Steve Chase, Luanne Johnson, Brett Thelen

Environmental Education for Environmental Activism?
Steve Chase

To reach its full potential, environmental education needs to be three-dimensional. It needs to include education *about* the environment, education *in* the environment, and education *for* the environment. Education for the environment, however, is often downplayed, or only focuses on “safe” activities affecting individual consumer decisions. Yet, if we really want to be a democracy and if we really are going to address the environmental challenges we face, environmental educators will have to find the courage to educate citizen activists for collective political action in defense of ecological sustainability, public health, environmental justice, and nature protection. What are the dangers and what are the benefits of environmental education for environmental activism?

Translating Wildlife Research into Effective Public Outreach and Education
Luanne Johnson

Many graduate students and wildlife professionals conduct research that informs management decisions on public and private lands as well as the choices of individual homeowners. However, mainstream media limits its focus to

controversial or charismatic research subjects. How can scientists package their research or public education materials to attract media attention or to reach a broader audience? In small or large communities, what venues could a graduate student or science professional use to create behavior change, educate, or learn more about public opinion on wildlife issues? Using her Coastal Skunk Ecology Research Project as a model, Luanne will discuss her outreach and education efforts over the past three years and provide suggestions for those who need to share their findings outside the scientific community.

Cultivating Connection: Incorporating Meaningful Citizen Science into Coastal Conservation Research and Education
Brett Amy Thelen

Long before biodiversity became a mainstay of the conservation lexicon, amateur naturalists were trekking through the field, observing and recording the occurrence and distribution of species. Today, volunteer participation in ecological research is hailed as a pillar of effective community-based environmental management. This "citizen science" integrates environmental education with conservation biology, and thus holds strong potential for informing ecological management while fostering greater awareness of critical environmental issues. Many organizations sponsor citizen science initiatives, but the success of these programs varies according to their ecological, social, and organizational settings. What are the key elements of successful citizen science projects, and how can citizen science be more fully integrated into coastal conservation research and education?

Poster Session:

Sea Turtles and the Tropics: Leveraging the New England Connection through Education and Communication
Jill Rolph

Nationally and globally, sea turtle conservation and recovery remain critical. All seven species of sea turtles are designated as either threatened or endangered by the U.S. Endangered Species Act. The success of conservation programs consists of diminishing or mitigating human impact through citizens participating in finding solutions to complex environmental problems.

Public awareness projects regarding sea turtles are usually limited to areas where sea turtles nest. Nesting occurs in tropical and subtropical areas, but sea turtles spend most of their lives at sea. Their feeding and migration routes make them subject to many human-induced threats in New England waters and worldwide.

Education and community outreach have become integral components of successful sea turtle conservation projects worldwide. This presentation will

highlight the importance of conserving marine turtles and their habitat in New England. Through real world projects and a goal of working together with conservation partners, teachers will learn to bring sea turtle ecology and conservation into the New England classroom. By creating a network for the protection of sea turtles through collaborative partnerships, students can develop an awareness of sea turtle conservation issues at a local, national, and international level. By studying sea turtles, we can hopefully better understand, monitor and protect the ocean for marine life and ourselves.