UNIVERSITY OF PUERTO RICO
SEA GRANT PROGRAM

Research and Information Needs for Innovative
Marine and Coastal Studies in the Caribbean

Academia - Western Puerto Rico
University of Puerto Rico, Mayagüez, Puerto Rico
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Introduction

The conservation of mangrove coastlines, seagrasses, coral reefs, and fishes is essential to sustaining marine ecosystems in the Caribbean. To date, we continue to search for more information on the best strategies needed for the management and conservation of our marine and coastal resources. With this in mind, the University of Puerto Rico Sea Grant College Program (UPRSG) is performing a regional assessment to determine critical research and information needs for innovative marine and coastal studies in the Caribbean. Thus, surveying the community of marine and coastal resource users and researchers is critical for an effective assessment of research needs.

Several researchers from the academic sector have made efforts to understand the complexity of these ecosystems and have contributed much to our scientific knowledge on the importance of conserving our marine and coastal resources. However, there are pending issues that need to be addressed in order to efficiently manage and conserve these resources. Therefore, we brought together professors that are conducting (or have conducted) research from various universities in western Puerto Rico (UPR-Mayagüez, UPR-Aguadilla and Interamerican University-San German) to discuss their major concerns in regard to the studies needed to improve management and/or conservation of marine and coastal resources in Puerto Rico.

Funding and Support

Dates and Venue

The focus group was held at the Salón Tarzan in the Student Center at the University of Puerto Rico - Mayagüez Campus on Saturday, November 6, 2010 from 10:00 am to 3:00 pm. Seven participants attended the activity. We also held short workshop on how to use the Sea Grant publications database.

Goals

The main objectives of the focus group were the following:
1. Assess research needs of scientists for the improvement of marine and coastal management or conservation in Puerto Rico on a short- and long-term scale.
2. Identify obstacles that may be hindering or delaying the development of research and strategies for marine and coastal management or conservation in Puerto Rico.

Discussion Questions and Feedback

The following questions were presented for discussion:
1. What type of research or information is needed on a short-term (less than 5 years) and long-term (5-10 years) period to effectively manage our marine and coastal resources?
2. What obstacles are presently hindering research/ assessments that can help better management and conservation of our marine and coastal resources?
3. Elaborate three research projects that you consider urgent and would help make management and conservation more effective (preferably in your area of expertise).

Responses to the first question regarding the short- and long-term research needed for resource management included:

- Declines in aerial coverage of coral reefs should be examined (subaerial and submarine) to determine reefs at risk and those that are influenced by coastal land use.
- Studies that monitor the rates of loss in reef shoreline (coastal erosion), which may be related to changes in land use, and can be used to show trends.
- Recompilation of historical data and compare with prehistoric data from coral growth bands/cores to detect changes or trends, which can be used to make predictions for the future of the reefs and the coast. Evaluate past and current conditions – what measures can be taken to reverse detrimental trends. This information should be complemented with knowledge from coastal resource users.
- Characterizing the biological complexity (macro and micro) of coastal habitats and watersheds and identify anthropogenic impacts, which requires long-term monitoring of these areas.
- Quantifying the impacts that sediments have on coral reefs and other important coastal habitats with the use of physical/transport models as well as consistent measurements (e.g., turbidity, light penetration, stratification, changes in bathymetry/topography, precipitation, runoff). Evaluate and model suspended sediment transport on a short and long term scale in order to determine distribution mechanisms and develop strategies for mitigation.
- Determine the role of microbial ecology in marine ecosystems and how they may be involved in the transmission of coral reef diseases. Evaluate the effect of microbes/pathogens from wastewaters on coastal habitats and what hydrologic processes may influence its distribution.
- Quantifying sediment transport, modeling of suspended and bedload processes that can help explain geomorphologic changes occurring in the coastal zone. Identify specific mechanisms (e.g., grain size, sediment composition, contaminants, dynamics of sediment transport).
- Impacts of climate change, particularly how it will affect storm frequency, sea level, coastal erosion, flooding patterns, global warming, ocean acidification, increasing water temperatures, coral diseases, calcification, reef accretion, and bleaching. Need research that focuses on scenarios of climate change and their effect on coastal habitats (e.g., eutrophication, sedimentation, acidification) by using models.
- Studies on processes associated with rivers, watersheds, soil erosion, wetlands, extent of floods, temperatures, precipitation, and evapo-transportation. Develop models that can best describe the mechanisms associated with these processes and can provide effective information for watershed/coastal management.
- Evaluate effectiveness of habitat mitigation strategies and the public's perception of such efforts.

- Studies that assess the development and enforcement of policies regarding environmental management and conservation.
- Projects that systematically evaluate the impacts of marine debris, including environmental and socio-cultural aspects. Some information has been collected, but has not been used to change public policy with respect to waste management.
- Examination of inputs of pollutants to marine ecosystems as well as monitoring efforts in support of decreasing uncertainties related to possible stress to riverine, estuarine and marine biota. It is important to address contaminant transport from inland to marine waters since these areas are associated to the increasing human population densities (mostly short-term scale).
- Assessment on human encroachment and its direct/indirect effects onto riverine, estuarine and coastal systems (modification of nutrient and organic matter fluxes, sedimentation, inputs of pollutants, and hydrology).
- Identify studies that emphasize conservation and restoration of natural resources - conservation of important or endangered species (sea turtles) and restoration of natural coastal landscapes and habitats (sand dunes, beaches, corals). The status of our coastal habitats has gone beyond methods for effective resource management. Efforts should be focused more on conservation rather than management.
- Novel monitoring programs based on hypothesis testing that are maintained on a long-term scale to help reveal baseline patterns that enable the development of meaningful research hypothesis and management strategies. Chemical, physical and microbiological approaches should be integrated into these efforts as they provide important indicators of environmental health.
- Efforts for legal orientation to researchers/scientists on issues pertinent to marine and coastal resource use and conservation.
- Assessments on the effectiveness of watershed management and whether restoration of deteriorating coastal habitats is a workable solution, which could be achieved by conducting detailed case studies (e.g., reef clean-ups, coral transplantation and rehabilitation, identifying sediment transport).
- Development of high spatial and temporal resolution of widely spaced ocean parameters using remote sensing technology for long-term monitoring of ocean temperature, salinity, depth, and chlorophyll levels.
- Development of water quality standards based on reef quality (reef bio-criteria) for considerations on public safety and health. Studies of shelf-wide biomarkers that indicate stress/threats may provide useful information for marine resource management.
- Studies on diseases in coral and other important reef organisms, with emphasis on pathogenesis, microbial dynamics, impact on marine reserves and MPAs, epizootiology, temporal and spatial variability in prevalence and virulence, reservoirs and vectors, links to climate change and local environmental degradation and the potential recovery of degraded reefs. In addition, reproductive output and natural recovery of deteriorated reef areas after disease bleaching-related mortalities.
- Development of coral aquaculture for reef rehabilitation.

Obstacles that are currently delaying the advancement of academic research that could improve resource management or conservation:

- Lack of standardized formats for data gathering and collections.
- Lack of communication between resource users and researchers that could help explain the present environmental and resource conditions, which could help predict future changes.

Promote more symposiums and networking among experts and resource users.

- Lack of interdisciplinary approach for studying the complexity of marine and coastal processes and ecosystems.
- Lack of efforts to incorporate and empower local communities with coastal resource management.
- Most studies are funded for short periods (e.g., 2 years), which does not allow for projects that need more time to get meaningful results.
- Lack of projects that address information/data that would be useful for local agencies and that should be considered with equal importance/priority for funding (e.g., data collection).
- Purchasing of materials and equipment can be very tedious and slow, resulting in less time to achieve research goals within the period of time allotted for the project.
- Loss/stolen/vandalized equipment.
- Lack of facilities/equipment for research (e.g., boating/vessels/docking facilities).
- Limited access to instrumentation due to certain limitations (e.g., purchasing/maintenance) by agencies that provide funding.
- Not enough time allotted for research due to high teaching loads; most teaching hours are not reduced in exchange for time spent on research.
- Projects critical to management/conservation are not continued for lack of funding.

Final Overview

In general, the group encouraged more research that focused on the conservation, as opposed to solely management, of marine and coastal resources. Emphasis was also given to collecting basic physical, chemical and biological data that could be used to develop models that help explain and predict coastal processes. Studies on the effects of anthropogenic activities on or near coastal habitats was considered a high-priority. Conducting scenarios of climate change and assessing their impacts on coastal habitats was also highly stressed. The role of microbes in marine ecosystems and their effect on reefs was another area of interest. As with other experts we have assessed, evaluating the effectiveness of management strategies was found to be particularly important.