

## **Marine Protected Area Science and Practice at the GCFI: From Nothing to Habitat Mapping to Reaching Out to Practitioners**

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### **ABSTRACT**

As fisheries stock assessment lost terrain in the wider Caribbean in providing responses to sustainable fisheries, and marine reserves showed up in the world map as the “promising land” for both protecting biodiversity and managing fisheries resources, many marine fisheries scientists in the region switched gears to investigating more “conservation” related questions such as essential fish habitats, vulnerable ecological processes and life stages, biogeographic divisions of the world, and others, in their quest for better understanding marine biological resources and the impact of human use. The increasing use of marine protected areas and their resources as the scenario and subject of research projects is reflected in the papers presented, the sessions and workshops, and the transformation of our membership. In the last years, as scientists became more aware of the imperative to apply their research results to management, fishers, MPA and fisheries managers, regulators and planners became an increasing part of our membership. This paper provides a historical overview of this process by describing the main contents of the papers related to marine conservation and marine protected areas, the breakthroughs of both the scientific subject and the audience, and the transformation of the Institute role as a catalyzer of conservation measures in the Wider Caribbean.

KEY WORDS: Marine protected areas, historical overview, wider Caribbean

## **La Ciencia de las Áreas Marinas Protegidas y su Divulgación en las Reuniones Anuales del GCFI: Desde Nada, a la Cartografía de Hábitats, al Intercambio con los Administradores de Recursos**

En la medida que la evaluación de las reservas pesqueras perdió terreno en darle respuestas a la producción pesquera sostenible en el Gran Caribe y las reservas marinas aparecieron en el mapa del mundo como la “panacea” para la protección de la biodiversidad y el manejo de los recursos pesqueros, muchos científicos pesqueros de la región cambiaron su objeto de investigación hacia asuntos más relacionados con la “conservación”. La investigación de hábitats críticos, procesos ecológicos y etapas del ciclo de vida más vulnerables, divisiones biogeográficas, y otros temas, atrajeron cada vez más la atención de los científicos en su búsqueda de respuestas para un mejor entendimiento de los recursos biológicos marinos y el impacto de las actividades humanas sobre ellos. El uso creciente de las áreas marinas protegidas y sus recursos como escenario y objeto de proyectos de investigación se refleja en los trabajos presentados, las sesiones y talleres, y la transformación de la membresía del GCFI. En los últimos años, en la medida que los científicos han tomado conciencia de la necesidad de aplicar lo más rápidamente posible sus resultados de investigación al manejo, ha aumentado el número de pescadores, encargados de áreas marinas protegidas y autoridades del manejo de recursos en nuestras reuniones. Este trabajo ofrece una breve reseña histórica de este proceso al describir los trabajos en temas de conservación marina y AMP presentados desde que comenzó el Instituto, algunos momentos importantes en la obtención de resultados y la asistencia, y la transformación del papel desempeñado por el Instituto como catalizador de medidas de conservación en la región del gran Caribe.

PALABRAS CLAVES: Áreas marinas protegidas, reseña histórica, Gran Caribe

### **INTRODUCTION**

As fisheries stock assessment lost terrain in the wider Caribbean in providing responses to sustainable fisheries, and marine reserves showed up in the world map as the “promising land” for both protecting biodiversity and managing fisheries resources, many marine fisheries scientists in the region switched gears to investigating more “conservation” related questions, such as essential fish habitats, vulnerable ecological processes and life stages, biogeographic divisions of the world, and others, in their quest for better understanding marine biological resources and the impact of human use.

This increasing interest is supposed to be reflected in the marine science focus or the academic community and subsequently in the presentation of papers of international conferences.

The Gulf and Caribbean Fisheries Institute is the

oldest and most popular scientific forum for marine scientists in the region, but it has also become in the last 10 years the most attended gathering of scientists interested in the conservation of biodiversity in the region. Due to its policy of requesting the submission of the paper’ manuscripts at the time of presentation, the Proceedings provides an historical record of the papers presented in both the oral and poster sessions throughout its 60 years lifespan.

Since 1948, and until 2004, ca. 2,330 papers were presented and published in the GCFI Proceedings (Posada and Franks, this issue). In 2007, all proceedings were digitized and posted in the GCFI website. It will allow for an easy access of all papers submitted to the meetings and, subsequently, a retrospective analysis of the evolution of each subject or thematic area throughout the 60 years of the Institute existence.

This paper provides an overview of the trends shown

by the papers on marine protected areas science and practice, particularly of features such as the subject matter, the geographic focus, as well as how the GCFI shifted from a traditional fisheries science forum to a more conservation oriented one. It also examines the incorporation on MPA managers in the membership, the development of partnerships with conservation organizations, and finally, the adaptive capacity of a scientific forum to meet the regions needs.

## RESULTS

The papers related to marine protected areas published in the Proceedings of the GCFI Annual Meetings ([www.gcfi.org](http://www.gcfi.org)) were examined. Despite the relationship to conservation issues, this overview does not include the papers related to conservation other than marine protected areas, such as fish spawning aggregations protection (examined by Acosta and Luckhurst, This issue).

Overall, ca. 200 (8%) out of ca. 2,500 papers and/or abstracts presented from 1948 to 2006 had a focus on marine protected areas. The focus ranged from the description of habitats and marine biological populations and ecological process within marine protected areas, to the analysis of the benefits of marine reserves for fisheries resources management. Some papers were more focused on ecological issues, while others had an emphasis on stakeholders involvement in MPA planning and management.

The main subjects of the MPA-related papers can be grouped as follows:

- i) Ecosystem characterization (habitat mapping, fish community and population assessment) for MPA design,
- ii) Ecological processes characterization and conservation strategies (juveniles settlement, larval dispersal and recruitment, adult ontogenetic migration),
- iii) Large-scale biodiversity assessment (nation, and region-wide),
- iv) Community participation in MPA management ,
- v) Monitoring methods (SPAG, SocMon),
- vi) The benefits of marine reserve as a management tool, and
- vii) Fishing and tourism within MPAs.

Due to the limited interest of scientists in marine conservation issues and the lack of connection between nature conservation and fisheries management, no papers on marine parks were presented in 1949 - 1958. In 1959, a paper was presented on the interpretative and research services of the US marine parks (mainly Dry Tortugas, Virgin Islands, Everglades, and others). This presentation was followed by a discussion facilitated by a panel (Walls 1959), where the recreational vs. commercial fisheries value of the area was raised. Yet, there is no mention in the paper or any recount on the potential impact of

commercial fisheries on parks conservation. Similarly, the paper presented in 1963 on the movements of juvenile pink shrimps in the Everglades National Park (see abstract in Idell *et al.* 1963). Many years still have to come for the academic community to acknowledge overfishing and its impact on marine ecosystems deterioration.

In the 1970s, fish stock assessment and aquaculture was the trend in fisheries science. In 1978, a paper on the spiny lobster fisheries in US Virgin Islands and Dry Tortugas mentions the value of marine parks for fisheries management (Davis and Dodrill 1980). We had to wait until 1987 (Posada 1992) to see a paper dedicated to the fisheries analysis in a park outside the US, in this case, the Los Roques National Park, Venezuela.

In the 1980s, the profound deterioration of fisheries resources, and the failure of traditional fisheries management (or the lack of enforcement or weak regulations) to prevent overfishing in most Caribbean countries, along with the increase in tourism investments, led to an increasing focus of marine science in marine conservation and the potential benefits of marine parks in biodiversity conservation.

In 1990, three papers were presented. One paper described the Montego Bay Marine Park (Walling, 1990), recognizing the benefits of the protection of an area versus fish populations as a matter of interest for fisheries scientists.

From 1990, the MPA-related papers in the GCFI annual meetings increased continually (except for a low number in 1996) to 17 in 1997 (Figure 1). This increase reflected also the increasing importance of marine parks as tourism dive areas, local seafood for the industry, as well as the boost of funding available for conservation.

In 1992, six papers were presented, including subjects such as essential fish habitats assessment, marine reserves spill over, etc. Several Caribbean MPAs were highlighted, such as Montego Bay Marine Park (Jamaica), Exuma Land and Sea Park (The Bahamas), the Dry Tortugas Marine Reserve (Florida), and the Belize marine protected areas. Three of these papers were presented by a group of scientists of an international non-governmental conservation, The Nature Conservancy, a debut that was followed by similar organizations (e.g. Environmental Defense, United Nation Environment Programme-Caribbean Environment Programme, etc.) in the next years. They will eventually become regular participants and sponsors of special sessions and workshops dedicated to marine conservation emergent issues.

After a relative hiatus of two years (there was no meeting in 1994, and only four related to MPAs were presented in 1993), 11 papers related to MPAs were presented in the 1996. In this meeting, held in Santo Domingo, Dominican Republic, new MPAs were highlighted: The Soufriere Marine Management Area (St. Lucia), La Parquera (Puerto Rico), Port of Honduras Belize), and Discovery Bay (Jamaica). They were focused on fish

communities and fishing in the MPAs, and the spill over effect of marine reserves.

The Annual Meeting of 1997 was an important one for MPA issues. For the first time a special workshop on MPA was held. Eighteen (18) papers were presented related to habitat and resource characterization for marine reserve design, and large-scale geographic priorities setting for marine conservation. In the paper presented by Richard Appeldoorn "Goals for marine fishery reserve design" (Appeldoorn 1997) he expressed the feelings of all participants by "Recognizing that there is a relationship between fish production and ecosystem sustainability and that Marine Reserves represent a paradigm shift in fisheries management, the development of a Caribbean-wide network of marine reserves is strongly recommended. There are several phases to developing such a system. On a regional basis, the ecological units and sensitive areas must be identified (Sullivan and Bustamante 1997) and potential for regional connectivity determined (Roberts 1997). Multilateral funding opportunities exist to target reserve development in priority areas. However, the process of establishing closed areas is a local one. Criteria need to be developed to aid in local MFR design. Equally, if not more important, and advocacy for marine reserves must exist locally, as reserves function best when designed and implemented with the participation of all user groups.

*"The GCFI is an important regional forum for promoting the use of MFRs and developing local advocacy. To realize this function, a concerted effort must be made to have resource managers involved more fully in such forums through the use of travel support (from infrastructure grants) and by developing sessions of key interest. Suggestions for future sessions or workshops include extracting design lessons from case studies and demonstrations of MFR implementation processes involving multiple user groups and managers aided with expert-decision computer programs"*

In accordance with this event, the GCFI Board of Directors, in conjunction with the host institution and other partner organizations, organized each year special workshops dedicated fully to MPAS. This effort entailed the attendance of MPA managers and leader fishermen sponsored by several organizations, primarily UNEP-Caribbean Environment Programme, Environmental Defense, The Nature Conservancy, University of West Indies, and national agencies such as NOAA International Office, Comision Nacional de Areas Naturales Protegidas (Mexico), and several others.

Since 1997, the number of papers related to MPAs presented in annual meetings increased significantly as well as the attendance of different stakeholders. From 1998 to 2005, a total 106 papers were presented in 8 MPA-

related workshops (Fig. 2). In addition, several sessions were dedicated to the protection and management of reef fish spawning aggregations (Acosta and Luckhurst, this issue).

In 1998, the annual Meeting was held in St. Croix, U.S. Virgin Islands. For the first time, The Nature Conservancy sponsored a special meeting and the papers addressed issues of marine parks design and management in Jamaica, Puerto Rico, USVI, Mexico, Colombia, Dominican Republic, and the Turk and Caicos Islands.

As a result of the maturation of the needs to address the biophysical and socioeconomic issues involved in MPA research, another landmark MPA-related workshop was held in the Annual Meeting held in Providenciales, Turk and Caicos Is. in November, 2001: "Marine protected Areas Case Studies: "What works and doesn't and why" led by dr. Richard Appeldoorn, "Connectivity at different spatial scales: management applications in MPA Design" chaired by Dr. Ken Lindeman, and "Capacity and community Involvement in MPA implementation and orientation" chaired by Dr. Patrick McConney. Thirty-six (36) papers were presented, including 23 at the special workshops. Peer-reviewed versions of the papers and workshop reports were published by the University of Southern Mississippi, College of Marine Science Gulf Coast Research Laboratory (GCFI 2003). The issues of biological and human connectivity in MPA design and management and the research needs in both biophysical and socioeconomic components of MPA science were examined in the reports. For the first time, several papers addressed larval dispersal across the wider Caribbean and cross-shelf habitat utilization as indication of marine populations' biological connectivity and its potential application in marine protected area siting and population replenishment. Among of the most interesting papers were the use of queen conch home ranges for designing marine fishery reserves (Glazer *et al.* 2003); the shifting of baselines and marine reserves (Bohnsack 2003), a session on the use of marine reserves to protect fish spawning aggregations (led by Dr. Will Heyman) and the development of a regional conservation strategy (Luckhurst 2003); a Caribbean-wide survey of marine reserves and its effectiveness (Appeldoorn and Lindeman 2003) the Caribbean MPA Network (CaMPAM) Capacity Building Program coordinated by UN Caribbean Environment Programme (Gardner and Vanzella-Khoury, 2001), and an analysis on the needs to connect people to better manage MPAs in the Caribbean (McConney *et al.* 2003) were presented. Among the site-based papers presented were some on Banco Chinchorro Biosphere Reserve, Mexico (Reveles and Camarena 2003), Princess Alexandra National Park, Turk and Caicos Island (Garland Cambell 2001), Florida Keys National Marine Sanctuary, USA (Keller *et al.* 2001); Laughing Bird Keys National Park, Belize (Vellos 2003); Seaflower Biosphere Reserve (Appeldoorn *et al.* 2003), and Folkstone Marine Reserve, Barbados (Mahon and Mascia 2003),.

Some of the most interesting events related to marine reserves in the GCFI lifetime occurred in the 2002 annual meeting held in Xel Ha, Mexico. Two workshops were implemented, namely: “Institutional arrangements for Caribbean MPAs and opportunities for Pro-management”, organized by MRAG (<http://www.mrag.co.uk/>) in conjunction with the University of West Indies, the Caribbean Conservation Association and GCFI, and a great Science

and Management Session, organized by The Nature Conservancy. The former was an invitation workshop attended by 43 participants (managers, fishers, policymakers, donors, NGOs, and scientists). During the latter, the Minister of Fisheries of Belize formally announced the creation of 11 marine reserves in fish spawning aggregations sites along the Belize shelf border. This announcement was greatly celebrated by the more that 200 partici-

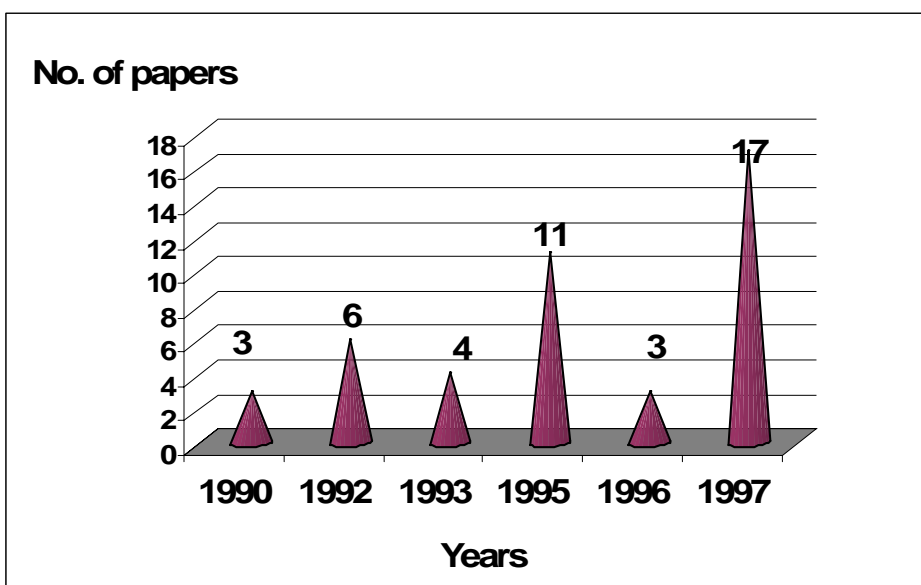


Figure 1. Number of papers related to marine protected areas presented at the annual meetings of the Gulf and Caribbean Fisheries Institute, in 1990-1997.

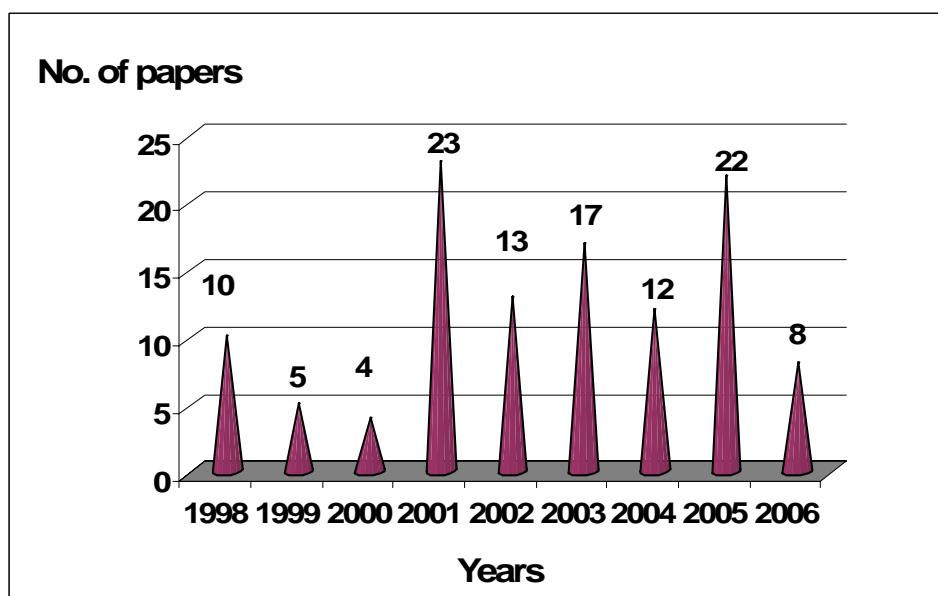


Figure 2. Number of papers related to marine protected areas presented at the annual meetings of the Gulf and Caribbean Fisheries Institute, in 1998-2006.

pants of the Annual Meeting, many of them fishers, MPA managers, and government marine resources officers, and stimulated similar statements by the The Bahamas Fisheries Department Head. Both countries have led the region in establishing regulations for protecting reef fish spawning aggregations and halt their deterioration beyond repair. As an indication of the popularity within the marine management community and the success of the GCFI in attracting policy makers and managers to the scientific discussions, this meeting benefited from the attendance of a numerous delegation of Belizean fishermen, sponsored by The Nature Conservancy, which has worked for a number of years in fish spawning aggregations research and management policy with Belizean partners. This was a great event that set an important milestone in the history of involvement of managers and policy makers in the most important marine science forum of the region.

In the 2003 annual meeting, held in Tortola, British Virgin Islands, during an especially wet but also very productive and fun week, seventeen papers were presented related to marine conservation issues, several of them addressed socio-economic (the involvement of stakeholders such as fishermen and tour operators) and funding issues of MPA management, subjects of great concern as MPA managers and scientists are increasingly aware of the importance of a participatory process to achieve success in MPA planning, adaptive management, and financial sustainability. The papers described situations and processes in several MPAs, namely Sian Ka'an and Seaflower Biosphere Reserves, the Turk and Caicos Conservation Fund, and South Eleuthera (The Bahamas).

In 2004, as the result of the expansion of the of CaMPAM Network and Forum, and its launching at the White Waters to Blue Waters meeting in Miami, a GCFI-CaMPAM special workshop was held in the 57<sup>th</sup> annual meeting held in St. Petersburg, Florida. Participants included the United Nations with funding to implement a special workshop for MPA managers and interested scientists. This workshop served as the kick-off activity of a GCFI-CaMPAM jointly initiative to further develop CaMPAM (<http://www.gcfi.org/campam/CaMPAM.htm>). The workshop had the following objectives: introduce the new CaMPAM Network and Forum to the GCFI membership and discuss with MPA and fisheries managers the activities scheduled for the next year. Based on this joint initiative and fundamental partnership between the fisheries science forum and an MPA human network, CaMPAM has used GCFI meeting as for discussing MPA science and practice emerging issues, and manage project initiatives such as the supervision of the Small Grant Programme program (<http://www.gcfi.org/SGF/SGFEng.php>) aiming at promoting exchanges among fishers and MPA managers and sustainable, livelihoods in coastal communities associated to MPAs. A fish spawning aggregation regional strategy workshop coordinated by The Nature Conservancy was also implemented in this meeting.

In 2005, taking the advantage of the magnificent venue of the 58<sup>th</sup> Meeting (San Andres Island, within the Seaflower Biosphere Reserve), on top of the regular session on MPA Science and Management, where 11 scientific papers were presented, two other special workshops related to MPAs were implemented, namely:

- i) The Nature Conservancy's Parks in Peril Marine Conservation Workshop, sponsored and the by TNC, CaMPAM, UNEP-CEP, GCFI itself and Coralina (San Andres and Providencia Archipelago Environmental Agency). This workshop focused on discussing the most pressing needs of marine conservation practitioners in the Latin American and Caribbean region and was attended by 30 participants from NGOs and government agencies.
- ii) Law Enforcement Capacity with emphasis on Protected Areas. It included 12 talks on fisheries and MPA enforcement issues, with international (SPAW, CaMPAM, CITES, Lacey Act, WildAid's programs) and national (Colombia, Barbados, Belize, Cuba, US Florida) focus.

In addition, a ceremony was held to award three fishermen with the Peter Gladding Memorial Award (sponsored by Environmental Defense) that recognizes fishers in the region whose long-term commitment toward sustainable management and conservation of marine resources make them leaders in their localities. Region-wide initiatives to acknowledge and support conservation-minded fishers such as this (see [www.gcfi.org/PGMA](http://www.gcfi.org/PGMA)) can assist future MPA initiatives as well.

At the 59<sup>th</sup> Annual Meeting held on November, 2006 in Belize City, eight papers were presented on MPA related issues, addressing subjects such as the use of indicators of measuring MPA management effectiveness, the school kids environmental education program, co-management in Cuban MPAs, restoration of reefs in Mexican MPAs, and a manatee survey in Belizean MPAs. The special session on Biological Connectivity allowed for presenting additional talks, one of them on the potential use of this scientific data for nominating new marine World Heritage Sites (Bustamante and Paris 2008).

## CONCLUSIONS

The analysis of the papers related to MPA published in the Proceeding of the GCFI Annual Meetings shows the increasing focus of the GCFI membership, and the fisheries science and management community, for that matter, on marine protected areas science and practice. Over the last 18 years, since the breakthrough paper on the benefits of marine reserves in fisheries management (Bohnsack 1990) special sessions and workshops on this topic have been implemented in each Annual Meeting. This interest has affected the GCFI membership qualitative and quantitative-

ly, with a change in the composition of attendees: MPA managers, conservation-minded fishers, and policy-makers have joined scientists to discuss issues of common interest.

This process is the result of the decline in fisheries resources and the failure of traditional management methods, and changes in international and national political agendas with the subsequent increase of conservation funds to address biodiversity protection and climate change. The evolution of the marine park issue as a subject of the GCFI annual meetings had a feedback in the way the GCFI conducts business, as the Institute Board of Directors became, strive to bringing resources to sponsor fishers, managers, and decision makers to enrich the audience of our sessions.

The role of GCFI as a free scientific forum expanded to a gathering of people interested in both research and best management practices to address the severely declining fisheries resources in the Wider Caribbean region. The meeting became more attractive to organizations that identified the GCFI as a good opportunity to hold workshops (both for all attendees and by invitation) and training courses. Among the organizations that contributed with human and financial resources to enrich the meetings with MPA-related sessions are Environmental Defense, The Nature Conservancy, the Universities of Puerto Rico, West Indies, Louisiana, Central de Venezuela; CINVESTAV (Mérida, Mexico), UNEP Caribbean Environment Programme, Caribbean MPA Management Network and Forum, and NOAA.

Among the most important achievements of the GCFI in providing a forum for MPA-issues are the following:

- i) The incorporation on MPA managers, conservation-minded fishers, and policy makers in discussions,
- ii) The development of partnerships with conservation organizations,
- iii) The great adaptive capacity to meet the regions emerging needs, and
- iv) The unique role of GCFI as THE regional forum for MPA science and practice.

We expect that the GCFI will continue its role in providing a forum for the discussion of emerging issues related to responsible marine resource management, and facilitate the approach of MPA implementation with managers, scientists, and with the fishing community.

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