

The United States Caribbean: A New Approach to
Shallow-Water Reef Fish Management

by

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ABSTRACT

Inhabitants of the United States Caribbean rely heavily on their fisheries as a source of food and employment. Because aquatic resources are common property,¹ they are extremely attractive to islanders, many of whom are landless and lack alternative opportunities to make a living.² For the past 30 years, Shallow-water Reef Fish (SWRF) catches in Puerto Rico (P.R.) and the United States Virgin Islands (U.S.V.I.) have been decreasing even as the number of fishermen increased and fishing techniques were modernized.³ Despite federal and state laws recommending more stringent conservation measures since the mid-80s, to this date, SWRF resources are still decreasing in the U.S. Caribbean. A variety of natural and anthropogenic stresses affect marine fisheries of P.R. and the USVI. More specifically, I believe that three socially-related issues currently hinder effective fisheries management in the region: the western style approach, enforcement, and lack of fishermen's participation in management. The aim of this project is to determine what practices need to change in order to lead to the desired fisheries` management⁴ objective: the recovery and sustainable yield of SWRF in the U.S. Caribbean. Additionally, I propose new management measures, which complement the existing managerial structure, and should improve the current situation.

¹ Common property = open access resource, which is available to everyone.

² MRAG 2000, FAO 2000, Adams 1996, www.onefish.org

³ CFMC 1993, Rogers et al. 2001

⁴ "Fisheries management is an integrated process involving information gathering, analysis, planning, consultation, decision-making, and the formulation and implementations of rules and regulations to govern fisheries activities to satisfy various objectives." (MRAG 2001)

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LIST OF ACRONYMS

CFMC = Caribbean Fishery Management Council

CMT = Customary Marine Tenure

CPUE = Catch Per Unit Effort

DOC = Department Of Commerce

EIS = Environmental Impact Statement

FAO = Food and Agriculture Organization of the United Nations

FCMA = Fishery Conservation and Management Act

FMP = Fishery Management Plan

ITQ & IFQ = Inter-Transferable & Individual Fishing Quotas

MRAG = Marine Resource Assessment Group

M-SFCMA = Magnuson-Stevens Fishery Conservation and Management Act

MSY = Maximum Sustainable Yield

NGO = Non Governmental Organization

NMFS = National Marine Fisheries Service

NOAA = National Oceanographic and Atmospheric Administration

OY = Optimum Yield

PR = Puerto Rico

SERO = South East Regional Office of the National Marine Fisheries Service

SFA = Sustainable Fisheries Act

SWRF = Shallow-water Reef Fish

TCF = Tropical Coastal Fishery

USVI = United States Virgin Islands

INTRODUCTION

*Change always comes at a cost,
The longer you wait, the higher the cost.*

The U.S. Caribbean region comprises the commonwealth of Puerto Rico and the territories of the U.S. Virgin Islands.¹ Inhabitants of this region have a long history of fishing surrounding waters for subsistence, and today still consume large quantities of seafood.² The open-access nature of this resource, and the low cost of entry to the fishery, appeals particularly to low-income islanders, who catch many species of fish and invertebrates using multiple techniques.³ Some of these techniques include fish traps, hand lines, seine nets, gill nets and trammel nets, all of which can be easily handled from the majority of small (>20 feet) traditional boats used in this region.

Shallow-Water Reef Fish (SWRF) are found in a depth range of 0-100 fathoms and live off, or very close to, reef structures.⁴ There are about 350 species of SWRF in the Caribbean, 180 of which are landed and used in quantity throughout the region.⁵ Out of these 180 landed species, 64 are currently managed in federal waters.⁶ Because these tropical coastal fisheries (TCFs) have traditionally been small and not economically important,⁷ local governments have apparently never felt the need to strongly regulate or study them. Puerto Rico currently regulates thirty-six species for minimum size take, while the USVI regulates Goliath grouper (no take) and Mutton Snapper (closed season).⁸ Additionally, several closed areas, such as the Red Hind Bank and marine parks, occur both in PR and the USVI.⁹

¹ Please see Map 1

² Christy 1997, Lemay 1998

³ CFMC 1993

⁴ CFMC 1985

⁵ Please see Diagram 1

⁶ CFMC 1991, 1993

⁷ Fisheries have always been an extremely important resource in the Caribbean but have only recently been acknowledged by local governments.

⁸ PR Fishing Regulations and USVI Commercial Fisherman's Information Booklet.

⁹ PR Fishing Regulations and USVI Commercial Fisherman's Information Booklet.

Management for SWRF stocks has been in place since 1985, and has contributed to getting rid of destructive fishing techniques, structuring the fishery, and protecting heavily depleted species.¹⁰ While the management process in place has proven its worth, the management procedure itself is slow, and managers have not been able to stop the decline of SWRF stocks. One element slowing down the management procedure is the Western style approach to fisheries management. This approach relies heavily on fisheries data as the basis for decision making, and on enforcement as a means to make the regulations effective. Both these requirements are challenged in the Caribbean: first because it is extremely hard to collect data for this type of fishery, and second because the possibilities for breaking the rules are many, while the regional enforcement capabilities are few.

Today uncertainty still exists regarding fisheries data, including: spawning potential ratios (to measure overfishing), catch data (especially location of catch), and the status of the remaining stocks.¹¹ It seems that due to social pressures - lack of political support, potential job loss, and physical intimidation - few fishery managers are willing to make regulatory decisions until very solid scientific proof exists to back them up.¹² Thus, regulatory management for many stocks is perennially delayed until conclusive data become available.

Speeding up management is a necessity in the U.S. Caribbean; otherwise fish stocks might all follow the way of Nassau grouper, and collapse before management has had a chance to act. In 2001 already, Rogers et al. stated: “fisheries appear to be near collapse.”¹³ In an effort to find ways of speeding up management, one has to look towards what has been done in island-states worldwide, which face similar challenges

¹⁰ “The FMP established regulations to rebuild declining reef fish species in the fishery and reduce conflicts among fishermen. It established criteria for the construction of fish traps; required owner identification and marking of gear and boats; prohibited the hauling of or tampering with another person’s traps without consent; prohibited the use of poisons, drugs, other chemicals and explosives for the taking of reef fish; established a minimum size limit on the harvest of yellowtail snapper and Nassau grouper, and established a closed season for the taking of Nassau grouper.” CFMC 1991

¹¹ CFMC 1993 Appendix II-A

¹² Nicholas Drayton, Stephanie Wear, DPNR employees, and NMFS scientists, personal communication.

¹³ Rogers et al. (2001), in reference to the USVI fisheries.

and seem to manage their TCFs with some level of success.¹⁴ This paper offers a summary of TCFs management techniques that are proven,¹⁵ and which could be adapted to fit the specific needs of the U.S. Caribbean fisheries.

METHODS FOR ANALYSIS

The information compiled in this Master Project results from literature searches and informal interviews with fishery stakeholders.¹⁶ In order to understand why Magnuson did not yield the desired results¹⁷ in the U.S. Caribbean, I researched: federal and state laws affecting fisheries, fishery management plans, social issues surrounding the fisheries, and the current biological state of SWRF.

Literature Search

My first objective was to gain a clear understanding of U.S. regulations pertaining to fisheries in the Caribbean region. I started with federal laws and regulations (i.e. MSFCMA), and then went on to State regulations for P.R. and the U.S.V.I. It was not easy to acquire this documentation, because: 1) I could not physically go to the state offices and ask for the texts I needed; 2) The documents I needed were not available on the CFMC and state agencies' websites; 3) It was difficult to get in touch with the people in charge through phone calls; and 4) There existed a certain level of suspicion towards my interest for financial statements, which demanded numerous explanations. Promises to send me documents were made, but this process took as much as a month and a half for most CFMC documents. To this date I still have not received the annual report I asked for in November of 2003.

My second objective was to understand how these laws and regulations had been applied for SWRF, and the results they yielded. Here, I compared official documents

¹⁴ Silvestre et al. 1997, MRAG 2000, Trudeau et al. 2001, Olsen 2003

¹⁵ Fishery Management Techniques used in developing nations by the FAO, UNDP, WB and various consulting firms.

¹⁶ Stakeholders include: CFMC and State Government members, fishermen, NMFS scientists, tourist industry representatives, fishmongers, and others.

¹⁷ To diminish and put an end to biological overfishing.

from the NMFS/CFMC¹⁸ to documents from the PEW Oceans Commission, The Ocean Conservancy, and several scientific papers. This allowed me to see several sides of the issues, with the NMFS/CFMC stressing what they had succeeded in doing, and the NGOs stressing what had still to be done.

My third objective was to get a feel for the fishery stakeholders` reaction to the current situation. I wanted to know who was aware of the current biological and regulatory situation, what they thought about it, and whether they were happy or unhappy with the process. For this part, I relied heavily on articles published by environmental NGOs, and the minutes from the CFMC public hearings.

Having assessed the regulatory, biological, and social context, I set out to find similar situations of TCFs biological overfishing elsewhere in the world, and how they had been dealt with. No single case was exactly similar to what was going on in the U.S. Caribbean, but several projects prepared by consulting firms, interest groups, think tanks, and the international development organizations had partially covered similar issues. Thus, I selected out the solutions I believed would meet the U.S. Caribbean issues, and pieced them together to come up with my recommendations. However, because consulting firms and international development organisms alike tend to emphasize on their successes and leave out what has not worked, it is important to view this information with a certain level of skepticism.

Informal Interviews

The informal interviews took place from June of 2003 to May of 2004. These were conducted with CFMC members, NMFS scientists, NGOs employees, national and international consultants, fishermen, U.S.V.I. and P.R. government employees, and Duke University professors and students. The aim of these interviews was to get personal accounts of the current situation of US Caribbean fisheries. I was especially interested in the information that generally did not find its way to official texts, such as 1) the financial difficulties faced by the CFMC and the local governments; 2) the notion of equity between PR and the USVI; 3) the fact that local inhabitants resist changes

¹⁸ For the U.S. Caribbean, the NMFS prepares the FMPs in conjunction with the CFMC.

brought about by the federal government, at the institutional, regulatory, and individual levels; 4) the cultural preferences that do not accommodate the notion of bycatch (all that is caught is used); and finally 5) that no one seems to want to take the harder decisions to save the fisheries. This behavior, while not uncommon amongst fishery managers who often fear for their careers, seems to be emphasized in the Caribbean where managers feel they receive little political support and are under a lot of pressure from the fishery stakeholders.¹⁹

RESULTS AND OBSERVATIONS

What constitutes the system? Who controls the TCF?

The total area of fishable habitat in the U.S. Caribbean is about 2,467 nm², and is under state and federal authority.²⁰ Puerto Rico's Department of Natural and Environmental Resources (DNER) and the USVI's Department of Planning and Natural Resources' Division of Fish and Wildlife (DFW) manage fisheries within their respective territorial waters.

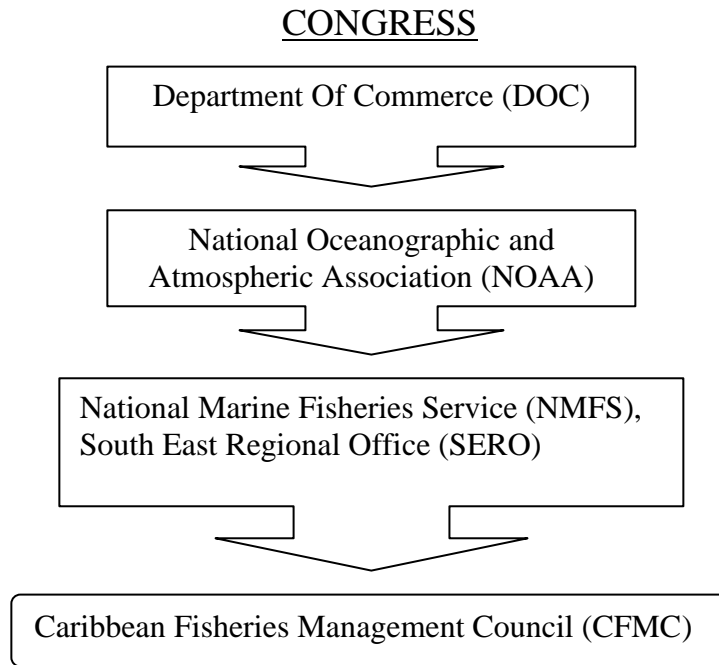
Fisheries located within federal waters²¹ are regulated by the NMFS, following recommendations from the CFMC, one of the eight regional councils in charge of managing U.S. fish stocks.²² The CFMC is itself under the authority of the Secretary of Commerce through the following arrangement:

¹⁹ Nicholas Drayton, Stephanie Wear, DPNR employees, and NMFS scientists, personal communication.

²⁰ NMFS, SERO Office (unpublished) + Please see Map 2

²¹ Federal waters = 3-200 miles for the USVI and 9-200 miles for PR + see Map 2

²² See Appendix A for a listing of all the regional councils.



The Council has the responsibility to recommend specific regulations in order to implement laws devised by Congress²³, while the DOC and its agencies have the actual authority to implement those recommendations. The main law we are concerned with is the *Fishery Conservation and Management Act*, which was initially created in 1976 and most recently amended in 1996 through the Sustainable Fisheries Act and renamed the Magnuson-Stevens Fishery Conservation and Management Act (M-SFCMA).²⁴ The mission statement of the Act is: “To provide for the conservation and management of the fisheries, and for other purposes,” which boils down to: This law is intended to ensure that fisheries will operate in a sustainable manner.²⁵

²³ Through the creation of FMPs

²⁴ It was then renamed *Magnuson-Stevens Fishery Conservation & Management Act*.

²⁵ Please see <http://www.nmfs.noaa.gov/sfa/magact/> for a full version of the M-SFCMA.

Issues and Solutions

Due to increasing fishing pressure, SWRF stocks in the U.S. Caribbean have been dwindling for the past forty years. In effect since the mid-80s, federal and state fishery management plans have tried to reverse this downward trend, but that reversal has yet to be achieved.²⁶ In addition to natural disruptions, such as hurricanes and diseases, a combination of socially-related issues has hindered effective management in this region. My research focused on three of these issues: Western style management, enforcement, and fishermen participation.

Western Style Management

The management style used in the federal waters of the U.S. Caribbean is based on the M-SFCMA, and mostly uses techniques developed for large-scale temperate fisheries. Management decisions regarding fishing quotas (ITQs & IFQs), fishing season length, gear restrictions, and marine protected areas (MPAs) are validated using fish stock assessments as a rational. Stock assessments are mostly derived from landings observations and observer data.²⁷ “In large-scale fisheries, observation of landings is facilitated in that there are relatively few landing points capable of handling large vessels. Observation on board is also feasible in many cases. In short, in most of these situations, the problems of counting the fish are not intractable.”²⁸ Further, this management style requires that regulations be properly enforced, without which the whole system would collapse.

The particular characteristics of TCFs, such as those in the Caribbean, have meant that assessment methods developed slowly compared to those in temperate waters.²⁹ The Western Style approach slows down SWRF management in the U.S. Caribbean for two main reasons: it is hard to “count the fish,” and enforcement agencies are overwhelmed by the number of fishermen.

²⁶ CFMC 1993, Rogers et al. 2001, SERO 2004 (unpublished)

²⁷ Michael Praeger, personal communication.

²⁸ FAO 2000

²⁹ Adams 1996, MRAG 2001

TCFs may be thought of as representing a higher order of complexity than the temperate fisheries for which the prevailing fisheries science modeling approach was first developed. U.S. Caribbean fishermen catch many species of fish and invertebrates using multiple techniques,³⁰ and unload these fish in many different locations throughout the islands. This makes it very difficult for fishery managers to collect all the data necessary for stock assessments, as there are too many fishermen and too many locations where catch can be unloaded. Basically, in the U.S. Caribbean there are no bottleneck areas where all landings can be easily observed.

The M-SFCMA requirements include: using the best available science to generate management alternatives to minimize bycatch to the extent practicable, (16 USC 1853(a) (11) (A) and rebuild depleted fish as soon as possible (16 USC 1853(a) (10)). However, when no data is available, not much management can happen, and management is delayed until more data is made available, thus delaying the management process.³¹ The CFMC agrees that, “Because of the nature of the database available, overfishing determinations will be imprecise.”³² Imprecise determinations lead to uncertain management.

Further delaying overall management is the fact that the Act covers fishery issues within federal waters, but has limited effect on territorial waters. State governments are only encouraged to apply regulations that are similar to those in the Act, and generally have their own set of rules. In some circumstances, federal regulations can pre-empt state regulations, but the NMFS is generally reluctant to do so, always trying to avoid the political tensions spawned by such actions. This separation of powers creates major issues in the US Caribbean, where state regulations lag behind federal regulations, and where 86% of the fishable habitat lies within territorial waters.

Finally, it is important to note that the commonwealth of Puerto Rico and territories of the United States Virgin Islands have little representation in the Senate, and no voting power. Therefore, this region has no one lobbying for it, unlike Alaska

³⁰ CFMC 1993

³¹ CFMC 1993: Appendix I pgs 13, 25, 26 and Appendix II pgs 1, 5

³² CFMC 1990

with Senator Stevens, and thus does not receive much federal funding.³³ This lack of funding affects NMFS' ability to produce the fish stock assessments necessary for good³⁴ fishery management plans.

Solution

One possible way of rapidly increasing data availability is to develop a program that incorporates fishermen's knowledge in the management process. In a sense, this can be thought of as fisheries co-management. The M-SFCMA is already a type of fisheries co-management, as it delegates responsibility from the federal government to the eight regional fishery management councils. Even so, it would be desirable to build on the structure of M-SFCMA, adjusting it to meet the needs of the U.S. Caribbean. Data and money are scarce in this region, but labor costs are low and fisheries are small and traditional. Many consulting firms, international organizations, and governments worldwide acknowledge that sufficient³⁵ data collection can occur, even with little funding.³⁶ If management is reorganized so that fishermen actively participate in its process, I believe the latter can help fill the knowledge gap on fish stocks while limiting the costs. Another benefit from involving fishermen in the management process is the transparency that incurs, which in turn should eliminate the suspicions fishermen tend to have towards managers.

Many examples of low-cost data collection techniques, as well as case studies, come from the Pacific region. In Melanesia, the Philippines, Fiji, and other island states, local fishermen have been trained in collecting fisheries information.³⁷ These collection methods are kept relatively simple and include the following characteristics:

1. Short (2-3 days) data-collecting training period for local labor
2. Full pay for data collectors
3. Supportive budget for as many data collectors as possible

³³ Personal communication: Nicholas Drayton, Miguel Rolon, Mike Barnette, Mike Orbach

³⁴ A "good" fishery management plan is one that relies on the best available data on fish stocks, makes minimal assumptions as to the initial stock size, recruitment, MSY, OY, and leads to the recovery and sustainable harvest of the resource over time.

³⁵ sufficient = enough data to develop a database to be used for a FMP

³⁶ MRAG 2000, FAO 2000, Christy 2000, Pomeroy 1995

³⁷ Adams 1996, Silvestre et al. 1997, Trudeau et al 2001, MRAG 2001

4. Data collection occurring through fish caught by fishermen; fish brought back to shore and sold.
5. Provision of materials (easy to use) for measuring fish parameters, e.g., plastic slates (similar to those used by divers) to note basic data such as the name of the fish; number of fish caught; length of fish; location of the catch; type of gear used; type of vessel, et cetera.
6. Professional data collectors hired to act as instructors and indicators. (They will move from region to region to conduct random sampling, as well as to supervise locals.)

While these techniques might not be the most advanced, they provide readily useable data in a short period of time.

Results should be summarized and set-up in a Fishery Management Information System (FMIS).³⁸ This computer program will act as a database, and enable users to quickly assess a situation while considering the interrelations of all parameters. The NMFS is currently using a similar program called TIP, but summarizing the Caribbean data to fit the program's specificities seems to be tedious.³⁹ The reason behind this is that each island (PR, St. Croix, St. Thomas, and St. John) previously used different computer formats, and rules regarding data collection and input. It is thus important that future data collection/input methods be similar for maximum effectiveness. When data on all species caught is available, a fishery management plan can be elaborated.

Enforcement

The CFMC has little effect over fisheries stocks in the region as only 14% of the total fishable habitat is located within federal waters. According to NMFS scientists,

³⁸ FMIS` can be bought off the market or developed to meet specific needs. Market programs have a cheaper starting cost, but cannot always consider all the specificities of each situation. Furthermore, these programs end up being more expensive in the long-run through the amendment of upgrades, which can only be purchased from the original purveyor. Custom-made systems are more expensive up-front and take longer to develop, but they can meet all the demands of projects and cost less in the long-run. Whichever system is selected, managers should take great care in maintaining transparency regarding their work, ensuring accessibility to all. (MRAG 2000)

³⁹ CFMC 1993

even if all fishing for SWRF were to be banned within the EEZ, that alone would not be enough to allow stocks to recover.⁴⁰

Territorial waters cover the other 86% of the total fishable habitats of the U.S. Caribbean and are under the management of Puerto Rico's DNER and the USVI's DPNR. Both agencies have installed some fishery management measures but are limited by tight budgets. After multiple efforts, I have been unable to acquire annual reports from the CFMC and state governments. Current state management measures have not been sufficient to protect SWRF stocks located in territorial waters.

It seems that local governments resist change and are reluctant to apply rules initiated by the federal government. State and federal fishery management plans are not always consistent, which leads to inefficiency. Fish that are protected from take in federal waters, such as Goliath grouper, are not protected in territorial waters,⁴¹ which limits the effectiveness of the initial protection measure and causes tensions between federal and state fishery agencies.⁴²

Basically, limited resources and the large/remote areas to be regulated, make fisheries enforcement difficult in the U.S. Caribbean. Currently, the NMFS' budget allows it to employ only two enforcement officers for all of the Caribbean EEZ,⁴³ making it virtually impossible to effectively cover the whole jurisdictional area. In the USVI, Rogers et al. state that the lack of enforcement of federal and territorial regulations has undoubtedly contributed to changes in the reef fish assemblages, leading to more herbivores, such as parrot fish, and fewer piscivorous fish, such as snapper and grouper.⁴⁴

An agreement was reached between the NMFS, PR and the USVI so that state enforcement agencies could help to regulate federal waters. However, given that state officers are already overworked in territorial waters, one has to wonder how effective they can be now that their jurisdictional area has been expanded 20 fold.

⁴⁰ NMFS SERO Office, (unpublished)

⁴¹ NMFS SERO Office, (unpublished)

⁴² Michael Barnette, personal communication; Rogers et al. 2001

⁴³ www.cfmc.gov

⁴⁴ Rogers et al. 2001

Adding to this work, state officers are often multi-tasked. In St. Croix⁴⁵ for example, only seven⁴⁶ agents are in charge of conducting enforcement for the 11 divisions of the Department of Planning and Natural Resources (DPNR). These men's tasks range from helping the coast guards with national security to dealing with hazardous chemicals, and/or helping out local police during big events. They have little time to physically patrol the surrounding waters in search of violators. "Man power is our biggest limitation" states Carlos Farchette, the chief enforcement officer for St. Croix. Manpower shortages result from two major causes; the entry exam for the DPNR enforcement team, and limited funding.⁴⁷

A common saying around the DPNR is that "while responsibilities increase every year, no more jobs are created, ever increasing the load on the few that are there." Farchette argues that, ideally, a marine unit should be created within the DPNR so that officers could be out on the water every day. "You have to let the fishermen see that we are there," he says, "because right now potential violators know when we are not able to go out, and choose those moments to go fishing." These shortcomings naturally hinder management/conservation efforts, as is the case with the Red Hind Bank. The latter was recently created to protect Red Hind spawning aggregations, but unfortunately it is located 12 miles off St. Croix. Its remoteness means that the DPNR does not send officers there every day, leaving the door open to violators.

Until recently, USVI state officers, who did not have ticketing powers, could do little to deter violators. "The worst a fisherman could get was a citation to appear in court, which rarely happened as fishery affairs are not a priority of the local justice department."⁴⁸ Ticketing rights were finally granted in March of 2004, and officers can now give out fines of up to \$400 to fishermen caught within protected areas. Farchette is pleased with this development, but says that his department has been trying to raise the value of other fines for the past ten years. "Right now, we can only fine someone on

⁴⁵ USVI

⁴⁶ 6 field officers and 1 desk officer

⁴⁷ Potential officers have to go through a 23-week police academy course that has tough academic and psychological standards, deterring many applicants.

⁴⁸ Aaron Hutchins, personal communication.

a second or third violation” ... “then again these fines are only for \$25 or \$50, which hardly deters anyone”⁴⁹

The Coast Guard and customs officers can also control fishing boats and potentially sanction for illegal fishing and/or catches. However, these two agencies` primary objective is homeland security and drug trafficking, making it unclear as to when or where they will intervene in fishery matters. Fishermen state that they are not happy when controlled, more because of the waste of time for them than anything else. “We feel that we are targeted by the coast guard and customs because we are the only ones out on the water. They make us lose time and money.”⁵⁰ As an additional point, it would be interesting to know how many officers from these two agencies know the fishery regulations in territorial and federal waters; likewise, how many are trained in fish recognition?

Solution

It is unlikely that sufficient state or federal money will be made available for fisheries enforcement in the near future, thus limiting the potential manpower increase that is needed.⁵¹ One solution would be to decrease the need for enforcement altogether. The idea would not be to get rid of the current enforcement officers, but rather to limit the scope of issues they would have to act upon, decreasing their overall workload and increasing their efficiency.

Studies show that when fishery-dependent communities (FDCs)⁵² are involved in the fishery management process, the need for enforcement is decreased.⁵³ Ideally, as managers raise awareness amongst the resource users, the latter often find more reasons to want to regulate themselves. Nonetheless, for this system concept to work, the incentives for the sustainable use of the resource (SWRF in this case) ideally come from

⁴⁹ Carlos Farchette, personal communication.

⁵⁰ Robert McCalaugh, personal communication.

⁵¹ Elections are coming up, leading few politicians to make serious decisions & historically, the US Caribbean has received little funding from the senate for fisheries management.

⁵² For the purpose of this project, FDCs comprise fishermen and their families, fish buyers, divers, and other potential users of SWRF.

⁵³ Christy 2000, Pomeroy et al. 1999, 1997

the resource users (bottom-up).⁵⁴ Further, Bennett, et al. argue that in order to keep FDCs relatively free of conflict, a high degree of consensus needs to be reached amongst stakeholders; all agree on the objectives of the fishery(s) (e.g., to provide food, to provide for future generations, or to operate efficiently).⁵⁵

Community proprietorship over fishery stocks can be thought of as the highest level of community involvement in the fishery management process. The aim of this system is to have the community regulate the resource, while the current managers (state and federal agencies) act as advisory bodies serving the community. Government supported enforcement will still be needed, especially to legitimize ownership over given areas, and resolve the more important regulatory conflicts. Finally, communication will be a key element, as officers will need to be easily accessible to all of the community in order to catch and solve issues early on.⁵⁶

Fisherman Participation

One of the main complaints from fishery managers⁵⁷ is that not enough fishermen participate in the workshops/meetings organized to discuss fisheries management. Several factors appear to affect participation rate, some of which are: workshop/meeting location and occurrence time, lack of interest, lack of trust, lack of incentives, and a lack of belief that another meeting is going to change things.⁵⁸

In the U.S. Caribbean, fishermen do not trust fishery managers, and the latter think the fishermen do not care about their resource and would rather make the most profit out of it instead of using it sustainably. I believe these attitudes are due to miscommunication. Neither side has made serious efforts to share critical information. Raw data is fairly difficult to understand, and no one has tried to simplify this information to make it available to a broader audience. Fishermen also have a huge

⁵⁴ Christy 2000, Pomeroy et al. 1999

⁵⁵ Bennett et al. 2001

⁵⁶ This idea is further developed on pg. 15

⁵⁷ For the purpose of this project, I define as managers all local and federal government officials affecting fisheries, consultants, and scientists.

⁵⁸ USVI fishermen, Nicholas Drayton, and Stephanie Wear, personal communication.

wealth of information on the fisheries, but generally do not share it with managers, for fear that yet another area will be closed.

Solution

The first step in getting greater participation from fishermen is to gain their trust. Instead of having one or two workshops/meetings in locations that fishermen can not always get to, managers need to go to the fishermen. By meeting the latter in their environment, managers demonstrate that they care about what is happening, at least enough to go all the way to the fisherfolk's house. Further, it is more comfortable for fishermen to give their opinion on issues at home, when the only cost to them is time.

In the event that managers are constrained by time, any general meeting should meet the following requirements: The meetings have to occur in places easily accessible to fishermen (fancy hotels and/or far away meeting places intimidate and deter many). If necessary, managers should charter participants to and from the meeting location. Meeting times should not conflict with fishing hours, and when they do, fishermen should be compensated for missing work and coming to the meeting. Stephanie Wear, with The Nature Conservancy, states that covering travel, food, lodging expenses, and an average pay of \$100 per day is necessary to get a good turnout at a meeting. Finally, managers have to follow-up with fishermen to explain how the issues are progressing. Keeping in touch is essential to demonstrating continued interest.

Another useful strategy is to keep fishermen informed of the exact state of the resources they depend on. This information should be clear and understandable to all, so that even the less literate can profit from it. Managers can use radio and television shows to disseminate the information, as these two means of communication are widely used in the islands. Hopefully, these facts would raise awareness amongst fishermen, who can then envision their way of life to disappearing in the near future. Desire for change should follow. Pomeroy argues that incentives need to arise from the community if effective management is to happen.⁵⁹ This is an important point, as most

⁵⁹ Pomeroy 1997

of the early management programs seeking to create incentives for the fishermen, have not produced very good results.

Once fishermen are informed and have newfound reasons to act, it is important to strengthen their incentives. Basically, managers need to make it worth their while. Fishery managers have to sit down with the fishery stakeholders and show them that the benefits of changing their habits will outweigh the costs. This needs to be kept simple as because people want to know exactly what they will have to give up, and what they are giving it up for. A method used in several developing nations encourages managers to give examples of similar situations in other regions/countries and how these had been dealt with. Ideally, it is even better if you can bring in fishermen that have lived through a restructuring of their fishery to talk to the fishermen you are working with. Fishermen tend to take the word of other fishermen more seriously than that of managers. This method of cultural exchange is already used in the U.S. Caribbean by The Nature Conservancy, but has not yet been used by local or federal management agencies.

One incentive/benefit for fishermen to change their current ways could be acquiring proprietorship over a given resource, also called a territorial use right in fisheries (TURF). The latter provides exclusive access to a community or to a group of fishermen over a certain area. This property right allows the users to determine the management system, which might take several forms (rent extraction, limited entry or others).

This system makes sense in the Caribbean for three reasons: 1) the current management process, although well founded, is too slow and receives too little funding to be efficient; 2) enforcement is unable to control all of its regulatory area; and 3) the open-access system in place does not give any incentives for conservation.

Having the fishing communities manage their exclusive areas will allow for the current management agencies to act more as supervisors and advisors. The agencies will be there to support the efforts of the community and provide the scientific back-up necessary for the sustainable management of the resources.

Enforcement and government support will still be necessary to legitimize the rights of communities over specific areas, and to remove violators if necessary. Officers

will then be able to respond quickly to arising issues instead of having to patrol large areas like watchdogs.

Creating proprietorship will get rid of the open-access problem. The fishermen will keep an eye on others in the community, and know that outsiders will not come and get their fish. This creates an incentive for the sustainable use of the resource, similar to a farmer with her/his land.

Good communication will be essential, because it is important that the community be able to quickly contact managers, scientists, and the enforcement officers in case a problem arises. Further, having all these people work hand in hand will allow relationships of trust to be built, which is important for lasting efficient management.

Several fishermen state that the TURF idea was already introduced to them, and that they wanted it to happen.⁶⁰ However, local governments seem reluctant to adopt this idea and do not support it. “Our government does not want to give away the funding” claims McCalaugh,⁶¹ “they fear that if we start managing the resource ourselves, we will take away the money they receive to manage our fisheries.” A solution to this dilemma could be to use the island of St Croix as a pilot project for this type of management.

The rationale for choosing St. Croix is based on the island’s isolated position, which makes it an easy control site, and its resemblance to the rest of the USVI and Puerto Rico.⁶² Further, fishermen from other islands are not known to travel all the way to St. Croix, and the local fishable habitats are mostly located within the 0-3 mile territorial sea.

The backbone of TURFs is that the whole community owns the area containing the SWRF resource. This includes the fishermen and their families, but also fish vendors, buyers, and the recreation industry. There are 200 licensed fishermen in St. Croix. For 100 of them, fishing is a full time job. Additionally, each fisherman employs as many as four helpers that are not considered licensed fishermen.⁶³ Currently, it is

⁶⁰ Robert McCalaugh, Alberto Sanchez, Edward Shuster, and Nicky Garrison, personal communication.

⁶¹ Founder of the St. Croix fishermen Cooperative.

⁶² St John and St Thomas are 20 miles and are the closest neighboring islands.

⁶³ Stephanie Wear, personal communication.

unclear whether St Croix fishermen belong to distinct communities, such as those related to certain villages, fishing techniques, or fishing areas. Thus, the first step in this pilot project will be to conduct an interview-based mapping of the islands` residents to determine differences between potential communities. Questions on the survey might ask questions about fishing locations, types of boat and geared used, and species caught.

Once distinctions are established among the different communities, proprietorship can be attributed. This is done by the government (local government in this case) that is the only authority able to legitimize the rights of the community over a given area. It is important that area locations be well defined, and that all communities are aware of who owns what. To get rid of any possible confusion, buoys should be placed along the area borders.

Communities will then be given the opportunity to manage their resources. One thing they might want to do is follow the example of the Matjes fishery in Scandinavia. This fishery managed to create a luxury product, the Matjes, or high grade herring.⁶⁴ Buyers, vendors, and fishermen meet at the beginning of each fishing season to agree on what the fishermen should catch. Buyers and vendors project what the market demand will be, and what the supply should be in order to maintain prices. If fishermen catch more than their quota, they are fined in proportion to the extra amount of fish they caught. By limiting the number of fish reaching the market, this community maintains prices high, which benefits everyone.

This fishery survives on a set of ten rules, named the Ten Commandments, by which all abide. These rules are simple and generally enforced by peer pressure over those who break them, reducing the need for enforcement. The rules are respected, because doing so benefits the whole community. The openness, exchange of information and equal participation from all stakeholders has created trust and confidence among the participants and are at the base of the institutional management set-up.⁶⁵

⁶⁴ Nielsen et al. 1996

⁶⁵ Nielsen et al. 1996

The government will be needed only for technical assistance and economic back-up, thus acting as an advisory body, reversing the previous arrangement. This management method does not mean that local agencies give up their funding. If the communities can find their own interest in managing their resource well, they will do it for free.

DISCUSSION AND CONCLUSION

Very little doubt is left about the need for fisheries management in the U.S. Caribbean. Since 1991, the CFMC has acknowledged the decrease in abundance of several large piscivorous fish, which had previously been the base catch for the fishing industry in this region.⁶⁶ “Catch per unit effort (CPUE) based on fish traps has declined in both the USVI and P.R. Landings of larger individuals of groupers such as Coney and Red Hind have decreased; and Nassau grouper in particular continue to be very scarce.”⁶⁷ The livelihoods of thousands of islanders depend on the continued availability of the resource, making this a huge social issue on top of being a conservation issue. Further, studies have demonstrated that as a resource base declines more conflicts emerge.⁶⁸ Therefore, state and federal management agencies are soon going to have much more to deal with than just fishery stock management. Currently, a significant need exists for simple and robust fisheries assessment methods that can estimate the potential of a particular resource, its capacity in terms of the level of fishing effort, and its current status, i.e., whether it is currently exploited sustainably or not.⁶⁹

Fishery dependent communities need to be properly informed of the present concerns regarding the health of SWRF stocks, as well as the reasons behind regulation efforts. Too often have regulations been set by the federal government without considering local opinion, as in the creation of marine parks off the USVI and Puerto Rico. This peremptory way of doing things has angered fishermen, who do not

⁶⁶ CFMC 1991

⁶⁷ CFMC 1993

⁶⁸ Bennett et al, Trudeau et al. 2001, Adams 1996

⁶⁹ MRAG 2000

understand why they are no longer allowed to fish in areas they have fished for decades. Truly, we cannot afford to list every major species as “no take,” or to close off too many areas. FDCs need to make a living, and will create conflicts if they feel they are being pushed out of the fishery.

Cooperation of all involved parties and balancing the different interests equally is essential to effective co-management. Community-based management, because of its success in other island nations, seems to offer the best promises for timely fisheries management in the U.S. Caribbean. In this case, the current managerial bodies need to take on an advisory role, guiding the communities into managing SWRF, rather than telling them what they can or can not do. “A precondition for successful co-management is, that the user-groups on one hand have the aspiration and capabilities to co-manage and take over competence and responsibility and on the other hand that an appropriate institutional arrangement is established.”⁷⁰ It would be interesting to apply the TURF approach in St Croix. While limiting the impacts of this type of management on the rest of the region, this approach could also give St Croix’s FDCs a chance to prove that they can manage their resources sustainably.

In conclusion, the recommendations given in this paper are not meant as the solution to all problems, but as a framework on which to develop the recovery of SWRF in the US Caribbean. Despite the limited means available to both state and federal agencies, some good work has already been done. More needs to happen to stop SWRF biological overfishing. Sacrifices and hard decisions need to be made, but what is done today will be easier than what will have to be done in the future should nothing change. The SWRF resource and its stakeholders can coexist, but since the fish cannot manage themselves, it is up to the stakeholders to manage the fish.

⁷⁰ Nielsen et al. 1996

LITERATURE CITED

- Adams T.J.H. Coastal Fisheries and Marine Development Issues for Small Islands. Marine and coastal workshop (in association with the World Conservation Congress). Montreal. 1996
- Bennett E., Neiland A., Anang E., Bennerman P., Rahman A.A., Huq S., Bhuiya S., Day M., Fulford-Gardiner M., Clerveaux W. *Towards a better understanding of conflict management in tropical fisheries: evidence from Ghana, Bangladesh and the Caribbean*. Marine Policy 25 (2001) 365-376.
- Caribbean Fishery Management Council (CFMC) and National Marine Fisheries Service (NMFS). Fishery Management Plan, Final Environmental Impact Statement, and Draft Regulatory Impact Review for the Shallow-Water Reef Fish Fishery of Puerto Rico and the U.S. Virgin Islands. February, 1985
- CFMC. Amendment number 1 to the Fishery Management Plan for the Shallow-Water Reef Fish Fishery, Preliminary Environmental Assessment and Regulatory Impact Review. May, 1990
- CFMC. Regulatory Amendment to the Shallow-Water Reef Fish Fishery Management Plan. July, 1991
- CFMC. Amendment 2 to the Fishery Management Plan for the Shallow-Water Reef Fish Fishery of Puerto Rico and the U.S. Virgin Islands. May, 1993
- CFMC. Regulatory Amendment to the Fishery Management Plan for the Reef Fish Fishery of Puerto Rico and the United States Virgin Islands concerning Red Hind spawning aggregation closures including a regulatory impact review and environmental assessment. August, 1996
- Christy F. T. Common Property Rights: An Alternative to ITQs. FAO. 2000
- Christy F.T. *The Development and Management of Marine Fisheries in Latin America and the Caribbean*. IDB. Washington, DC. July 1997
- FAO. The state of the world fisheries and aquaculture (SOFIA). Rome, Italy. 2000
- Lemay M.H. *Coastal and Marine Resources Management in Latin America and the Caribbean*. Inter-American Development Bank (IDB) Technical Study. Washington, DC. 1998

- Marine Resource Assessment Group (MRAG). The Performance of Customary Marine Tenures in the Management of Community Fishery Resources in Melanesia. London. July, 1999
- MRAG. Strategic Assessment of tropical Fisheries Management. Final Technical Report. Project R7040. 2000
- MRAG. Information Systems for the Co-Management of Artisanal Fisheries: Final Technical Report. Vol. 1, Project R7042. 2001
- National Marine Fisheries Service (NMFS) Southeast Fisheries Science Center. Our Living Oceans. 1999
- Nielsen J. R., Vedsmand T. Fisheries Co-Management: An Alternative Strategy in Fisheries – cases from Denmark – OECD. 1996
- Olsen S. B., Frameworks and indicators for assessing progress in integrated coastal management initiatives. *Ocean & Coastal Management* 46: 347-361. 2003
- Pew Oceans Commission. *America's Living Oceans: Charting a course for sea change*. Pew Charitable Trust. 2003
- Pido M. D., Pomeroy R. S., Garces L. R., Carlos M. B. A Rapid Appraisal Approach to Evaluation of Community-Level Fisheries Management Systems: Framework and Field Application at Selected Coastal Fishing Villages in the Philippines and Indonesia. International Center for Living Aquatic Resources Management (ICLARM). *Coastal Management*, 25: 183-204.1997
- Pomeroy R. S. Community-based and co-management institutions for sustainable coastal fisheries management in Southeast Asia. *Ocean & Coastal Management*, Vol. 27, No 3, pp. 143-162. 1995
- Pomeroy R.S., Pollnac R. B., Katon B. M., Predo C. D. Evaluating factors contributing to the success of community-based coastal resource management: the Central Visayas Regional Project-1, Philippines. *Ocean & Coastal Management*, Vol. 36, Nos 1-3, pp. 97-120. 1997
- Pomeroy R. S., Berkes F. Two to tango: the role of government in fisheries co-management. *Marine Policy*, Vol. 21, No. 5, pp. 465-480. 1997
- Pomeroy R. S. A process for Community-based Fisheries Co-management. *Naga*, the ICLARM Quarterly. January-March 1998

- Pomeroy R. S., Katon B. M., Harkes I. Fisheries Co-management: Key Conditions and Principles Drawn from Asian Experiences. ICLARM. 1999
- Rogers C. S., Beets J. *Degradation of marine ecosystems and decline of fishery resources in marine protected areas in the US Virgin Islands*. Environmental Conservation 28 (4): 312-322. 2001
- Silvestre G., Pauly D. Status and management of tropical coastal fisheries in Asia. ICLARM Conference Proceedings 52, 208p. 1997
- Trudeau H., Santos G.H.A., Meintjies J. Professional management and alternative livelihoods: approaches to enforcing fisheries laws. 2001
- United States Congress. *Magnuson-Stevens Fishery Conservation and Management Act*. Public Law 94-265. As amended through October 11, 1996

WEBSITES USED

www.cfmc.gov
www.mragltd.com/
www.noaa.gov
www.reefguardian.org
www.un.org
www.wb.org

LIST OF INTERVIEWEES

- Marianne Cufonne and Nicholas Drayton, The Ocean Conservancy.
- Stephanie Wear, The Nature Conservancy.
- Carlos Farchette and Aaron Hutchins, Department of Planning and Natural Resources.
- Robert McAuliffe, Alberto Sanchez, Edward Shuster, and Nicky Garrison, USVI fishermen.
- Miguel A. Rolón and Diana T. Martino, Caribbean Fishery Management Council.
- William J. Tobias, CFMC Scientific and Statistical Committee.
- Robert Trumble, Marine Resource Assessment Group Americas.
- Mike Barnette, National Marine Fisheries Service, South East Regional Office.

MAPS & DIAGRAMS

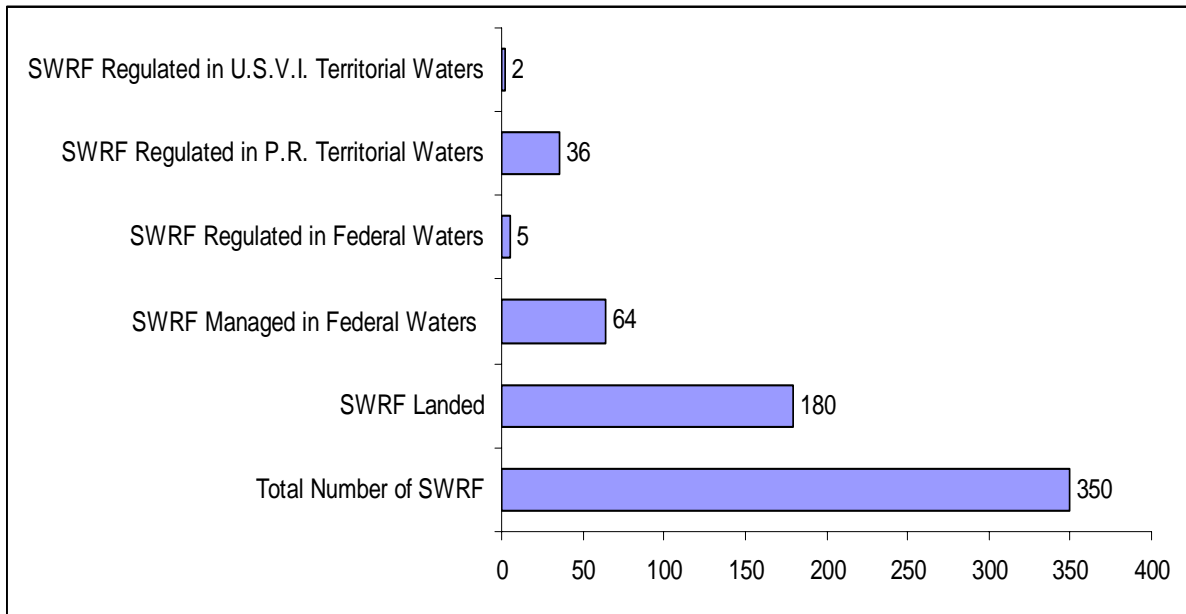
Map 1: Location of the U.S. Caribbean



Map 2: Fishable Habitat of the U.S. Caribbean (Zone < 100 fathoms)



Diagram 1: Shallow-water Reef Fish Management in the U.S. Caribbean



Appendix A: U.S. Regional Fishery Management Councils

A) NEW ENGLAND COUNCIL.--The New England Fishery Management Council shall consist of the States of Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut and shall have authority over the fisheries in the Atlantic Ocean seaward of such States (except as provided in paragraph (3)). The New England Council shall have 17 voting members, including 11 appointed by the Secretary in accordance with subsection (b)(2) (at least one of whom shall be appointed from each such State).

(B) MID-ATLANTIC COUNCIL.--The Mid-Atlantic Fishery Management Council shall consist of the States of New York, New Jersey, Delaware, Pennsylvania, Maryland, Virginia, and North Carolina and shall have authority over the fisheries in the Atlantic Ocean seaward of such States (except North Carolina, and as provided in paragraph (3)). The Mid-Atlantic Council shall have 21 voting members, including 13 appointed by the Secretary in accordance with subsection (b)(2) (at least one of whom shall be appointed from each such State).

(C) SOUTH ATLANTIC COUNCIL.--The South Atlantic Fishery Management Council shall consist of the States of North Carolina, South Carolina, Georgia, and Florida and shall have authority over the fisheries in the Atlantic Ocean seaward of such States (except as provided in paragraph (3)). The South Atlantic Council shall have 13 voting members, including 8 appointed by the Secretary in accordance with subsection (b)(2) (at least one of whom shall be appointed from each such State).

(D) CARIBBEAN COUNCIL.--The Caribbean Fishery Management Council shall consist of the Virgin Islands and the Commonwealth of Puerto Rico and shall have authority over the fisheries in the Caribbean Sea and Atlantic Ocean seaward of such States (except as provided in paragraph (3)). The Caribbean Council shall have 7 voting members, including 4 appointed by the Secretary in accordance with subsection (b)(2) (at least one of whom shall be appointed from each such State).

(E) GULF COUNCIL.--The Gulf of Mexico Fishery Management Council shall consist of the States of Texas, Louisiana, Mississippi, Alabama, and Florida and shall have authority over the fisheries in the Gulf of Mexico seaward of such States (except as provided in paragraph (3)). The Gulf Council shall have 17 voting members, including 11 appointed by the Secretary in accordance with subsection (b)(2) (at least one of whom shall be appointed from each such State).

(F) PACIFIC COUNCIL.--The Pacific Fishery Management Council shall consist of the States of California, Oregon, Washington, and Idaho and shall have authority over the fisheries in the Pacific Ocean seaward of such States. The Pacific Council shall have 14 voting members, including 8 appointed by the Secretary in accordance with subsection (b)(2) (at least one of whom shall be appointed from each such State), and including one appointed from an Indian tribe with Federally recognized fishing rights from California, Oregon, Washington, or Idaho in accordance with subsection (b)(5).

(G) NORTH PACIFIC COUNCIL.--The North Pacific Fishery Management Council shall consist of the States of Alaska, Washington, and Oregon and shall have authority over the fisheries in the Arctic Ocean, Bering Sea, and Pacific Ocean seaward of Alaska. The North Pacific Council shall have 11 voting members, including 7 appointed by the Secretary in accordance with subsection (b)(2) (5 of whom shall be appointed from the State of Alaska and 2 of whom shall be appointed from the State of Washington).

(H) WESTERN PACIFIC COUNCIL.--The Western Pacific Fishery Management Council shall consist of the States of Hawaii, American Samoa, Guam, and the Northern Mariana Islands and shall have authority over the fisheries in the Pacific Ocean seaward of such States and of the Commonwealths, territories, and possessions of the United States in the Pacific Ocean area. The Western Pacific Council shall have 13 voting members, including 8 appointed by the Secretary in accordance with subsection (b)(2) (at least one of whom shall be appointed from each of the following States: Hawaii, American Samoa, Guam, and the Northern Mariana Islands).

(2) Each Council shall reflect the expertise and interest of the several constituent States in the ocean area over which such Council is granted authority.

(3) The Secretary shall have authority over any highly migratory species fishery that is within the geographical area of authority of more than one of the following Councils: New England Council, Mid-Atlantic Council, South Atlantic Council, Gulf Council, and Caribbean Council.

