

MANAGEMENT IN THE GULF AND CARIBBEAN: MOSAIC OR MELTING POT?

Patrick McConney, Hazel A. Oxenford and Milton Haughton¹

Centre for Resource Management and Environmental Studies (CERMES), University of the West Indies Cave Hill Campus, Barbados, E-mail pmcconney@caribsurf.com

¹*Caribbean Regional Fisheries Mechanism (CRFM) Secretariat, Belize City, Belize, Central America.*

ABSTRACT Does “managing large pelagic fishes” mean the same thing across the diversity of maritime jurisdictions, governance arrangements, economies, languages, cultures, scales of operation and other features of the Gulf and Caribbean region? It would be surprising if it did. Yet international fisheries management urges this mosaic of management to become a melting pot; at least integrated, even if differentiated. This paper examines some themes underlying whether a mosaic or melting pot is the most apt metaphor for where we are, and are headed, in attempts to manage large pelagic fishes in the region. We pay particular attention to the multi-dimensional concept of scale. Included are the scales of management units, fisheries authorities, management outcomes, harvest and postharvest enterprises, and the interdisciplinary perspectives that can be brought to bear on fishery problems and solutions. We are also interested in linkages, because linkage is connected to the scaling-up that is important in a region with many small countries and territories. Even if the management of large pelagics starts as a mosaic, coherent patterns of sub-regional and regional interactions can conceivably be nested and linked to improve the integration, and hence effectiveness, of management interventions ... at least in theory.

RESUMEN Significa “Manejo de grandes peces pelágicos” lo mismo a través de la diversa jurisdicción marina, arreglos de gobernabilidad, economías, lenguajes, culturas, escalas de operación y otras características de la región del Golfo y el Caribe? Sería sorprendente si así fuera. Sin embargo el manejo internacional de pesca sugiere que este mosaico de manejo regional se convierta en un crisol de razas; por lo menos estar integrado, aunque sea de manera diferenciada. Este escrito examina algunos de los temas subyacentes para determinar si mosaico o un crisol de razas es la más apta metáfora para indicar donde estamos, y hacia donde vamos, en nuestro intento por manejar grandes peces pelágicos dentro de la región. Ponemos atención particular al concepto multi-dimensional de “escala”. Incluidas están las escalas de unidades de manejo, autoridades de pesca, resultados de manejo, empresas para cosecha y post cosecha las de perspectivas disciplinarias e inter disciplinarias que puedan aplicarse a los problemas y soluciones de la pesca. Estamos igualmente interesados en enlaces, ya que el enlace está conectado al aumento a escala que resulta importante dentro de una región con muchos pequeños países y territorios. Aunque el manejo de grandes pelágicos empiece como un mosaico, patrones coherentes de interacciones sub-regionales y regionales pueden concebiblemente anidarse y enlazarse a fin de mejorar la integración, y por ende la efectividad, de intervenciones de manejo... por lo menos en teoría.

INTRODUCTION

Wedge between the continental Americas, the Gulf of Mexico (GOM) and Caribbean Sea contains more than 100 million people located in over 30 countries and territories, the majority of which are islands. It would be surprising if “managing large pelagic fishes” meant the same thing across the diversity of maritime jurisdictions, governance arrangements, economies, languages, cultures, scales of operation and other features that reflect the heterogeneity of the GOM and Caribbean Sea. Yet international fisheries management trends urge this diverse mosaic to become a melting pot; at least integrated in its management regimes, even if differentiated to some extent.

For example, the International Commission for the Conservation of Atlantic Tunas (ICCAT) recommended management measures for large pelagic fishes are typically intended to be uniformly applied in the area. Some countries in alliances such as the Organization of Eastern Caribbean States (OECS) and the Caribbean Community

(CARICOM) have harmonized their national fisheries regulations for demersal inshore and turtle species, and may yet do so for large pelagics. Major importing countries insist that their Caribbean suppliers meet international fish trade and quality standards (e.g., Hazard Analysis Critical Control Point systems, European Union Import Standards for Fish Products) that extend backwards along the fish chain to small-scale harvest operations. However, despite these forces of homogenization, there are other factors that maintain heterogeneity and reinforce the differences in the fisheries and fisheries management regimes of the region.

These differences include the sizes and capacities of the fisheries management authorities, the scales of the industry components (vessels, landing facilities, processing plants, etc.), the relative size and value of the commercial harvest, the values of recreational fisheries, the institutional and governance relationships among resource users or other stakeholders and managers, the capabilities of fisheries research agencies, and more. The differences

are reflected in the approaches to fisheries management, the inputs and outcomes, and they apply to all parts of the fish chain in both private and public enterprise.

In the management of large pelagic fishes in the region there will always be pros and cons as to whether complete uniformity (extreme melting pot) is more desirable than high diversity (extreme mosaic) or the reverse, or some middle ground. The conclusion will often be situation (fishery, management measure, country, stakeholder, etc.) specific. Leveling the playing field through standardization (from reporting procedures to technical regulations) may be equitable under some circumstances, but be highly inequitable in others where the capacity to manage differs significantly among fishery participants. However, regardless of whether or not industry and management diversity is considered “good” or “bad,” fisheries managers and other stakeholders should be aware of what factors maintain or erode diversity to greater and lesser extents. Without this knowledge it will be difficult to engineer any planned degree of integration which is an important ingredient in maintaining the mosaic without much mixing or stirring the melting pot to achieve the best blend.

This paper examines some of the themes underlying whether “mosaic” or “melting pot” is the most apt metaphor for where we are, and are headed, in attempts to manage large pelagic fishes in the region through various means of integration. We pay particular attention to the multi-dimensional concept of scale because it is pervasive in the region. We are also interested in linkages through networks, because linkage determines whether or not scaling-up is feasible. The scaling up of management can be desirable in a region with many small developing countries and territories that rely heavily on project-implemented fisheries management. Following the introduction of what we mean by scale and network, these concepts are applied in some brief analyses of fisheries in the GOM and Caribbean Sea region. We attempt to provide unconventional and provocative perspectives on these topics, to see how well the metaphors fit the situations and to draw some conclusions from the findings.

Scale and Network Concepts

The concepts of scale and networks, for the purpose of this discussion, are best addressed in the context of fisheries governance as a complex adaptive system (CAS) and social-ecological system (SES) (Garcia et al. 2003, Bavinck et al. 2005, Kooiman et al. 2005, Wilson 2006). CAS are highly interactive internally, and often exhibit the capacity to self-organize and adapt without outside influence (Mahon 2005). SES are conceptualized as being far more intricately interwoven than is achieved by simply

fitting humans into ecosystem models or adding natural resource dynamics to models of human society. The SES view emphasizes that social and ecological systems are inevitably linked and integrated, and that the delineation between the 2 systems is artificial and arbitrary (Berkes and Folke 1998, Anderies et al. 2006).

Scale is a concept common to most disciplines. SES operate at multiple scales so it is critical to consider the scale or range of scales at which we can collect and process information, reach conclusions on and manage effectively; ecological scales are both spatial and temporal. Social scales also include the jurisdictional and institutional, among others. Integrated into an SES perspective, complex and dynamic interactions and feedback loops may occur within or across ecological and social scales (Cumming et al. 2006).

Using the scheme of Cash et al. (2006), “scale” is the overall label of the feature being measured such as spatial, temporal, jurisdictional, institutional, management arrangements, network, and ecological knowledge scales. “Level” is the particular resolution within a scale. “Multi-scale” means more than one scale, and “cross-scale” signifies interactions across them. “Cross-level” refers to interactions among different levels within the same scale (Figure 1).

In Figure 1, considering a hypothetical Caribbean fisheries example, one may have an international fisheries instrument with international jurisdiction (such as the FAO Code of Conduct for Responsible Fisheries) that drives fisheries policy at the sub-regional (e.g., eastern Caribbean) and country (e.g., St. Vincent and the Grenadines) levels. This is multi-scale, cross-scale and multi-level. The international instrument also drives policy at the national jurisdictional level (cross-level). In this example, because of vessel flagging practices, national jurisdiction may extend well beyond the geographic borders of the country. All of the above may be top-down (shown by descending unidirectional arrows), but at lower levels in this multi-scale case there are two-way interactions between watershed and settlement as fisheries is integrated into coastal management according to the FAO Code. There are also organizational interactions such as of the Fisheries Division with communities (e.g., village council jurisdiction) and individuals (who have personal social networks) for getting the Code implemented.

Three common “scale challenges” include: the failure to recognize important scale and level interactions altogether (ignorance); persistence of mismatches between levels and scales (mis-match); and failure to recognize heterogeneity in the way that scales are perceived and valued by different actors (plurality)(Cash et al. 2006). In natural

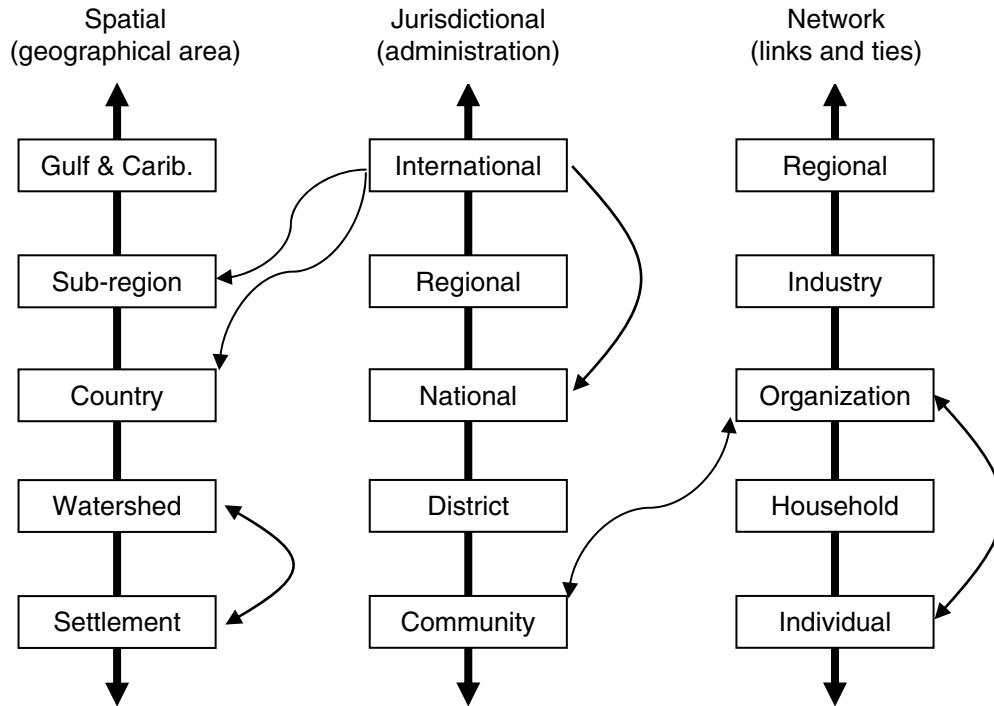


Figure 1. Spatial, jurisdictional and network multi-level scales showing cross-scale and cross-level linkages (Based on Cash et al. 2006). Single headed arrows indicate unidirectional action (such as top-down influence) while double headed arrows indicate two-way interaction (such as negotiation).

resource management systems, social-ecological scale mismatches are evidenced by losses of adaptive capacity and resilience (Cumming et al. 2006). Successful co-management institutions provide examples of approaches to scales and linkages that address cross-scale governance issues (Berkes 2002, 2006). This brings us to networks.

In the context of this paper, network analysis focuses on the interactions between SES components and the ways in which the structure of nodes and links, and the flows contained within, affects the performance of the system on a variety of scales at various levels. Network analysis has been applied to both social systems and ecological systems, combining qualitative and quantitative information, but seldom integrating SES (but see Janssen et al. 2006). Network architecture or structure is of little value unless the nature of flows through the network and its purpose are also known. For example, a dense network may be good for the rapid diffusion of a beneficial innovation or information, but it may also spread irresponsible fishing methods or constrain individual fisheries managers from experimentation for adaptation if close-knit cliques are formed.

Depending on the type of analysis (food web, community, fishery, business) network nodes can be individuals, organizations, countries or whatever entities are appropriate. The focus on ties (relations between the focal node and

other nodes) and links (relations only between other nodes in the focal node's network) as the main features that confer network properties, rather than the nodes themselves, is distinctive to network analysis. Ties and links between nodes may be characterized in innumerable ways. In social network analysis the strengths and directions of the flows of information, assistance, funds, conflict and other types of exchanges are quantified and described. Although networks are often illustrated 2-dimensionally as flat structures, adding a third dimension or height can display differences in levels within a scale, disparities in power and other variations which may be perceived as inequitable or otherwise problematic, and hence attract management attention (Figure 2).

Figure 2 depicts a hypothetical personal social network with a longline captain (LLC) as the focal node. His network contains his crew (LLF), the boat owner (BO) and fisheries officials of various ranks. The most powerful of the latter is the Chief Fisheries Officer (CFO) with whom there is only a top-down relationship. Communication with the CFO requires the captain to go through his boat owner and a fisherfolk leader (FFL), or he can speak to one of the lower ranked fisheries officials (DC or SFO). Typically, hierarchical public administration is illustrated by the links between the fisheries officials. We now turn to how scale, linkage and network concepts are applicable

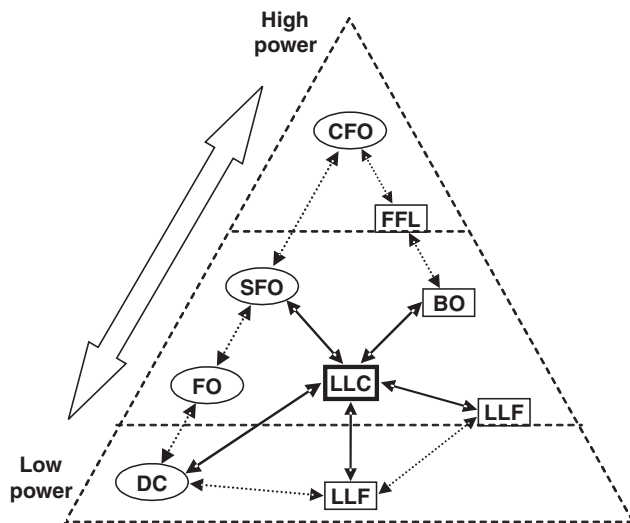


Figure 2. Network of fishery stakeholders with power level hierarchy superimposed CFO = Chief Fisheries Officer; SFO = Senior Fisheries Officer; FO = Fisheries Officer; DC = Data Collector; FFL = Fisherfolk leader; BO = boat owner; LLC = longline captain (the network node here); LLF = longline fisher. Arrows denote communication with direction(s) indicated, solid for ties and dotted for links. Dashed lines in triangle define three different levels of power. State stakeholders are shown as oval shapes and industry stakeholders in rectangular boxes.

to the management of large pelagic fishes in the GOM and Caribbean.

Fisheries perspectives

In the GOM and Caribbean, large pelagic fishes are the targets and by-catch of commercial, recreational and subsistence fisheries that range from large scale to very small scale. The species and species groups we refer to are primarily the large tunas, billfishes, swordfish, dolphinfish, wahoo and large mackerels. Sharks are often included as by-catch. The most recent information on the status of stocks and fishery assessments is from ICCAT (www.iccat.int). However, although stock status, fishery trends and regulatory measures are clearly pertinent to management, they are not the main focus of this paper. Instead, we examine some of the practical consequences that scale, linkage and integration have for management, by means of brief examples mainly from a CARICOM perspective.

The mosaic aspects of wider Caribbean geography are conspicuous in the illustration of marine jurisdictions comprising hypothetical Exclusive Economic Zones (EEZs) based on the principle of equidistance (Figure 3). This jurisdictional mosaic consists of 26 countries and the 19 dependent territories of 4 other countries; the majority of these countries and territories are small island developing states (SIDS) with high dependence on fishing and

tourism. There is considerable spatial and seasonal heterogeneity in marine productivity and oceanographic features (Mahon 2002). In terms of ecological linkages, the trophic connections between productive coastal areas and less productive offshore planktonic or pelagic systems are poorly understood for this region. Food chain linkages between exploited resources with differing scales of distribution and migration through the EEZs or across the high seas, such as flyingfish and large pelagics, have not received much consideration in management. However, supporting research is currently in progress. Knowing such linkages may be critical to preventing the stock depletion that has occurred in many other areas and systems where predator-prey relationships have not been adequately considered in the exploitation of large pelagic species (Mahon 2005).

A second, but patchier, mosaic layer superimposed on these EEZs comprises the various organizations and alliances to which the countries and territories in the region belong. The spatial scales of the organizations can be illustrated by highlighting their membership. This is also shown in Figure 3 for CARICOM countries, but there are several other organizations relevant to large pelagic fisheries including the Western Central Atlantic Fishery Commission (WECAFC) of the Food and Agriculture Organization (FAO), OECS and Organización del Sector Pesquero y Acuícola del Istmo Centroamericano (OSPESCA) among others (Chakalall et al. 1998, 2007).

It is immediately obvious that this patchwork of marine jurisdictions and organizations poses serious challenges to the integration of fisheries management in the region, and especially so in the case of large pelagics that range beyond the region (Singh-Renton et al. 2003). Spatial (ecological) and jurisdictional (management) scales are generally not well matched at any level, and this is well known (Mahon and McConney 2004a). However, little attention has been paid to the lower levels on the spatial and jurisdictional scales and how these are linked to the higher levels. An exception is the analysis by Berkes (2006) of tuna management in the eastern Caribbean within the context of cross-scale governance (Figure 4). He argued that international, regional, national and community levels are mis-matched and poorly linked. He goes on to point out that this is also true for the scales of power and knowledge seldom considered in management.

Using the case of small-scale fishers in Gouyave, Grenada, it has been shown that their local fishery knowledge has no way of making an impression on the complex science used in ICCAT assessments (Grant and Berkes 2004, Grant and Rennie 2005). ICCAT wields immense power that affects the livelihoods of artisanal longline fishers and constrains their opportunities. The impacts of

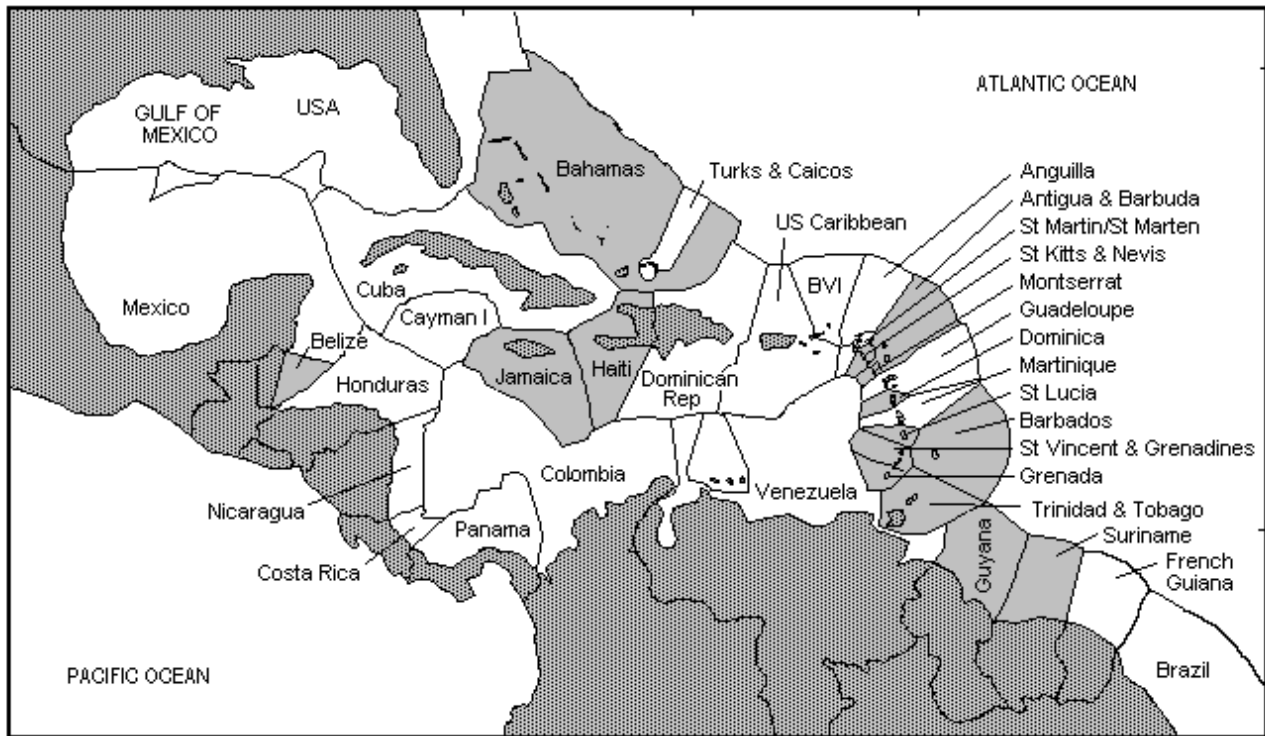


Figure 3. The wider Caribbean region highlighting hypothetical EEZs of CARICOM countries (Adapted from Haughton et al. 2004).

ICCAT allocation criteria and management measures at the community level are not well documented in a form that is likely to be consumed by the international Commission even if socio-economic matters were to be given more consideration. Indeed, even at the regional level of CARICOM, there is little that has been done by Member States to comprehensively document the socio-economic, institutional and linkage aspects of their fisheries. A study to examine these aspects has only recently been undertaken in the context of establishing a Common Fisheries Policy and Regime (Phillips et al. 2006). However, much more needs to be done to integrate livelihood perspectives into the management of large pelagics if small fishing communities are to be integrated into management.

The above analysis argues for bottom-up integration in fisheries management, but it would be erroneous to assume that information on international or regional fisheries management routinely penetrates beyond the national level to reach fishing communities, fisher organizations and individual fishers. While fisheries managers in the region may well speak and understand the language of ICCAT or other international fisheries bodies such as the bodies of FAO, this is not the case for fisherfolk. A barrier to top-down integration and sharing of fisheries management outlooks often exists at the national level due to the limited extension and outreach capacities of small fisheries authorities. Local level fisherfolk are typically unaware of the scale

mis-matches and lack of integration since ICCAT and the concepts of managing large pelagics are completely alien to them. National barriers to integration and scaling up are perhaps the most persistent.

In considering the issue of capacity, Mahon and McConney (2004b) argue that fisheries authorities in small island developing states (SIDS) cannot simply be scaled up to perform as miniatures of the large and relatively well funded agencies of developed countries such as the federal National Marine Fisheries Service (NMFS) and the state authorities in the United States of America. These authors observe that technical capacity to manage fisheries will almost always be below optimum, and suggest that it be supplemented by more people-centered approaches. In the case of Barbados, the fisheries authority set out, as advice to policy-makers, the costs and benefits of becoming an ICCAT Contracting Party prior to the country becoming a member. In this policy proposal, the costs included recruiting an additional fisheries officer to join the single fisheries biologist primarily responsible for all science associated with the country's nine fisheries management plans. Although the policy decision was to join ICCAT, the additional officer was not approved. The main justification for the additional officer was to bridge the gap between the regional and international levels and the local fishing industry. The intent was to "translate," in real time, ICCAT communications so that the local longline industry would

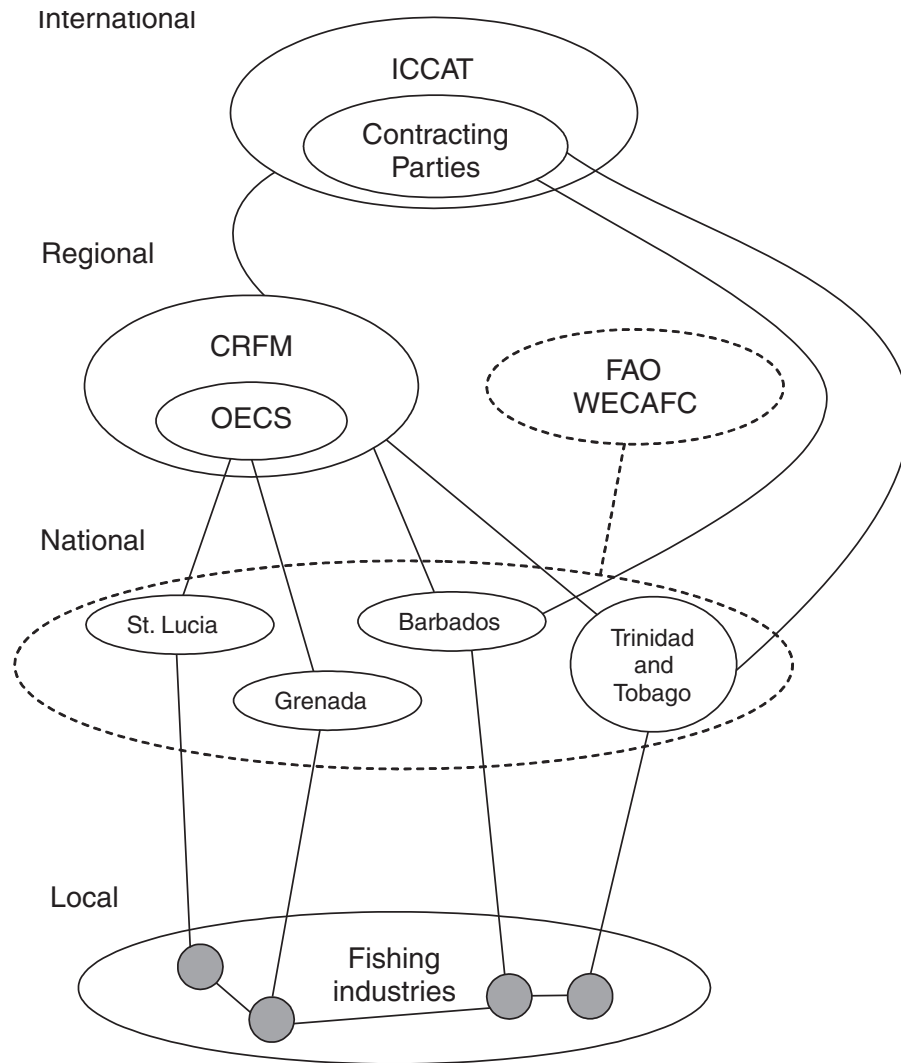


Figure 4. Cross-scale networked governance in Caribbean tuna management. ICCAT=International Commission for the Conservation of Atlantic Tuna, CRFM=Caribbean Regional Fisheries Mechanism, OECS=Organization of Eastern Caribbean States, FAO=Food and Agricultural Organization of the United Nations, WECAFC=Western Central Atlantic Fisheries Commission (Adapted from Berkes 2006). Dashed lines of FAO WECAFC and around its member states indicates relationships of secondary importance. Dark-filled fishing industry circles represent dense networks of non-State stakeholders

gain a much better appreciation of how large pelagic fishes are managed, or not managed, and make meaningful inputs into the Barbados perspective and policy on management. Although all cannot be blamed on the absence of a single officer, the very limited capacity of the fisheries authority to engage the industry has severely constrained integration at national and higher levels.

For a fuller explanation of constraints on integration at the national level we also need to look beyond the management authority and examine the linkages to policy decision-making and to fisherfolk collective action as interest or pressure groups. Policy-making and constituent lobbying are closely related in political processes. Although large pelagic fisheries are currently or potentially impor-

tant to the societies and economies of most CARICOM countries (Mahon and McConney 2004a), these fisheries seem to be of limited political interest and do not attract the attention of ministers responsible for fisheries. Again taking Barbados as an example, large pelagics dominate foreign exchange earnings from fisheries through export of tunas and swordfish. The scale of fishing is small, but larger than what was described above for Grenada. Yet few linkages exist between the industry and fisheries authority that assist in empowering the latter successfully to pursue policy decisions and to build management capacity to participate more effectively in ICCAT. Because the industry shows no interest in ICCAT, and because large pelagics are not very prominent icons in local fisheries culture,

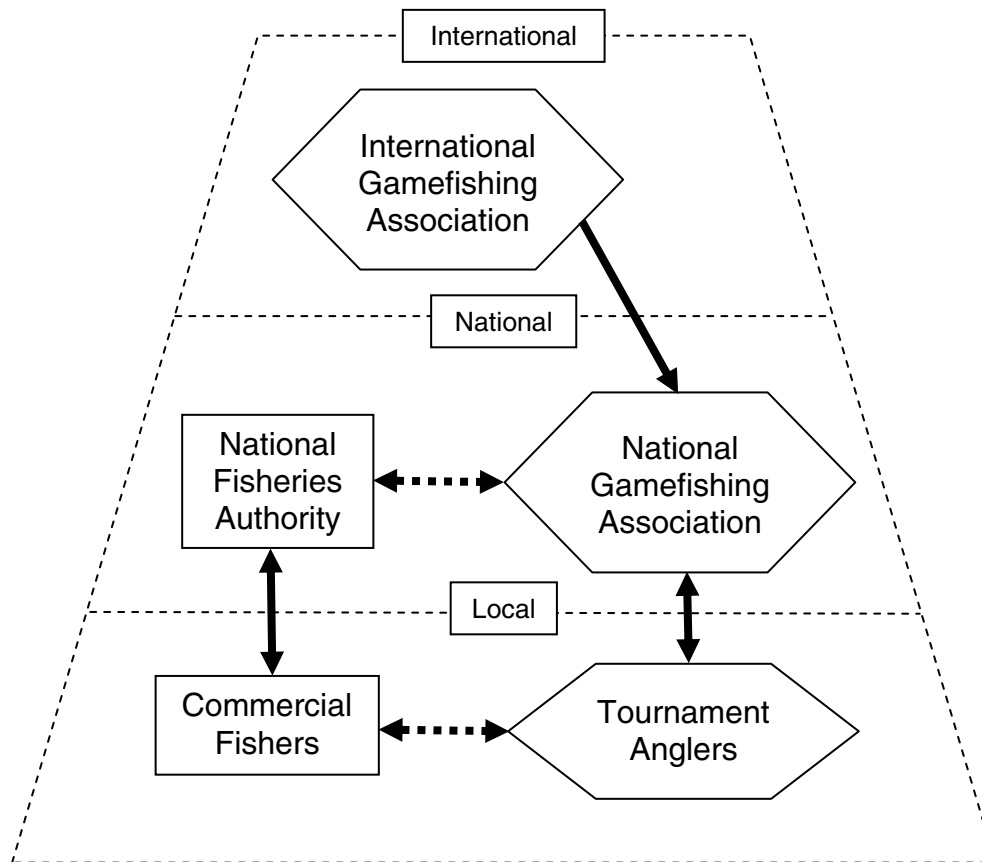


Figure 5. Strengths and weaknesses of linkages in recreational fishing at three levels on the jurisdictional scale. Solid arrows are strong linkages, dotted arrows are weak linkages. Directions are indicated by arrow heads. Recreational fishery stakeholders are shown as hexagons, and commercial fishery stakeholders as rectangles.

the Fisheries Division is unlikely to be able to attend its meetings or to obtain annual budgetary allocations for improving research or management. This contrasts sharply with the fisheries for flyingfish and sea urchins in which cultural and popular aspects are prominent and these fisheries receive a considerable amount of attention from policy decision-makers. The lesson here is not to underestimate the importance of local politics, power and culture in fisheries management. If managers wish large pelagics to attract the attention of policy-makers to management issues, they may have to focus first on increasing interest among their constituents.

These constituents include fisherfolk organizations that are typically too weak and poorly organized to act collectively as interest or pressure groups, resulting in dependence on a few key individuals. Such persons may be involved in the harvest, processing, marketing, distribution and trade of large pelagics. Some may be members of fisherfolk organizations such as associations and cooperatives, but in CARICOM countries most of these groups are rooted in the harvest rather than postharvest sector. Significant

proportions of the large pelagics landed in most countries are purchased and exported by private or public sector companies that tend to be individualistic rather than integrated in a postharvest organization. Also, as the scale and capital investment of fishing enterprises increase, non-fishing vessel owners may be less inclined to be in fisherfolk organizations since wealth is often accompanied by power and socio-economic status. As such, their individual interests can be met without organizational affiliation. Hence collaborative relationships are likely to be much stronger among fisher captains and crew than among boat owners and persons in postharvest. Social networks are often important assets in coping with the uncertainties of fishing even more than formal organizations are (McConney 1997). Therefore, strategically, fisheries authorities should aim to link with influential fishers of large pelagics in order to pass on communications concerning the management of the industry. If social networks are dense, then the diffusion of information can be fast and extensive with these captains acting as nodes. If fisheries authorities have an appreciation of social network structure, and the

flows within them, it is possible for them to be used instrumentally in fisheries management to increase the degree of integration. Longline fishers are known to have transboundary networks for information exchange and assistance at sea that span much of the south-eastern Caribbean (A. Kinch, Barbados longline fisher, pers. comm.). These informal fisher networks are likely to be more efficient for transmitting information than any official national or regional system of communication.

The recent initiative of CARICOM leaders to strengthen and deepen regional integration by establishing a single market and economy to replace the common market may have significant implications for the management of large pelagics and other shared species. The intentions of this initiative are to: 1) fully integrate and liberalize the internal markets and economies of CARICOM States to facilitate the structured integration of production of goods and services; 2) facilitate the unrestricted movement of capital, labour and technology; and 3) allow access by nationals to the collective resources of the region on a non-discriminatory basis (CARICOM 2002). The common fisheries policy being developed as part of this process is designed to give effect to these general objectives while ensuring effective conservation and management of the fisheries resources.

Another related integration initiative that may become relevant to the management of large pelagics is the CRFM's project to strengthen and link local and national fisherfolk organizations into a regionally networked system. If this initiative is successful, it may be more feasible for fisherfolk organizations to participate in fisheries management through the bodies of the CRFM such as the Caribbean Fisheries Forum that addresses policy advice and the Large Pelagics Working Group (LPWG) that was set up in 2000 to conduct and contribute to fishery assessments. To date the LPWG has functioned as a loose network mainly of individuals who are responsible for data management in national fisheries authorities and who share information just prior to the CRFM science meetings in order to determine and report on fishery and resource trends. These assessments have been assisted by scientists from outside the region (UK and USA) thereby creating brief additional linkages. A weakness in the LPWG networking is, however, that the inter-sessional activities, linkages and communications are not well developed; a constraint related again to the limited capacities of both the CRFM Secretariat and its Member State fisheries authorities. This working group is in urgent need of strengthening if the CRFM is to have a stronger presence at ICCAT and if it aspires to becoming the regional fisheries management organization for the pelagic species that are not of great immediate interest to

ICCAT (e.g., dolphinfish, wahoo, blackfin tuna), perhaps under some type of inter-agency cooperation agreement.

In the management of the postharvest sector, the small-scale fishing industries have learned about ICCAT through some of the trade requirements such as swordfish certificates of eligibility to reduce the harvest, or at least the landing and export, of undersized fish. Many fishers in the eastern Caribbean are also aware of the trade and conservation issues associated with bluefin tuna that complicate their rare incidental catches of these prized animals. It is possible that more is known about the conservation and management of large pelagics through the practice of trade than through the dissemination of information on harvest regulations such as size limits and quotas. In the case of trade, the US market and that country's adherence to ICCAT management measures have tended to integrate management across exporting countries through business networks.

Caribbean commercial fishers are becoming increasingly knowledgeable about the rules and restrictions governing recreational fishing, and are aware of how recreational lobbyists have reduced or excluded commercial harvests in some places and fisheries in the USA. For anglers, many gamefishing clubs will be made aware by an organization such as the International Game Fish Association (IGFA) of current responsible fishing practices such as tag and release and size limits (Antia et al. 2000). Tournament anglers travel to fish under the rules in other countries more often than commercial fishers since there are no access agreements covering large pelagics in the CARICOM region. From a network perspective there are strong connections among anglers as a community of interest. The connections between the gamefishing bodies and national fisheries authorities, and between anglers and commercial fishers, are likely to be fewer and weaker (Figure 5).

This network information is pertinent to initiatives such as that of The Billfish Foundation to improve conservation in the region. Knowing the linkages facilitates directing effort and information to where success is most likely.

Of mosaics and melting pots

The brief analysis presented here strongly suggests that large pelagics require more attention from fisheries managers in the region, but the managers also need new tools and perspectives to improve their chances of successful management. The mosaic metaphor sets a scenario in which the entities are poorly connected or integrated and attempts to scale up will be confronted by many boundaries and barriers. The melting pot suggests strong

integration while maintaining some differentiation or recognizable diversity with few obstacles to scaling up. In the GOM and Caribbean the management of large pelagic fishes is extremely weak and is still mostly a mosaic (little integration) with some areas that are melting pots (stronger integration) such as among OECS and CARICOM Member States.

Informal linkages among fishers and linkages related to fish trade or recreational fisheries seem to be better developed than more formal linkages among management bodies and between them and either policy-makers or fisherfolk. A critical area for future management research could be the characterization of fisher social networks. Regarding the “scale challenges,” in the GOM and Caribbean, there is little ignorance about issues of scale, but there are scale mis-matches and plurality issues. These need to be urgently addressed if the management of large pelagic fishes is to be improved, integrated and scaled up where possible.

Not all aspects of these problems can be tackled simultaneously. It is necessary to identify critical areas for integration and determine what needs to be scaled up since fisheries authorities will remain constrained by limited capacity in relation to their areas of responsibility, at least in CARICOM countries. Use of complex adaptive systems concepts such as scale and networks in interdisciplinary fisheries research guided by social-ecological systems perspectives will help to create new views for fishery managers. Managers and researchers need to draw more upon emerging social science and management theory to address the human dimensions of management and to deal with the pervasiveness of constraining power dynamics and conflict in the management of large pelagic fishes.

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