

14. Assessing and managing coastal fisheries of Latin America and the Caribbean: underlying patterns and trends

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A synthesis of the characteristics of fisheries in Latin America and the Caribbean (LAC), and of the methods and tools used for the assessment and management of these fisheries can provide some insights and enable comparisons that may be useful for improving the situation of coastal fisheries in the region. The synthesis presented in this chapter is drawn largely from the information provided by the twelve country chapters, supplemented by previously published literature. In the first section, we present the key characteristics of these fisheries. The second and third sections provide a comparative description of the various fishery assessment and management tools employed and discussion on the challenges faced. In the final section, we summarize needs and prospects for improving assessment and management of the fisheries in the region.

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1. CHARACTERISTICS OF COASTAL FISHERIES

While acknowledging the uniqueness of each coastal fishery, several attempts to define and characterize coastal fisheries show emerging commonalities (e.g. Panayotou, 1982; Russel and Poopetch, 1990; Charles, 1991; Agüero, 1992; FAO, 2000; Staples *et al.*, 2004; Chuenpagdee *et al.*, 2006). Generally, coastal and small-scale fisheries share the following characteristics (Salas *et al.*, 2007a):

- (a) Multispecies, multiple gears, with changing and flexible target species and gears employed.
- (b) Labour intensive, low-capital investment.
- (c) Many small landing sites dispersed along coasts, including remote areas.
- (d) Livelihood diversification (including non-fishing) is common among coastal fishing households.
- (e) Significant provision of food, income and jobs for coastal communities.
- (f) Migration of people from upland areas to coasts in search of jobs and income from fisheries is common.
- (g) Intricate relationship between fishers and fish traders who often serve as money lenders.
- (h) Health provision and education facilities are generally poor due to remoteness of the areas.

The complexity of these fisheries is increased by the heterogeneous characteristics of the fleet among countries and even within countries. This makes it difficult to evaluate the dynamics of the fleet and its fishery. The fleet has increased significantly in the last decade; an example of this trend as it applies to the countries considered in this publication is depicted in Table 1.

Coastal fisheries of LAC are also characterized by a number of challenges and problems which, while not necessarily universal, are certainly widespread. These range from the high levels of labour involved and social implications and the lack of policy support for such fisheries to the marginalization of some fishing communities due to physical remoteness and economic disempowerment (Agüero, 1992; Pauly, 1997; Thorpe *et al.*, 2000; FAO, 2006). Also commonly found in many coastal fisheries are open access conditions, which have contributed to the overexploitation of fishery resources. For instance, in the 1980s, most countries encouraged increases in fleets as a way of generating jobs and food for coastal communities (Thorpe *et al.*, 2000; Agüero and Claverí, 2007). At times, governments have also supported the migration of people to coastal areas, to participate in fisheries as a 'last resort' source of employment (Salas and Torres, 1996). These programmes may have assumed that it was unnecessary to control fishing intensity, as coastal populations grew, on the basis that this was not seen as threatening the resources – yet the increased targeting of such resources has created severe problems with fish stock declines (Agüero, 1992; Salas and Torres, 1996; Pauly, 1997).

TABLE 1
 Number of fishers and fleet size of coastal fisheries in the twelve countries of LAC included in this publication for the period between 1980 and 2004

Country	Boat size and other characteristics of the fleet	1980s–1990s		2000–2004	
		Fishers	Boats	Fishers	Boats
Argentina	Small boats (<10 m) and small vessels (10–18 m)			2 185	144
Barbados	Small boats (< 12 m)			2 200	613
Brazil	Small boats (< 10 m)	554 000	49 100		
Colombia	Boats with outboard motors of 15, 40, 75 hp	50 000	11 000		9 000
Costa Rica	Boats fishing in areas up to 100 m from shore	6 000	2 344	8 000	3 040
Cuba	Boat size 10–23 m				999
Dominican Republic	Fishing in areas up to 100 m from shore			9 500	3 675
Grenada	Small boats (5–15 m)			1 931	560
Mexico	Small boats (8–13.5 m)	186 000	40 250	138 941	102 807
Puerto Rico	Small boats (4.5–12 m)				
Trinidad and Tobago	Small boats (7–10 m) of 40–75 hp (Trinidad); small boats (6.7–12 m), of 15–100 hp (Tobago)			2 146	1 471
Uruguay	Boats < 10 GRT; fishing within 13 km from shore	790	250	1 400	571

Sources: Agüero, 1992; Beltran, 2005; Chuenpagdee *et al.*, 2006; FAO, 2004, 2006, years vary by country (see Fisheries Profile at www.fao.org/fi/fcn/profile); Quesada Alpízar, 2006; and country chapters in this volume.

Despite their contribution to national economies, the approximately two million people linked to coastal fisheries in LAC do not appear to have significantly improved their livelihoods in the last couple of decades (FAO, 2000). This situation has encouraged people to seek diversification of their activities by becoming involved in non-fishery coastal activities like tourism (Quesada Alpízar, 2006). In many cases there has been a decline of economically important species in fisheries, and while economic theory may predict that this would lead to an exiting of fishers from the fisheries and thus a decline in fishing effort (Smith, 1969), in fact, resource declines have often been accompanied by a long-term trend of increasing fishing effort. This has occurred either because fishers have spent more time and money to catch the same or a reduced amount of fish, or because they have taken fishing activity farther offshore. Either of these results in the fishery being less efficient in economic and social terms, and has a consequent impact on biological systems.

2. FISHERIES ASSESSMENT TOOLS

Pauly and Agüero (1992) stated that by the 1990s the focus of fishery science in LAC had traditionally concentrated on the collection of data of total catches of main fishery resources, and on fish stock evaluations based mainly on fish growth and mortality estimates. Salas *et al.* (2007a) observed that currently some countries in the region still present limited human and logistic capacity to evaluate their resources, although some changes in these trends are evident in Mexico and certain South American countries. Another issue regarding stock assessment that needs attention has to do with the use of old paradigms when evaluating resources, some of which have already been shown to be inadequate (Caddy, 1996; Caddy and Seijo, 2005). Several authors emphasize the need to go beyond analysis of information based on the landings and to begin, for example, to explore the spatial distributions of resources, catch and effort spatial trends, as well as to assess fishing strategies and fleet dynamics (Seijo *et al.*, 1994; Cabrera and Defeo, 2001; Salas and Gaertner, 2004; Caddy and Defeo, 2003; Caddy and Seijo, 2005). A more recent trend calls for incorporation of an ecosystem approach in the analyses (Pauly *et al.*, 1998; Plagányi, 2007; De Young *et al.*, 2008).

Table 2 provides information on fishery data and assessment methods, drawn from country-specific chapters in this volume, as well as from workshop discussions held during the CoastFish conference. It is evident that collection of catch statistics and data on size frequency of fishing resources obtained from the landings seems a common practice; fishing effort information in most countries is presented mainly in nominal figures when available. Of the twelve fisheries reported in this publication, data collection relating to Mexico, Cuba and Argentina are the most comprehensive.

Bio-ecological studies in the countries are diverse, ranging from basic biology to stock assessment through modelling. Environmental factors *per se* are seldom included. Observer programmes existing in Mexico and Argentina have generated detailed spatial data on resource distribution. With this seemingly strong data collection programme, these two countries are able to perform several types of bio-ecological assessment using different types of models. Ecosystem-modelling approaches on the other hand have been employed in Brazil, Mexico, and Trinidad and Tobago.

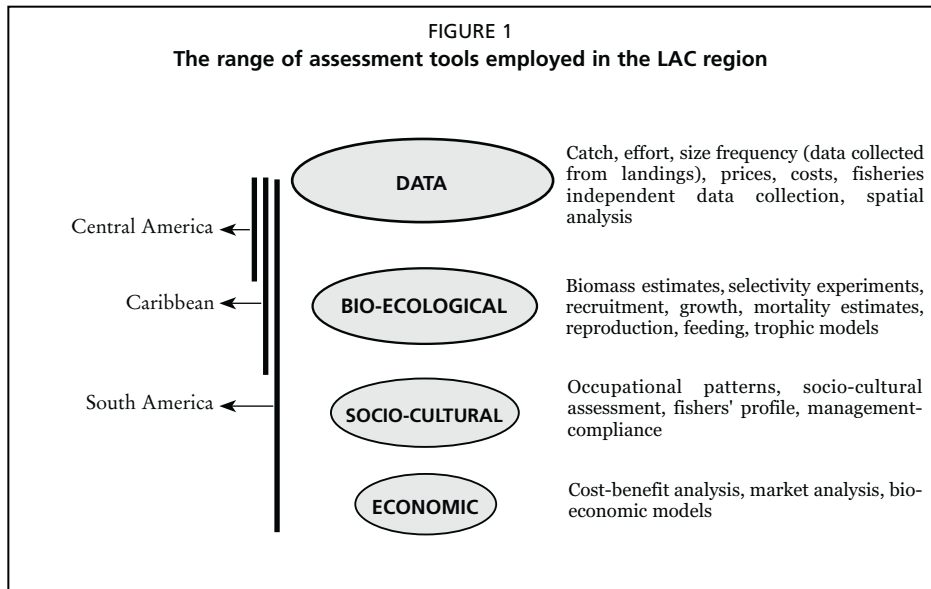
On socio-cultural aspects, although many countries report a census on the number of fishers or boats or some general information, four countries of the twelve – Argentina, Barbados, Brazil and Mexico – have assessed issues such as social and cultural dimensions, institutional arrangements and fisher perceptions on resource use, as well as management and compliance for some of their fisheries. These countries, as well as Cuba, also have performed economic assessment using methods such as benefit-cost analysis and, in some instances, bio-economic modelling.

TABLE 2
Data and assessment methods employed in the twelve LAC countries

Issues/Tools	Argentina	Barbados	Mexico	Cuba	Colombia	Costa Rica	Brazil	Uruguay	Dominican Republic	Puerto Rico	Grenada	Trinidad and Tobago
DATA												
Catch statistics	X	X	X	X	X	X	X	X	X	X	X	X
Size frequency	X		X	X	X	X	X	X	X	X		X
Spatial data	X	X	X					X		X		
Types of gears	X		X	X	X				X	X		X
Biological surveys	X		X	X	X	X		X		X		
Observer programme	X		X									
Number of fishers	X		X	X	X	X			X		X	X
Oceanography information	X		X	X						X		
BIO-ECOLOGICAL												
Growth	X	X	X	X	X	X	X	X	X	X	X	X
Mortality	X	X	X	X	X	X	X	X		X		X
Recruitment		X	X	X	X	X	X	X	X	X		X
Larval studies	X		X	X					X	X		
Feeding	X		X	X								
Reproduction	X		X	X	X	X	X	X	X			
Trophic models			X		X							X
Selectivity			X	X	X	X		X				
Surplus production models	X		X	X	X	X	X	X	X	X		X
VPA	X	X	X	X	X		X			X		X
Yield per recruit	X		X	X	X		X			X		X
Biomass dynamic models			X	X	X					X	X	X
Environmental issues	X		X	X								
Ecology	X		X	X					X			
Fishing effort analysis			X	X	X			X				
CPUE trend analysis	X	X	X	X	X	X	X	X		X		X
SOCIO-CULTURAL												
Fishers' perception	X	X	X				X	X				
Inst. arrangements		X	X				X		X			
Fishers' social profile	X		X				X					X
Migration		X	X						X			
Traditional knowledge		X					X					
ECONOMIC												
Cost-benefit analysis		X		X					X			X
Occupational structure	X	X	X	X						X		
Economic assessment	X	X	X	X	X		X	X		X		X
Bio-economic models			X	X	X		X	X				
Market				X			X					X

Figure 1 summarizes the use of assessment tools within the LAC region. Data collection is common in all countries; Caribbean countries also have elements of bio-ecological assessment and some socio-cultural studies; South American countries generally cover all aspects of assessment, including those areas covered by Caribbean countries plus economic assessments as well. Central America seems to be the area where less comprehensive assessment is undertaken.

The complexity of coastal fisheries systems, given their heterogeneity and high uncertainty, together with limited capacity for data collection and data analysis, has generated challenges to the assessment of such fisheries in the region. The discussion at the CoastFish conference (Salas *et al.*, 2007b), in addition to literature reviews, reveal limited capabilities within fishery research institutes in the region. This is due largely to a lack of trained personnel, insufficient financial support for data collection, and an absence of well-defined programmes for routine assessment and monitoring of resources.



The reliability of catch statistics may be questionable in some cases due to inconsistent format and non-standardized methods of data collection. Usually only the most important species (by volume or value) are separately recorded, and separating data on individual species from the mix of species traditionally landed in coastal fisheries has been problematic. The difficulty in obtaining information about fishing effort is attributable to the diversity of gears and vessel types, and fishing seasonality. Thus, using the number of boats and number of fishers to assess fishing effort may not reflect the actual fishing pressure. The application of an ecosystem-based approach to fisheries management and other integrated models is still at an early stage in the region. There is also a general lack of trained personnel to undertake interdisciplinary research.

Despite the above challenges, some progress in fisheries assessment in the region has been observed. It has been recognized in recent years that improving scientific knowledge on coastal fisheries requires a shift in approaches; some examples are reported in the country chapters included in this volume (Puerto Rico, Cuba, Mexico). Among the positive efforts to date are the introduction of the spatial analysis and the conceptual development of meta-populations and connectivity to address coastal fisheries problems (Caddy and Defeo, 2003; Ehrhardt, 2005; Rios-Lara *et al.*, 2007; Seijo, 2007). There has also been an increasing recognition of the need to incorporate social and economic issues, and to engage in multidisciplinary work on integrated fishery analyses, including stakeholder analysis (Quesada Alpízar, 2006; McConney and Baldeo, 2007).

Another group of positive experiences in fishery assessment deals with the progress in: (i) monitoring programmes that include collection of data independent from the landings; (ii) the involvement of fishers in data collection;

(iii) improvements in the capacity of research institutes; and (iv) widening the geographic and spatial coverage of data collection. In several countries, some international agencies have promoted such initiatives (e.g. FAO, International Development Research Centre [IDRC], Caribbean Community [CARICOM], World Wildlife Fund [WWF], World Bank, European Union [EU], etc.).

3. FISHERIES MANAGEMENT TOOLS

Data availability limits the range of applicable assessment methods. The choice of management measures is in turn affected, since this choice depends largely on both the type of data collected and this assessment. The types and range of management tools employed in the twelve case studies for different types of fisheries resources, i.e. demersal (D), benthic (B) and pelagic (P) are shown in Table 3.

	Argentina	Barbados	Brazil	Colombia	Costa Rica	Cuba	Grenada	Mexico	Puerto Rico	Dominican Republic	Uruguay	Trinidad and Tobago
MANAGEMENT SYSTEM												
Institutional management bodies	D	P				D		P,D				D,P
State management	D,B,P	D,B,P	D,B,P	D,B,P	D,B,P	D,P	D	D,B,P	D,B,P	D,B,P	B,P	D,P
Co-management	B,D	B,D	B				D	D,B				
Sea tenure								D				
ACCESS RIGHTS AND REGULATIONS (who, when and where have access to the resources)												
Open access	D(*)			X(*)						D(*),P		
Restricted access	D,B	B,P		D	D	D	P	D,B,P	P	D		D
Exclusive fishing area (TURFs)	D	B	B	X	D			D	B		B	
Fishing permits	B	B	B	D	D,B,P	D		D,B,P				D,P
Closed areas	D,B,P	B,P	B		D	D		D	D	D	B	
Seasonal closure	D	B		X	D	D		D,B,P	D	D	B	D
Marine protected areas		X	X	X								
FISHERY POLICY INSTRUMENTS												
Restrictions on gear and fishing effort	D	D,P						D,P	D,B			D,P
Minimum legal size	D,B	B,D,P	D	D	D	D	P	D,B,P	D,B,P	D	B	D,P
Total allowable catch (total quota)	D,B,P			D,P		D		D			B	
Community quotas				D,P	D			D	D			
Protection of berried females						D		D	D			
Fishing restricted during spawning season								D		D		
Individual quotas (fisher or boat)	B	B	B	D	D			B,P			B	
Species excluding devices	D			D	D			D				D
Use of explosives or pollutants forbidden		B,P	B	D	D				D,B			

Notes: D = Demersal; P = Pelagic; B = Benthic; X = Not specified by resource; *applicable to some species or for subsistence fisheries.

When it comes to the range of policy instruments employed to manage all three types of fisheries, Mexico uses the widest range, followed by Argentina and Colombia. Barbados employs a wide range of tools as well, but mainly to manage the dominant benthic resources, as is also the case in Brazil and Uruguay. The Dominican Republic, Uruguay and Grenada use comparatively fewer tools than other countries in LAC. The top-down system dominates in the region, although fisheries co-management has been reported in Argentina, Barbados, Grenada, Brazil, Mexico and Costa Rica. Such institutional arrangements have proved to be easier to implement for the management of species with limited mobility. They are becoming more widespread in the region, along with related schemes such as marine tenure arrangements and territorial use rights, all of which can provide more practical mechanisms of enforcement and monitoring (Castilla and Defeo, 2001; Hernández and Kempton, 2003; Quesada Alpízar, 2006; country chapters in this volume).

Minimal legal size, seasonal closures and fishing permits are the main instruments applied for most resources in all twelve countries. Mexico is the only country reporting the use of sea tenure, and together with the Dominican Republic, it imposes fishing restriction during spawning seasons. Countries reporting use of marine protected areas (MPAs) are Barbados, Brazil, Colombia and Mexico. Quesada Alpízar (2006) also reports the existence of MPAs in Costa Rica.

Banning of chemical use, poison and explosives are also common for demersal species, particularly in reef areas. Compared to that for demersal and benthic resources, management of pelagic species is sparse, with monitoring and enforcement generally more difficult, especially in cases of strong migratory behaviour. Management of pelagic fisheries can include restrictions on gears and fishing effort.

It has been noted that given the uncertainty in fisheries, and the need to apply a Precautionary Approach, fishery managers need a set of multiple, mutually reinforcing management tools, to increase the robustness of the system and the resilience of the fishery overall (Cochrane, 1999; Charles, 2001). At the same time, not all management tools are appropriate in every situation. For instance, while the setting of total allowable catches (TACs) as global quotas – i.e. catch (output) controls – is used in a number of fisheries, concerns over the efficiency of such an approach arise due to: (i) unreliable biomass estimates; (ii) limitations on the reliability of catch and fishing effort statistics; (iii) unreported catches; (iv) illegal fishing; (v) inadequate resources for monitoring and enforcement; and (vi) a more general lack of institutional capacity. Problems of allocation can also arise. Thus, a broad set of management tools can be helpful, but careful selection would be required to fit the situation at hand. Proper enforcement programmes are of course mandatory in order to be able to implement management plans.

Challenges in the management of coastal fisheries in the region relate largely to the characteristics of the fisheries and the implementation methods. Generally, the existence of open access fisheries and a lack of control over fishing effort, combined with high levels of illegal fishing, make the management tasks difficult. Participation of fishers is high in some cases but is generally lacking in most. Conflicts between

coastal and industrial fisheries are still prominent. Weak institutions and lack of appropriate frameworks to implement management regulations are also limiting factors as reported in many cases in the country chapters.

Despite the challenges in the management of coastal fisheries in LAC, some success stories can be noted. Increasingly, involvement of fishers in the management process has reduced some of the conflicts, and led to successful allocation of local fishing rights. This is a notable trend in Barbados, Mexico and Cuba. These advances do not apply, however, to whole countries, but only to a certain fishery or fisheries in a particular location within those countries (see Seijo, 1993; FAO, 2000; Castilla and Defeo, 2001; McConney and Baldeo, 2007; Sosa *et al.*, 2008).

Fisheries management often requires a combination of measures, approaches, and institutional arrangements compatible with the particular situation. Measures such as marine protected areas may be used in conjunction with stock enhancement and habitat restoration, as well as restriction of fishing effort in the areas, as is done in Barbados and Mexico, to increase management effectiveness. For demersal and benthic species, fishing permits and quotas may be implemented together, provided that the latter are not excessive and can be accompanied by adequate monitoring and enforcement. Good examples of this arrangement are found in Argentina, Colombia and Mexico. In the case of pelagic species, given the high vulnerability to climate-related environmental change, both risk and uncertainty analyses are valuable tools when assessing and managing these fisheries, as is the use of adaptive approaches through which management (and fishing intensity) responds to changing conditions.

4. PROSPECTS IN FISHERY ASSESSMENT AND MANAGEMENT

Coastal fisheries are facing many problems, and while certainly some of these are specific to certain subregions within the overall LAC region, several issues and challenges reported by authors of the country chapters seem common; some of these have also been reported by other authors working with coastal (small-scale) fisheries (Staples *et al.*, 2004; Agüero and Claverí, 2007; Béné *et al.*, 2007; García *et al.*, 2008). The challenges are wide-ranging in LAC fisheries, from those relating to fishery management (e.g. illegal fishing and a lack of institutional capabilities – technical, logistical and economic – for enforcing regulations) to those relating to fishery assessment (e.g. a poor understanding of the dynamics of the socio-economic relationships in coastal fisheries that arise through interactions among diverse, complex ecosystems and communities). The challenges also go beyond the strict boundaries of fisheries themselves, to include concerns over environmental disturbance and habitat destruction, as well as the need for attention to factors that contribute to the vulnerability of coastal communities and small-scale fisheries.

Addressing the problems associated with coastal fisheries in LAC will require a set of key responses, to be discussed sequentially in this section: (i) comprehensive fisheries assessment, which requires improved technical and financial support for research, on a permanent basis, and suitable support for developing and

implementing appropriate assessment methods; (ii) building capacity for fishery data collection, assessment and management; (iii) incorporation of social, economic and livelihood considerations in the broader ecosystem-based and livelihood-based approaches, (iv) exploration of alternative management schemes, moving from traditional systems to new governance; and (v) promotion of equitable access and clear fishery use rights among fishers, fishing communities and other relevant stakeholders, as well as organization and self-regulation of fishers, to enable full participation in fisheries management.

4.1 Comprehensive fisheries assessment

Implementation of fishery management plans relies heavily on fisheries assessments, which are undertaken in most countries of LAC by national institutes of fisheries or the like. However, in many cases these institutes lack the financial and technical support to keep up to date with changes arising in the fisheries. Most efforts have concentrated on gathering basic catch data, size frequency of individual organisms and, in only a few cases, fishing effort information. Given such data limitations, scientists are unable to undertake a full and integrated assessment of a given fishery (including biological, social and economic aspects). Further, single species approaches are the most common for this region, which may not necessarily be appropriate given the complexity of coastal fisheries (with their multispecies and multigear context). In addition to some comments here, this latter point is examined in more detail later, in Chapter 15, within the context of the ecosystem approach to fisheries.

While fishing pressure has imposed significant problems on coastal fisheries and their managers across most of the LAC region, the analysis undertaken here indicates varying degrees of response in terms of fishery assessment. For example, major assessment efforts are apparent in parts of South America and some Caribbean islands like Puerto Rico, while the capacity to implement such measures is less in Central America – where continuing use of conventional assessment tools limits the capability to benefit from a broad package of management tools. This can be a reflection of differences in the economic and human capacity to address ongoing needs as well as specific problems.

A focus on biological approaches has dominated across much of the LAC region, but this focus has proven insufficient. Integrated assessment produces multidimensional advice with a broader perspective (Charles, 2001; García *et al.*, 2008). García *et al.* (2008) also emphasize the fact that assessment must be cost effective, rigorous, timely, integrative of approaches from different disciplines, and incorporating local knowledge in order to be effective. Of course, the presence and extent of these attributes will depend on the conditions prevalent in the particular region where the evaluation takes place (scientific capacity, financial support, etc.) and the nature of the institutional framework for management.

Finally, the information exchanges that led to, and that are reflected within this volume, indicate that an open and positive attitude by fisheries scientists to seek out and implement new approaches for assessment, and a general willingness to

interact with others across the region in order to generate a suitable knowledge base, are crucial ingredients in the quest for sustainable fisheries resources.

4.2 Building capacity

A move toward sustainable fisheries management, aiming to maintain healthy ecosystems and improve fisheries in the Latin America and Caribbean region, requires the building of appropriate capacity. This in turn necessitates suitable project development and training for (i) the selection and/or design of appropriate assessment approaches to match the diverse manpower and financial possibilities in the region (including, at least initially, designing approaches for data-limited situations); (ii) design of data collection systems for answering relevant fishery management questions, notably within the context of ecosystem considerations; (iii) aiding decision-making in fisheries management in a context of uncertainty and incomplete knowledge of the fishery and the ecosystem in which it operates; and (iv) fostering, among fishers and fishing communities, an understanding of ecosystem dynamics, interdependencies and the effects that various options for human interventions may have on these over time.

The aid provided by some international agencies has partially helped LAC countries (e.g. through working groups organized by FAO, like that on spiny lobster, or training courses or workshops such as those organized by the Danish International Development Agency (DANIDA) and the International Development Research Centre (IDRC). However, it is a common concern that, when international agencies leave, government agencies do not (or cannot) take responsibility to maintain the programmes initiated or promoted by the international agencies, and the results of those efforts fade. Thus, more attention is required, on an ongoing basis, to build capacity and maintain it within the region to improve the assessment of fisheries and to promote sustainable fisheries management.

4.3 Incorporating social, economic and livelihood considerations

A major gap in the information reported in most country chapters within this volume relates to a poor understanding of how socio-economic, cultural and legal considerations affect fishing and fisheries. Many fisheries problems are socio-economic in nature, and many involve aspects of the coastal economy that extend beyond the fishery (Fraga, 2004; Staples *et al.*, 2004; Agüero and Claverí, 2007; Salas *et al.*, 2007a; García *et al.*, 2008). For instance, while it has been stated in many cases that coastal fisheries can contribute to food security and poverty alleviation of local communities (Staples *et al.*, 2004; Béné *et al.*, 2007), a better understanding of the socio-political circumstances, the legal frameworks and local conditions of communities is necessary in order to evaluate how government interventions may succeed or fail with alternative management programmes or future development assistance in the search for sustainable fisheries and sustainable coastal communities (Jentoft, 2000; Garcia *et al.*, 2008; Hauck, 2008).

It is necessary to understand the characteristics and functioning of fishing communities, the perceptions of people regarding the use and management of natural resources, the dynamics of fishing operations, the behaviour of resource users regarding compliance, as well as the way people cope with vulnerability given an increase in threatening conditions for coastal fisheries and those who depend on them (Allison and Ellis, 2001; Chuenpagdee *et al.*, 2004; Salas and Gaertner, 2004; De Young *et al.*, 2007; Hilborn, 2007).

4.4 Alternative management schemes

In complex fisheries systems, where data is scarce, knowledge incomplete, uncertainty high, and fishers compete heavily for limited resources, conventional management systems – relying on top-down control by state agencies and based on narrow approaches – have proved ineffective. Degnbol *et al.* (2006) call for a change in the way fisheries managers have been approaching the problems of complex fisheries. They contend that the main trend in fisheries management has been to look for solutions in the form of ‘discipline-specific approaches’. These might involve economic tools (e.g. individual transferable quotas – ITQs) focused on economic efficiency, bio-ecological tools (e.g. MPAs) promoted by biologists and focused on resource conservation, or community-based management (CBM), promoted by anthropologists and emphasizing empowerment. The authors argue that any one discipline alone cannot fully address the complex and diverse problems of fisheries management and an integrated vision (transdisciplinary) and changes in paradigms are necessary to challenge current fisheries problems.

According to Degnbol *et al.* (2006), when only one criterion (e.g. biological, economic or social) is used to evaluate or implement management tools, there is a risk of ‘tunnel vision’. Application of a single management tool may be appropriate for a particular context, but when promoted as ‘universal remedies’, it ceases to be useful in tackling fisheries problems (a point highlighted by Charles, 2001). On the other hand, if several ‘discipline-specific approaches’ can be combined (subject to concerns over conflicting objectives), the selection of one approach over others, or a combination of several, will depend on managers’ preferences, political will and implementation costs, among other factors (Seijo *et al.*, 1998). While the use of multiple management tools is important for a resilient system, it may be both possible and more practical for managers to follow a well-known path using a set of simple tools (ones that are easy to explain to user groups, easy to implement and less costly to enforce). In some cases, this may limit the use of more complex approaches such as an ecosystem approach for management (Plagányi, 2007), but may lead to an adaptive management process (Walters and Martell, 2004), or to move beyond the traditional biological approach, which has dominated fisheries management of small-scale fisheries in many countries (Staples *et al.*, 2004).

Employing a mixture of policy instruments and involving fishers in the decision-making process and policy formulation are necessary steps towards improved management schemes in the LAC region. There are some positive trends in developing effective alternative management systems for LAC coastal fisheries,

as shown in some of the country chapters; these could signal progress for the region in moving towards resource sustainability and social well-being. There is a need, however, to expand and, where possible, replicate some positive examples of self-governance to improve on conventional management systems. Responsibility for a change of vision and approaches must come from scientists, fishers and managers. To reach this goal, a broader and more participatory approach to governance of fisheries is required. This policy direction will be explored in more detail in Chapter 15.

4.5 Promoting equity, use rights and participation in management

An issue faced across the coastal fisheries of the LAC region is that of providing equitable access to and distribution of the resource among competing groups, and keeping fishery access from being concentrated in too few hands. One avenue for achieving this is the allocation of fishery use rights – i.e. the right to go fishing, rather than ownership over the resources *per se* (Charles, 2002). Such schemes are said to create incentives for those holding rights to safeguard the well-being of fishery resources (Berkes *et al.*, 2001; Castilla and Defeo, 2001; Castilla and Gelcich, 2008). However, allocation of fishing rights by themselves will not ensure good fishery practices, to conserve resources, if the rights holders are not involved in the management of the fishery. Furthermore, institutional adjustments are also necessary in order to achieve cooperation from different users' groups to maintain healthy resources (Chuenpagdee and Jentoft, 2007).

It is useful to highlight some successful examples in the LAC region, which may encourage further exploration of options for allocation of fishing rights, whether by area or by resource, or a combination of both. For example, in Chile and Peru, marine areas are allocated for fishing to specific groups, who also enforce their own rules (FAO, 2000; Mendo *et al.*, 2002; CeDePesca, 2005; FAO, 2000; Castilla and Gelcich, 2008). In Mexico, concessions by species and area are allocated for lobster fishing to some groups of fishers – these groups have regulated access to the use of this profitable resource. The security of access through use rights has encouraged self-enforcement actions in communities in Mexico and Grenada (Chuenpagdee *et al.*, 2004; Seijo, 1993, McConney and Baldeo, 2007; Sosa *et al.*, 2008).

5. CONCLUDING REMARKS

This chapter has provided an analysis of the state of fisheries assessment and management along the coasts of LAC, as synthesized from the country chapters in this volume, as well as from additional insights arising in the CoastFish conference. We have seen that there has been progress in various areas, but also significant gaps remaining. The final section of this chapter focuses on the future, on the prospects for LAC coastal fisheries, and some directions forward, with an emphasis on (i) developing comprehensive fisheries assessment; (ii) building capacity for fishery data collection, assessment and management; (iii) incorporating social, economic and livelihood considerations; (iv) implementing alternative management schemes;

and (v) promoting equity, appropriate use rights and participation in fishery management. While these directions appear crucial for the future, choosing the most appropriate approaches for their realization will undoubtedly be crucial in increasing the likelihood of improving the state of coastal fisheries in LAC.

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Abstract

The importance of fisheries for coastal communities and livelihoods in Latin America and the Caribbean (LAC) is well documented. This is particularly the case for ‘coastal fisheries’, including subsistence, traditional (artisanal) and advanced artisanal (or semi-industrial) varieties. There are, however, major gaps in knowledge about these fisheries, and major challenges in their assessment and management. Therein lies the key theme of this document, which seeks to contribute to a better understanding of coastal fisheries in the LAC region, as well as to generate discussion about ways to move towards sustainable fisheries. The document includes three main components. First, an introductory chapter provides an overview of general trends in the fisheries of the LAC countries, as well as some of the key challenges they are facing in terms of sustainability. Second, a set of twelve chapters each reporting on the coastal fisheries of one country in Latin America and the Caribbean, collectively covering fisheries of each main subregion: the Caribbean islands (Barbados, Cuba, Dominican Republic, Grenada, Puerto Rico, Trinidad and Tobago), North and Central America (Costa Rica, Mexico) and South America (Argentina, Brazil, Colombia, Uruguay). All these country-specific chapters follow an integrated approach, to the extent possible, covering aspects ranging from the biological to the socio-economic. Third, the final component of the document contains a synthesis of information from the countries examined, an analysis of the main issues and challenges faced by the various fisheries, an outline of policy directions to improve fisheries management systems in the LAC region, identification of routes toward more integrated approaches for coastal fisheries management, and recommendations for ‘ways forward’ in dealing with fishery assessment and governance issues in the region.

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