

1. Coastal fisheries of Latin America and the Caribbean region: issues and trends

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1. INTRODUCTION

The importance of fisheries for coastal communities in Latin America and the Caribbean (LAC) has been highlighted in many forums and reports, including those of the Food and Agriculture Organization of the United Nations (FAO) and other development agencies such as the World Bank and the Organisation for Economic Co-operation and Development (OECD). Coastal and small-scale fishers often have considerable livelihood and income dependency on local resources – making them highly vulnerable to negative trends in the fisheries, such as declining catches and degrading habitats, and particularly to the risk of downturns and collapse (Staples *et al.*, 2004; World Bank, 2004; Bené *et al.*, 2007).

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These realities reinforce the importance of understanding, assessing and effectively managing coastal fisheries. This is the key theme of the document – to examine the various approaches and challenges arising in the assessment and management of coastal fisheries within the LAC region. For the purpose of this document, the term ‘coastal fisheries’ refers to three main types: subsistence fisheries, traditional fisheries (artisanal), and advanced artisanal (or semi-industrial) fisheries. The adaptability of fishers, which enables them to switch gears and target species, makes it difficult in some cases to differentiate among these three types, but broadly the main distinction made here is between coastal fisheries and industrial or recreational fisheries. Coastal fisheries tend to share certain features, such as high mobility of fishers, transboundary issues related to shared resources, high competition among user groups, seasonal use of resources, and multiple livelihoods (Beltran, 2005; Agüero and Claverí, 2007; Salas *et al.*, 2007; Chakalall *et al.*, 2007).

This volume strives to contribute to a better understanding of coastal fisheries in the region, in terms of their assessment and management, as well as to generate discussion about ways to move towards sustainable fisheries in the region. The heart of the document is a set of twelve chapters each reporting on the coastal fisheries of one country in the LAC region. Specifically, these ‘country chapters’ include information on the fisheries of each of the main subregions of Latin America and the Caribbean: 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).

The twelve countries included in the document provide reasonable geographical coverage, but the information presented herein is certainly not exhaustive. The heterogeneity and complexity of coastal fisheries in the LAC region is clear, given its large number of countries and their diverse geophysical, bio-ecological and socio-economic characteristics. Accordingly, this document reflects only a sampling of the region’s fisheries – but it does highlight many issues and challenges shared by fisheries in the region, especially regarding assessment and management. It also provides an analytical discussion and directions for future fishery research and management.

The document is organized into three main sections. In this introductory chapter we provide an overview of the general trends in the fisheries of the LAC countries as well as some of the key challenges they are facing in terms of sustainability.

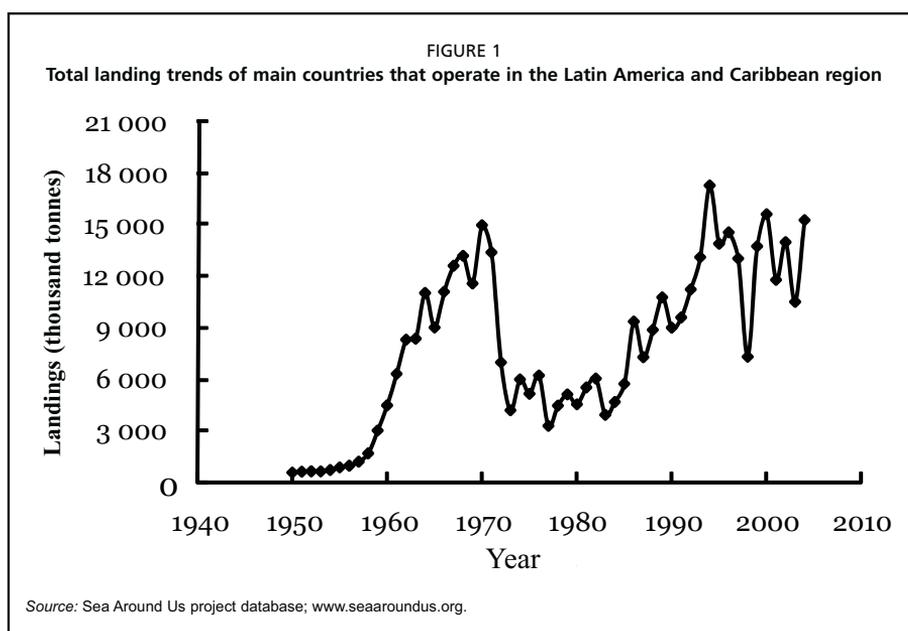
Following this is the set of 12 ‘country chapters’ described above, which present a range of contexts, and discuss common problems as well as particularities that illustrate the complexity of the fisheries in the region. All the country-specific chapters follow the same format, to the extent possible, in terms of content, ranging from biological to socio-economic information. The focus of each one varies, however, depending on key characteristics of the fisheries in the corresponding country, and the range of disciplines and specialization of the authors. Each also

reflects the existing availability of information and the authors' judgements of issues that need to be discussed in order to improve assessment and management of coastal fisheries in the LAC region.

The final part of the document contains conceptual and analytical chapters, as well as concluding remarks. A synthesis of information from the twelve country chapters and an analysis of the main issues and challenges faced by each fishery are presented in Chapter 14. Then Chapter 15 outlines policy directions to improve fisheries management systems in the LAC region, and suggests how to move towards a more integrated approach to coastal fisheries management. The final chapter consolidates the lessons learned from discussions in the document, and provides recommendations for the ways forward in dealing with assessment and governance issues.

2. MAJOR TRENDS IN COASTAL FISHERIES OF LATIN AMERICA AND THE CARIBBEAN

Catch trends of the twelve countries covered in this document, as well as other key countries in the LAC region, show important fluctuations in the last five decades (Figure 1). Landings increased from 1960 to 1970 before dropping sharply; the recovery was gradual until it reached a peak in 1994. One of the main contributors of Latin America has been Peru, with close to 60% of landings. In addition to Peru, major contributors to the LAC region's fisheries are Chile, Argentina, Mexico, Brazil and the Bolivarian Republic of Venezuela. Countries from the Caribbean islands, despite small landings, receive important foreign exchange from their catches (Agüero and Claverí, 2007; Salas *et al.*, 2007).



The major contribution to the region's total landings comes from pelagic species landed by industrial fisheries. For example, the fluctuations in landings, such as the sharp rises in 1970, 1994 and 2000 and the declines in 1972, 1983 and 1994 were due largely to fluctuations on landings from purse seine fisheries in Peru and Chile. Also, high squid landings in these two countries in recent years contributed significantly to the total increase. Similar to Peru and Chile, catches from Mexico come mainly from purse seines (about 42% in 2004). On the other hand, in Argentina and Brazil, the majority of the landings come from trawling (about 72% and 50% of total country landings in 2004, respectively).

If we focus on coastal landings, by excluding from the data catches from gears operating mostly in offshore areas (i.e. bottom trawls, midwater trawls and purse seines), the contributions from Peru and Chile are reduced from 84% to about 44% of the total within our reference group of 14 countries. While this does not change the top five countries in Table 1, in terms of total landings, the importance of coastal fisheries becomes evident in countries like the Dominican Republic, Grenada, Puerto Rico, and Trinidad and Tobago, in each of which landings from gears used mostly in coastal waters exceed 50% of the total landings for that country (Table 1). Peru and Chile, on the other hand, provide far less of their catches from coastal fisheries, with landings from this sector contributing only about 2% and 9% respectively to the total for each country. Incidentally, these proportions are the lowest among the LAC countries examined here.

Mexico and most countries in Central America have fleets both on the Pacific and Caribbean coasts, and they are highly dependent on coastal fisheries, especially as a source of jobs and food. Reports by FAO (2000) for these countries indicate that catches appear to be higher on the Pacific than on the Caribbean coasts in most cases. In the latter, a lower volume seems to be compensated for by the capture of profitable species like conch, lobster and shrimp, among others, which contribute significant foreign currency to these countries. Total export of catches in the LAC region (excluding aquaculture) by the year 2001 was close to US\$7 million; five countries made up 73% of this contribution (Agüero and Claverí, 2007).

Accurate figures on fishing effort in coastal fisheries of the LAC region are generally not available, and when they do exist there is typically a shortage of consistent information. Even though catch records began in the 1950s in some countries, information on fishing effort started to be collected much later. Such data are important in the evaluation of fishing capacity and labour capacity relative to catch trends. In general, the number of people involved in fishing and fish farming has more than doubled in the last three decades (FAO, 2006a; Salas *et al.*, 2007), with many of these people entering the coastal fisheries industry. In contrast to global trends (Figure 1), it is evident when evaluating landings only from coastal fisheries that between the early 1970s and the mid-1990s there was an increasing trend in catches in South America, with a declining trend after this period (Figure 2). In the Caribbean, the trend has been generally upward for three decades, afterward a sharp decline has changed the general trend.

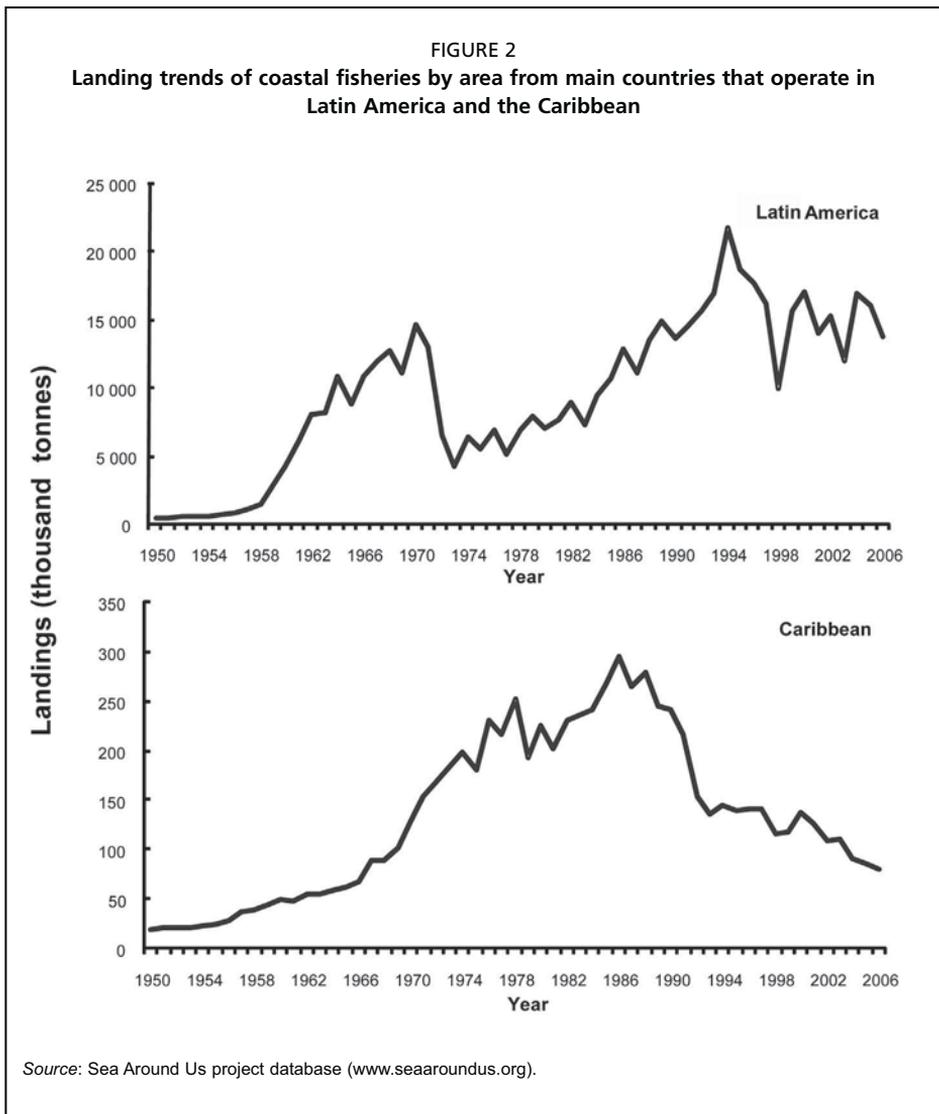
TABLE 1

Catches for those countries included in this document plus Peru and Chile in 2004. Total landings integrate catches from all gears¹ and landings from 'coastal gears'² include all gears except bottom trawl, mid-water trawl and purse seines

Country	Total landings for all gears ('000 tonnes)	% of total landings of all listed countries	Landings from 'coastal gears' only (tonnes)	% of coastal landings in total for the country
Peru	9 611.94	52.68	151.27	1.57
Chile	5 317.31	29.14	492.18	9.26
Mexico	1 286.57	7.06	134.60	10.46
Argentina	945.94	5.18	187.36	19.81
Brazil	746.21	4.09	130.66	17.51
Colombia	124.95	0.68	13.82	11.06
Uruguay	122.98	0.67	15.38	12.51
Cuba	36.14	0.20	16.21	44.85
Costa Rica	20.85	0.11	3.64	17.46
Dominican Republic	14.22	0.08	7.28	51.20
Trinidad and Tobago ¹	10.03	0.06	5.10	50.84
Puerto Rico	6.12	0.03	3.50	57.18
Barbados ¹	2.14	0.01	0.92	43.00
Grenada ¹	2.03	0.01	1.80	89.00

Source: ¹ FAO (2004: <http://www.fao.org/fishery/geoinfo/en>); ² data from Sea Around Us, 2004 (www.Seaaroundus.org) adapting FAO data.

As in other parts of the world, the expansion in catches in the LAC region has been due to technological development and an increase in the size of the fleet, an expansion of the fishery workforce, exploration of new fishing grounds, and related impacts of government financial transfers (FAO, 2006a; OECD, 2006; Gréboval, 2007). In the last decade, in many of these countries the most important resources are considered to be at their maximum level of exploitation (World Bank, 2004; FAO, 2006b; Agüero and Claverí, 2007). Despite this situation, the status of many fisheries in the region is poorly known. Agüero (1992) states that one of the problems these countries face has been the lack of consistency in the way catches have been recorded and fisheries analysed. Fisheries institutes in many of these countries were created in the 1960s to conduct research, but they have not achieved sufficient technical capacity (human and logistic) due to limited financial support (Agüero and Claverí, 2007).



3. FACTORS AFFECTING SUSTAINABILITY OF LAC COASTAL FISHERIES

Many factors have contributed to the unsustainability of fisheries, and these in turn have led to excess capacity (Gréboval, 2002; Swan and Gréboval, 2004; Gréboval, 2007). These factors include: (i) a lack of solid governance structures; (ii) fishery complexities, incomplete knowledge and the associated uncertainties; (iii) inadequate incentives and subsidies that stimulate overcapacity; (iv) stock fluctuations due to natural causes; (v) growing demand for limited fish resources; and (vi) poverty and a lack of alternatives for coastal development. These factors are examined below as well as throughout the document.

3.1 Fisheries complexities

Scientific literature and public media have extensively reported problems that fisheries in many areas of the world are facing. While it is generally known that overexploitation, habitat degradation and unintended catches and discards are common causes of such crises, their effects on the ecosystem and the economy of the nations involved, especially in the context of coastal fisheries, are not always properly addressed. This is due mainly to the complexity of these fisheries, which makes assessment and management difficult (Cochrane, 1999; Mahon *et al.*, 2008, 2009). For instance, many coastal fishers switch among alternative fishery resources using various fishing gears throughout the year, making it difficult to determine fishing effort. Some fishers engage in other occupations such as tourism, salt mining or aquaculture to supplement their fisheries income. As coastal areas around the world continue to attract migrants, conflicts between various uses of coastal resources accelerate and consequently affect the livelihoods of the coastal communities. Balancing between uses and conservation in coastal areas has thus become more challenging, especially when information to foster comprehensive understanding of those fisheries is insufficient.

3.2 Growing demand for scarce resources

In the last few decades the increase in food consumption has been oriented to protein intake in many countries, especially in Europe and Asia. This trend has been favoured by an improvement in food technology which has provided added value to diverse products including those coming from the sea. According to FAO, the per capita consumption of fish in the world has increased from 9 kg in 1961 to 16.5 kg in 2003 (FAO, 2006b). Even though consumption in developing nations is lower than that of developed nations, the market still offers incentives to enter the fishing industry. The increase in tourism in coastal areas also keeps up the demand for marine products.

An increase in coastal population has resulted in steeper competition for a reduced level of resources. At the same time, degradation of habitats from the expansion of different activities along the coast has had an impact on the corresponding ecosystems, on their resources, and on the people depending on them.

The sharp rise in fisheries production outlined above has been caused by many factors, including uncontrolled capacity in the industry, technological improvements, an increase in demand for seafood, and a lack of governance. A general pattern of overcapacity and resource degradation has been reported in countries from the LAC region (Ehrhardt, 2007; Ormaza, 2007; Salas *et al.*, 2007; Vasconcellos *et al.*, 2007; Wosnitza *et al.*, 2007). It is important to note that while some general patterns can be observed in the whole LAC region, the situation in each country is context specific, and an understanding of the issues and challenges faced in each location, taking into account particular geopolitical conditions, could provide useful insights for the whole region (Agüero and Claverí, 2007; Chakalall *et al.*, 2007). This, we hope, will be one key outcome of this document.

3.3 Different incentives

One of the factors promoting growth of the fishing industry is the intervention of government through different types of financial transfers. Government financial transfers (GFT) are defined by the OECD (2006) as “the monetary value of government interventions associated with fisheries policies” and include market price support, untaxed resource rent, negative subsidies, as well as infrastructure expenditure. Unfortunately, limited information exists on financial transfers applied in the LAC countries and their impacts; most of the interventions reported in the country chapters of this document have to do with subsidies.

Indeed, the issue of subsidies in coastal fisheries is discussed in seven of the fisheries chapters (Argentina, Mexico, Trinidad and Tobago, Costa Rica, Grenada, Brazil and Barbados). Among the subsidies reported are: (i) grants for the construction of new vessels, traps, aggregating devices, etc.; (ii) grants for the modernization of the fleets; (iii) preferential credits; and (iv) reduced prices for purchased inputs (e.g. fuel, bait and ice). The impact of subsidies on sustainability depends on the dynamics of fleet capacity and effort of both small-scale as well as industrial vessels. To the extent that subsidies reduce operating costs in fisheries, this tends to artificially generate profits that further stimulate fishing capacity growth, lower biomass levels and raise competition.

3.4 Stock fluctuations

Clearly, independent of fishing activity, stocks will fluctuate in the short and long run due to natural causes. For pelagic resources, major stock fluctuations occurred even prior to human exploitation (Soutar and Isaacs, 1974). These fluctuations have been best documented in relation to the El Niño-Southern Oscillation (ENSO) climatic phenomenon, especially as it affects the production of small pelagic fishes in the eastern Pacific (e.g. Lluch-Belda *et al.*, 1989), but also as it impacts other resources and other geographic areas. Similar climatic forcing factors have been affecting marine production systems on the global level (Kawasaki, 1992; Klyashtorin, 2001), and long-term fluctuations will be reinforced by climate change (Kelly, 1983). Thus, although ‘decadal’ periodicities are frequently mentioned in the fisheries literature (e.g. Zwanenberg *et al.*, 2002), Klyashtorin (2001) suggests that natural cycles in productivity of around 50 to 60 years duration are likely to be dominant.

Coastal fishery resources are also vulnerable to other human activities that may affect critical habitats and/or biological and biophysical processes (e.g. Spalding and Kramer, 2004). With respect to the latter, the long-term role of environmental change in fisheries has become easier to observe in recent years now that fisheries data series more commonly exceed a half century in duration. However, our ability to discriminate between natural environmental changes, the effects of fishing, and the impact of other human activities remains poor.

3.5 Lack of governance structures

According to Kooiman *et al.* (2005), governance is beyond government and broader than management in that it involves problem solving, creation of opportunities, and interactions. Mahon *et al.* (2008) advocate an interactive fisheries governance perspective, which involves a dynamic and complex fish chain, leading from the resource and its supporting ecosystem to the global marketplace and the local consumer. The dynamics of this chain need to be balanced as the system responds to a variety of stimuli.

Interactions within complex fisheries systems in many cases have been ignored when fisheries resources are examined in an isolated manner and public participation in problem solving and creating opportunities are discouraged (Castilla and Defeo, 2005; Charles, 2001; Garcia and Charles, 2008; Mahon *et al.*, 2008). Given the current context and the high diversity that characterize coastal fisheries in LAC, alternative forms of governance are required, particularly to develop local institutions that help increase social capital and develop strategies suitable to the social, economic and political contexts faced by the corresponding fisher groups. For example, many chapters throughout the document place special emphasis on the need for collective access rights for fishing communities in order to promote co-management. This approach highlights resource use and access among the challenges fisheries face in the move towards good governance.

4. CONCLUDING REMARKS

As fishing pressure has imposed significant problems on fisheries and their managers across most LAC countries, various degrees of response, in terms of fishery management and assessment, have been developed. However, many gaps still exist in the understanding of the issues, as will be discussed in the different country chapters. These gaps arise as a result of some key limitations.

First, with regard to assessment, the limited qualitative and quantitative information on coastal and small-scale fisheries is evident. In many countries, official statistics make no distinction between landings from small-scale fisheries and from larger-scale commercial ventures. Although landings from these two sectors can be distinguished based on gear use in some cases (as attempted in Table 1), there is generally a lack of permanent programmes to monitor catches from these fisheries. Problems associated with evaluation are also common, exacerbated by limited financial support for research.

Second, the 'management tool-kit' appropriate for small-scale fisheries is much less developed than that for large-scale fisheries, and transferability of management approaches from the latter to the former is highly questionable given the major differences both in the characteristics of these fisheries and in their importance to fishing households. Even if these tools were transferable, an important management limitation – the lack of human and economic resources – remains a key challenge (FAO, 2000; Salas *et al.*, 2007; Mahon *et al.*, 2008).

These problems are discussed in a number of the chapters, and a summary of trends in adoption and use of the various assessment and management tools is presented in Chapter 14. This compilation of information serves three goals. First, an overview of the fisheries in terms of their biological, social and economic assessment provides insights for management purposes. Second, the document aims to identify research gaps in coastal fisheries, to provide guidance on priorities for research themes, approaches and tools. In this regard, it becomes clear that to achieve a sufficient understanding of fishery complexities, an emphasis on multidisciplinary research – incorporating the bio-ecological and socio-economic processes of fisheries – is critical. Third, we see from this analysis that from a management perspective, the complex characteristics of coastal fisheries demand a shift away from conventional approaches, towards a system that enables local organizations to adapt to both the current context inside the LAC region and to global trends.

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Coastal fisheries of Latin America and the Caribbean



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Fishing boat with bottom nets for hoki in Tierra del Fuego, Argentina (courtesy of Miguel S. Isla); landing products in Holbox, Quintana Roo, Mexico (courtesy of Mizue Oe); artisanal boat operating in Santa Marta, Colombia (courtesy of Mario Rueda); artisanal fisher fishing octopus in Yucatán, Mexico (courtesy of Manuel Solís); lobster boat with traps in Cuba (Centro de Investigaciones Pesqueras de Cuba); artisanal boat operating in Santa Marta, Colombia (courtesy of Mario Rueda).

Coastal fisheries of Latin America and the Caribbean

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Dedication

This document is dedicated to the memory of our colleague and friend **Bisessar Chakalall**, former Fishery Officer in the Subregional Office for the Caribbean (SLC) and Secretary to the Western Central Atlantic Fishery Commission (WECAFC). Bisessar was an extraordinary human being who gave testimony to the values he believed in. He was brilliant and humble; dynamic and parsimonious; structured and spontaneous. He was an honest, generous and committed person. He had profound interest in understanding others, their culture and context, and a genuine interest in improving the well-being of fishing communities. Bisessar knew when to listen and when to speak out with his ideas and suggestions. He conducted himself with the passion and wisdom to intelligently explore life in all its dimensions. Bisessar was an excellent and unique friend. His human legacy remains in our hearts and minds.

Preparation of this document

The idea of preparing a state-of-the-art document examining the assessment and management of coastal fisheries in Latin America and the Caribbean grew naturally out of the CoastFish conference of 2004 (see www.mda.cinvestav.mx/eventos/Coastfish/english/welcome). This interdisciplinary conference, held in Mérida, Mexico, brought together individuals from many different institutions and organizations across the region, covering a wide range of perspectives, in order to contribute to a better understanding of coastal small-scale fisheries. The focus was on fishery assessment and management, taking into account biological, socio-economic and policy issues, aiming to examine the extent of information available for different countries and to identify the gaps in knowledge and management. The goal ultimately was to use this understanding to determine desirable directions for future fishery research, as well as governance and management approaches to moving towards sustainable fisheries in the region. This goal remains valid for this document as well.

This document has been prepared as an initiative of the editors – S. Salas, R. Chuenpagdee, A. Charles and J.C. Seijo – in cooperation with a strong set of authors writing about coastal fisheries in twelve countries across Latin America and the Caribbean. Writing and compilation of the document were supported by the European Union through the project Integrating Multiple Demands on Coastal Zones with Emphasis on Aquatic Ecosystems and Fisheries (INCOFISH). The Food and Agriculture Organization of the United Nations (FAO) coordinated the final proofreading, publishing and distribution. References in this document follow international bibliographic standards rather than FAO house style.

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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Fishing boat with bottom nets for hoki in Tierra del Fuego, Argentina (courtesy of Miguel S. Isla); landing products in Holbox, Quintana Roo, Mexico (courtesy of Mizue Oe); artisanal boat operating in Santa Marta, Colombia (courtesy of Mario Rueda); artisanal fisher fishing octopus in Yucatán, Mexico (courtesy of Manuel Solís); lobster boat with traps in Cuba (Centro de Investigaciones Pesqueras de Cuba); artisanal boat operating in Santa Marta, Colombia (courtesy of Mario Rueda).

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