

## The Fisheries of Belize

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### ABSTRACT

Belize relies heavily on fishing for subsistence and primary income for a significant section of the population. Furthermore, marine based tourism is a rapidly growing and nationally important industry, and both tourism and fishing depend on healthy and productive marine environments. The export oriented, commercial component of fisheries has been dominated by lobster (*Panulirus argus*) and conch (*Strombus gigas*), with shrimp (*Penaeus* spp.) increasing from the late 1980s. Reported landings reached a peak just below 2,000 t in the early 1970s (driven by conch) and again in the early 1990s (due to shrimp), but generally have been declining since the mid 1980s. However, the substantial catches of subsistence and artisanal fisheries, and tourist-based recreational catches, remain unaccounted for. Despite extensive legislative tools for management, Belize has not been successful in management of their resources, nor been able to guarantee the health of the ecosystems. Historically, management has largely been top-down and not sufficiently participatory. The need to rationalize government management of its fisheries and coastal resources has been met by some innovative partnerships, e.g., between fishers cooperatives and conservation NGOs. Thus, a concept of resource 'governance' has emerged where government recognizes that various non user groups have legitimate rights and negotiate for their share of the resource. The role of government is therefore limited to that of setting the rules of engagement and ensuring that rules are obeyed.

### INTRODUCTION

Belize, with a population of ~230,000, is the second smallest country on the American continent, covering an area of ~23,000 km<sup>2</sup>. Mexico lies to the north, Guatemala to the west and south, and the Caribbean to the east.

Belize has responsibility for an EEZ of ~170,000 km<sup>2</sup>, over 7 times its land area (see [www.seararoundus.org](http://www.seararoundus.org)). The Belize coast harbours complex ecosystems that include mangrove forests, river deltas, estuaries, sea grass beds and coastal lagoons which support many important species including crocodiles, manatees, turtles and seabirds (McField *et al.*, 1996). At least 594 genera and 1,040 species occur in coastal regions, while at least 634 genera and 1,304 species occur in marine areas (Gillett, 1999). Nineteen rivers from the interior empty into the coastal system. Until recently, these rivers were the most important avenues of communication and transport in the country (Gordon, 1981).

Included in Belize's national jurisdiction is the Belize Barrier Reef complex (the largest barrier reef in the Atlantic), which lies about 20-25 km off the coast, running in a north-south direction, from the southern tip of the Yucatan Peninsula to the Gulf of Honduras. The 250 km long reef complex contains over 1,060 mangrove and sand cays, and 113 coral species have been reported as endemic (Jacobs, 1998). Three offshore atolls lie to the east of the reef in deeper oceanic waters.

Agriculture is the leading industry, accounting for ~22% of GDP, ~70% of export earnings, and ~29% of the total labour force in the late 1990s, with sugar cane and bananas being the primary export items ([www.caricom.org](http://www.caricom.org); [www.belize.gov.bz](http://www.belize.gov.bz)). However, besides their role as a vital domestic food source, marine products have increasingly become an important source of foreign exchange, with the fisheries sector (and aquaculture) now third largest foreign exchange earner (B.Z.\$<sup>1</sup> 71.8 million in 2000), and is dominated by exports of lobster and shrimp (Belize Government Cabinet Briefing - May 8<sup>th</sup>, 2001; [www.belize.gov.bz](http://www.belize.gov.bz)). Already during the mid-1990s, marine products represented 2.6% of national GDP and 5.3% of the countries total exports (Anon., 1996; Sorensen and Aschan, 1997). In real terms, the marine products industry has expanded by almost 25% during the 1990s, largely as a result of high market prices and increased production, especially from the aquaculture sector for shrimp (Huntington and Dixon, 1997).

As in other countries, high population growth including immigration and refugees from neighbouring countries (Plaisier, 1996) has

<sup>1</sup> B.Z.\$ 1.0 = U.S.\$ 0.50

lead to increased pressure on coastal resources, this being added to the 'normal' growth of the fisheries (Wells *et al.*, 1992). Thus, overfishing of conch and lobster was already evident by the mid 1990s, though price increases have tended to mask the effects of declining catches in weight.

Also, the number of tourist arrivals increased, e.g., from 142,000 in 1988 to 329,000 in 1994, and by 1995 generated income of about US\$ 75 million (McField *et al.*, 1996). Seventy-two percent of all tourists spend time snorkelling, and over 50% will participate in a dive. Thus, tourists compete for healthy and diverse reef and fish resources.

### **The Belize fishing industry**

The Belize Barrier Reef and coastal waters have supported subsistence fishing by the indigenous population for millennia. Fishing and trading activities that took place along the coast by Mayan people some 2,500 years ago are still evident at several Mayan archaeological sites (Craig, 1966; Gordon 1981; Vail, 1988), and evidence of pre-historic effects of fishing on marine ecosystems in the Caribbean have been documented (Jackson, 1997; Jackson *et al.*, 2001). Fishing as a commercial activity did not develop until the mid 19<sup>th</sup> century (Price, 1984), and records of fishing activity have been kept by coastal communities since the early 1840s. Between 1920 and 1960, the Belize fishing industry changed from a small scale domestic fishery, with periodic incursions into the Mexican market, to whole sale marketing of lobster (*Panulirus argus*), conch (*Strombus gigas*) and fin-fish to the more lucrative U.S. and Caribbean markets. The commercial fishery did in fact evolve from foreign dominated purchasing and marketing companies, to locally owned 'cooperative' bodies which gained prominence during the 1950s and 1960s (Snyder, 1976; Gibson, 1977; Vega, 1979; Gordon, 1981; Espeut, 1994). This form of economic organization has come to dominate the sector, with 13 registered fishing cooperatives being owned, operated, and managed by the fishers themselves. It is these cooperatives that are dominating the export market for lobster, conch and fin-fish products. There are believed to be between 3,000-4,000 fishers operating with a fleet of approximately 900 licensed vessels (Richards, 1995), of which ~60% belong to cooperatives ([www.caricom.org](http://www.caricom.org)).

The Belize fishery may be divided into the following categories:

*Lobster and conch fishery:* Both of these species are taken along the reef and within the atolls. Traps are set for lobsters, while conch (as well as lobster) are taken by free diving. The trend observed for lobster suggests that the fishery is operating at or just above its sustainable level. Conch show a declining trend;

*Inshore artisanal fishery:* This includes reef fish and estuarine fishes and crabs:

(i) Reef fish are primarily snapper (Lutjanidae) and to a lesser extent grunts (Haemulidae), porgy (Sparidae) and hog fish (Gerreidae). They are taken largely by line fishing, spears, gill nets, traps and weirs;

(ii) The estuarine fishery consists of mullet (Mugilidae), stone bass (Serranidae), and mojarras (Gerreidae), caught using nets and weirs. This is a seasonal, small scale fishery;

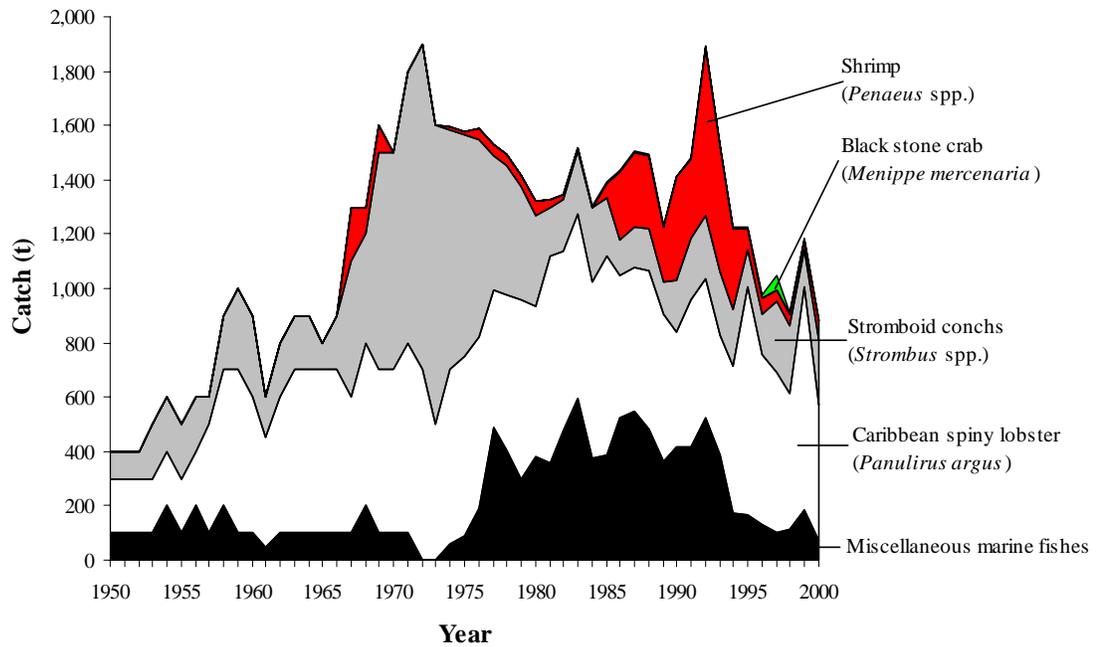
(iii) Two species of crabs are exploited. They are the stone crab, *Menippe mercenaria*, and the blue crab, *Callinectes sapidus*. Both are caught in specially baited traps and are destined for export;

*Deep slope and bank fishery:* These fisheries are composed largely of snappers (Lutjanidae) and groupers (Serranidae). They are the traditional base of the fin fish export industry. The fish are usually caught using hand lines, primarily during spawning aggregation events. Overexploitation is an acknowledged threat;

*Inshore pelagic and shark fishery:* The scombrids (mackerel, tunas and barracuda) and sharks are targeted. The fishery is seasonal and largely for the Mexican, Honduran, or Guatemalan market;

*Inshore commercial trawl fishery:* Established in 1984, this fishery peaked in 1988 with a fleet size of 11 standard Mexican/Gulf trawlers. Declining catch and uncertainty haunt the industry; and

*Marine aquarium fishery:* This fishery targets the fish hobbyist in the U.S. and Europe. The value of the catch continues to increase.



**Figure 1:** Reported landings of Belize in FAO area 31 (Western Central Atlantic), based on FAO-FISHSTAT.

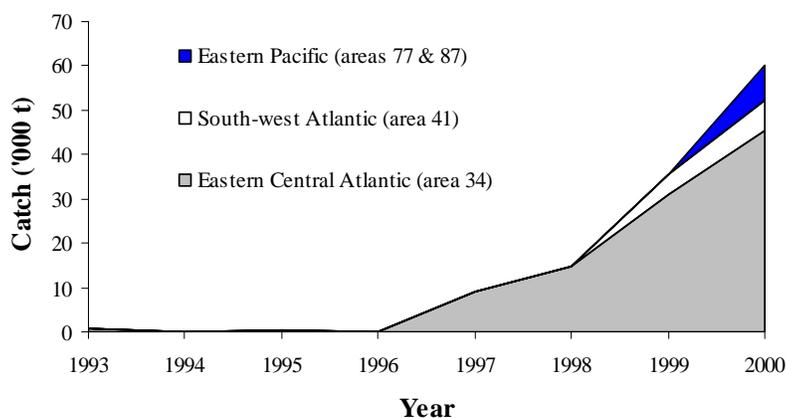
### Fishery catches

Historically, Belize fishers have only been active in FAO area 31 (Western Central Atlantic), indicating the predominantly subsistence and artisanal nature of fisheries operations, and the reliance of Belize on their own coastal and reef resources (Figure 1). Reported landings have traditionally been dominated by lobster and conch, with shrimp becoming important in the late 1980s to mid 1990s (Figure 1). Overall, reported landings peaked just below 2,000 t in the early 1970s (driven by conch) and again in the early 1990s (driven by shrimp), and, with the exception of the brief peak in shrimp catches in the early 1990s, have shown a distinct decline since the mid-1980s (Figure 1). However, given the high levels of subsistence and artisanal fishing activities throughout the country, one has to assume that substantial catches remain unreported. This would especially apply to finfish, here only reported as 'miscellaneous marine fishes'. Note also that the reported landings from national waters do not include the increasing recreational catches due to the expanding tourism industry. Hence, one would suspect that the overall extractions of marine resources by Belize are considerably higher than represented by the data supplied to FAO by the Government of Belize.

The lobster fishery has historically been the most valuable fishery in Belize. In 1995, the lobster catch was valued at over USD 7.7 million, and is representative of a continuing increase in weight and value of lobster. However, the fishery is of concern as signs of overexploitation are evident (Glaholt, 1986). Another major marine income earner, the conch fishery also shows signs of overexploitation (Gibson *et al.*, 1982), with harvesting driven solely by demand and high prices for the product. The fishery for shrimp is also in decline, and it has been recommended that the shrimp fleet be disbanded or drastically reduced (RDA, 1989). The fishery is under pressure from the public due to destructive practices and high discards. Furthermore, the fisheries department is of the view that the fishery has outlasted its usefulness, and shrimp catches have been overtaken by aquaculture production. The fin-fish or scale-fish fishery appears the only fisheries sector with any future potential, and appears to have expanded during the 1990s. However, certain key species, such as groupers were already viewed as in danger of overexploitation in the early 1990s, due to over-harvesting of spawning aggregations (Carter *et al.*, 1994).

Starting in the early 1990s, Belize reported increasing catches from waters in the Eastern Central Atlantic (FAO area 34), which by the

year 2000 had grown to nearly 40,000 t (Figure 2). These catches are dominated by large and small pelagics, as well as cephalopods and some other schooling species such as hake. These landings exceed those from national waters (Figure 1) by nearly 40 times for the year 2000 (Figure 2). For the last two years of available data (1999 and 2000), Belize also reported catches from the southwest Atlantic and the eastern Pacific (Figure 2), which are dominated by squid and large tuna, respectively. These catches were made by vessels with Belize flags, but are not of concern here, as we consider only catches from Belize waters.



**Figure 2:** Reported landings of Belize from Atlantic and Pacific FAO areas, based on FAO FISHSTAT data.

### Fishery management

The Ministry of Agriculture and Fisheries is the Government agency responsible for fisheries management, and it carries out this duty through the Fisheries Department. The Fisheries Department is slated to be replaced by a semi-autonomous agency, the Belize Fisheries Development Authority (Belize Government Cabinet Briefing - May 8<sup>th</sup>, 2001; [www.belize.gov.bz](http://www.belize.gov.bz)). The Belize Fisheries Department and the other Government departments tasked with managing the fisheries and other users of the marine resources, lack the human and material resources to do the job, notwithstanding extensive arrays of legislative acts and formal institutions (Gillett, 1999). Thus, in Belize, there are 94 Acts pertaining to marine resource conservation, administered by 18 Permitting Agencies and 10 Ministries (McField *et al.*, 1996). Belize is a member of 24 international conventions and treaties concerning marine life and coastal protection,

including the CITES Convention, the World Heritage Convention, the Convention on Biological Diversity and MARPOL (McCalla, 1995; Jacobs, 1998). Issues related to mangroves have been described by Zisman (1992), and Cirelli (1993) and McCalla (1995) covered fisheries. McCalla (1995), for example, identified 27 legal tools which have some bearing on fisheries or marine related activity.

Despite this extensive legislative accounting for resources, however, the Government has not been successful in sustainable management of fisheries and their resources, nor guarantee the health of the ecosystems upon which the fisheries and the resource depend. The primary legislative tool is the Fisheries Act (1980), which was revised in 1993, and focuses on new formulae for fishing licensing and regulation of the aquaculture sector (Cirelli, 1993). However, historically management has largely been top-down and not sufficiently participatory. Indeed, the present management of the Belize fishery which aims to maximize yield, to provide

foreign currency, and to provide jobs for the disadvantaged cannot achieve the tasks of sustainability. The inability of governments to successfully manage marine resources is not unusual (Dubbink and van Vliet, 1996), and afflicts governments even when they invest considerable time and energy in fisheries management. Indeed, some of the legislation enacted by Belize reflects advanced thinking on natural resource conservation. But the existence of a legislative framework does not always reflect or guarantee a coordinated view of agencies responsibilities and power, leading to jurisdictional and enforcement problems (Freestone, 1995). For example, while the concept of the participatory principle has been embraced by legislation, its practice lags far behind. Several problems exist:

Firstly, although regulated by the Fisheries Act through prescribed closed seasons, size limits, closed areas, etc., the fisheries are largely open access. Anyone who wishes to do so can buy a license; thus licensing is not used as an effort control mechanism (Sorensen and Aschan, 1997). Secondly, there is a lack of

good analytical information which can be meaningfully accepted and adopted. Thirdly, there is a deliberate policy to diversify the industry, targeting new species for which little or no biological information exist. Fourthly, there is the perceived threat of declining environmental health. The area devoted to aquaculture development continues to increase: For example, over 400 hectares of ponds were developed in 1995. Seagrass beds are being impacted by dredging operations, siltation due to land clearing, and nutrient enrichment due to agricultural runoff. Sea grass beds are an important habitat link between the mangrove and coral reef ecosystem. It is also an important breeding and feeding ground for many marine species including lobster, conch and many fish. While the ecological integrity of Belize's mangroves is thought to be good, the rate of clearance, especially on the cays, is troubling. Only 2% of mangrove cays are protected compared to 25% along the mainland coast. Scientific opinion recognizes that losses in mangrove habitat will reduce biodiversity and threaten the natural wealth of the ocean, both near and far from shore (Ruetzler and Feller, 1996).

The expansion of residential development, throughout the mainland coast and on the cays highlights the issues associated with development, including contamination and disposal of sewage into the marine environment. The issues of solid waste disposal, habitat destruction and degradation, and socio-economic and cultural problems, are prominent. The tendency to overlook these problems and 'grow first, clean up later' should be challenged as it also alienates Belize nationals whose accessibility to credit for investment in the fisheries sector has been eroded. For example, Ambergris Cay was, prior to 1957, owned largely by nationals, who mostly fished for a living. By 1995, most of the available land, except for 14 hectares, was acquired by foreign interests.

Furthermore, with the decline of lobster on the fishing grounds adjacent to the island, most of the fishers have shifted to tourism, largely to work as tour guides. Membership in the fishing cooperative has declined from 148 active members in 1985 to 86 in 1991. The importance of tourism is not being denied. It generates considerable foreign earnings and employment, as indicated by a 52% increase in tourist arrivals between 1991 and 1994. It is, however, impacting the fishery sector as

visitors compete for snorkeling, diving, and fishing space. Sport and recreational fishing is also heavily promoted by the industry but the status of the underlying resources is largely unknown.

Thus, fisheries *per se* are not managed for conservation or sustainability, nor for optimal utilization. Historically, developments occur mainly through state intervention in the form of legislation and development plans crafted by the Ministry of Agriculture and Fisheries or the Ministry of Economic Development. Indeed there is increasing capital investment in open access fish capture through utilization of faster, more efficient vessels (Auil, 1993). Furthermore, the number of fishers is also increasing (Gillett, 1995), despite the lack of adequate knowledge of the potential yield, structure or stability of stocks. Concern is now growing for the future viability of the fishery which is compounded by the destruction of critical habitats for fish stocks, such as mangrove habitats (McField *et al.*, 1996), and the depletion of stocks as illustrated through declining catches at known fish spawning aggregation sites.

### **Trend towards decentralization**

The need to rationalize government management of its fisheries and coastal resources has been met by some innovative inputs, particularly by the cooperatives and the conservation NGO communities, often in innovative partnerships. This latter group has been remarkable in the extent to which it has taken on the responsibility of funding and managing activities in the conservation sector. This has led to a *de facto* acceptance, by the Government of Belize, of governance arrangements wherein power is shared between stakeholders. These efforts have led to the acceptance by government of the concept of establishing protected areas to sustain the country's biological diversity and, by extension, its economic viability. Thus, e.g., the Advisory Committee of the Bacalar Chico Reserve is composed of representatives of the following institutions:

- Fisheries Department;
- Forestry Department;
- Coastal Zone Management Project;
- San Pedro Town Board;
- North Ambergris Cay Land-owners Association;
- Caribena Fishermen Co-operative;

**Table 1:** Some NGOs active in protected area management in Belize (Gillett 1999)

Organization	Inputs	Area Protected	Support
Belize Audubon Society	Education, funding, management	Half Moon Caye Natural Monument; Laughing Bird Caye reserve	Broad community support
Belize Center for Environment Studies	Technical, Education	Port Honduras; Ambergris Caye	Limited community support
Belize Enterprise for Sustainable Technology	Training, education, management	Manatee Special Development Area	Rural community support
Belize Tourism and Industry Association	Educational, promotional	Country-wide	Special interest
University College of Belize	Technical, education, training	Turneffe Island, Belize City	Special interest
Coral Caye Conservation	Technical, research, funding	Bacalar Chico, Caye Caulker, South Water Caye	Special interest
International Tropical Conservation Foundation	Technical, research, funding	Bacalar Chico	Special interest
Wildlife Conservation Society	Consultancies, funding	Hol Chan, Pedro Glovers Reef	Special interest

- Sartaneja Village Council;
- Hol Chan Marine Reserve;
- Coral Cay Conservation;
- International Tropical Conservation Foundation;
- San Pedro Tour Guide Association; and
- University College of Belize.

Such wide representation also occurs in the Boards or Advisory Committees of various marine protected areas, and Table 1 gives a non-exhaustive list of groups involved.

It is ironical that some of the theoretical advances (Kooiman *et al.*, 1999) concerning the manner in which natural resource management systems ought to operate should be tested first in developing countries such as Belize. Upon reflection, however, we can see that this only duplicates the experience with marine protected areas, where developing countries have a lead (Roberts, 1999).

### Management options

It has been recognized that for fisheries management to be successful, it must look beyond fisheries *per se*. Management concepts cannot be simply imposed upon those intended to benefit from it. A buy-in process has to be developed within which all stake holders participate in developing, implementing, and monitoring the performance of policies. Three alternative approaches have been proposed to the archaic 'top-down' regulatory approach to fisheries management (Pauly, 1999):

- (i) Market-based approaches;
- (ii) Community-based approaches; and
- (iii) Ecology-based approaches.

The first is meant to deal with the race-to-fish, based on open access resource, which results in overcapitalization of the industry and the transfer of public assets to co-operate ownership (Pauly, 1999). The second alternative, although popular and seemingly supportive of participatory processes, is often exclusive as it generally excludes non-user groups. The third approach essentially promotes management incorporating ecosystem considerations and processes, including Marine Protected Areas (MPA's), as the best opportunity to apply precautionary approaches in the light of high natural uncertainty (Pauly *et al.*, 2002).

A new concept, that of 'modern governance' has emerged where government recognizes that various non-user groups have legitimate rights. Therefore, a forum is provided within which all the stake holders (extractive and non-extractive) justify their claim, in a transparent way, and further negotiate for their share of the resource. The role of government is therefore limited to that of setting the rules of engagement and ensuring that the rules are obeyed (Pauly, 1999). It remains to be seen which path Belize takes in the management of its marine resources.

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