The Marine Fisheries of Jamaica

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Abstract

The marine fisheries of Jamaica are almost entirely artisanal, with at least 15 000 fishers and an annual catch of approximately 7 000 t. A recent development is a small industrial fishery for queen conch and spiny lobster that earns significant foreign exchange for the country. The major aquatic resources are coral reef fishes, conch, lobster, small pelagics and seasonal large pelagics. The major fishing grounds are the southern island shelf and Pedro Bank, a large oceanic bank 150 km to the southwest of Kingston. The fisheries are rated as overfished, except the queen conch fishery which is relatively well managed. A new Fisheries Bill is currently being reviewed with the intention of improving the efficiency of management measures and of fisheries administration. There are plans for rehabilitating the fisheries and developing them with a focus on their sustainability in the future.

Introduction

Jamaica lies to the center of the southwestern Caribbean Sea and is the third largest of the Greater Antilles with a total land area of 10 940 km^2, a population of approximately 2.5 million and a coastline of 885 km. It has many small bays and inlets along this coastline (NRCD 1987). Lying in the path of the northeasterly trade winds, wind speeds exceeding 15 m/sec and associated choppy seas are common, with a calmer period between October and February (Munro 1983; Aiken 1993). Currents in the vicinity of the islands are westerly and are from 0.5-1 kt. For most of the year tidal effects are slight to nil although over Pedro Bank they can reverse at ebb tide. The majority of the sea floor on the shelf is seagrass and soft corals over sand and limestone bedrock, with coralline growth usually concentrated at the edges (Aiken 1993; Halcrow 1998). There are muddy areas near the estuaries of several large permanent rivers emptying at the south coast. Much of the south shelf is flat and shallow with a mean depth of approximately 20 m and a maximum width of 25 km. The north shelf is a narrow 1.6 km band (Fig. 1). The larger reefs are found on the eastern portion of the south shelf and are of the fringing and sill types. There is deep water separating the island from all the oceanic banks. The edges of the shelf have a vertical or near-vertical profile into deep water (>300 m) on all sides (Munro 1983). The island and the nine proximal oceanic banks have a total area of 4 170 km^2. An Exclusive Zone established in 1996 has increased Jamaica's total maritime area to 274 000 km^2.

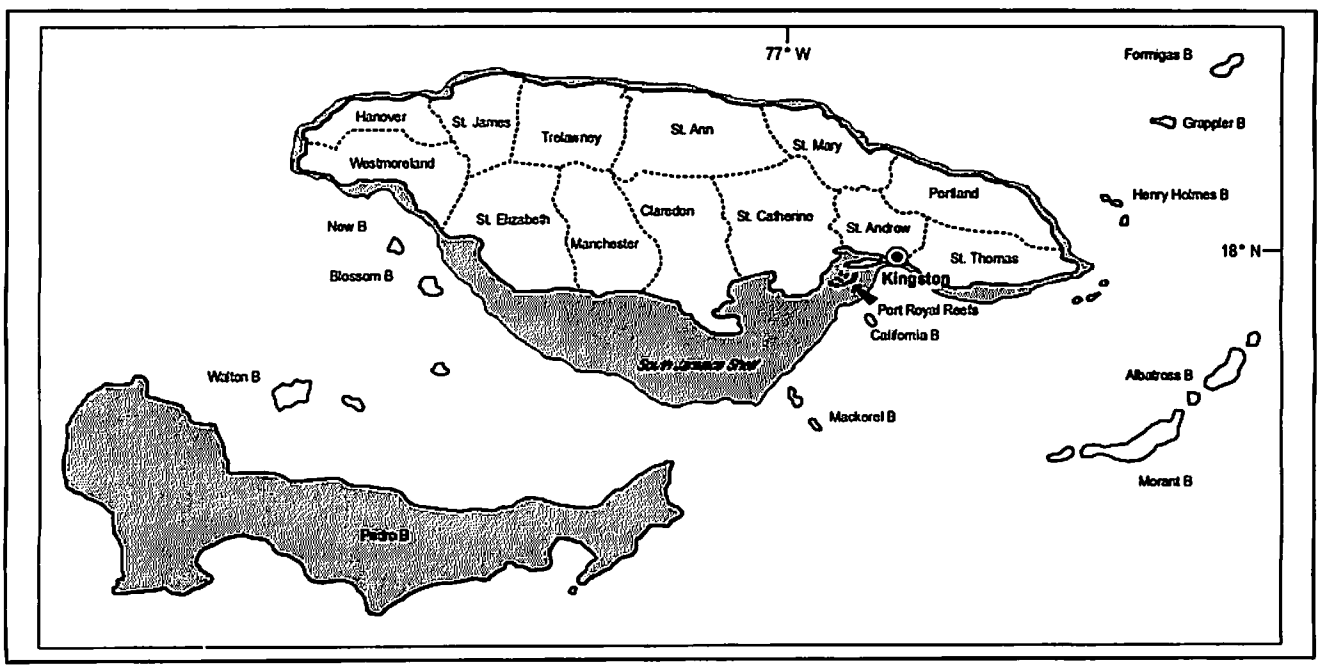

Fig. 1. Main fishing grounds around Jamaica.

Fishing Activities

The fishing industry is primarily artisanal and small-scale, but is surprisingly diverse and complex (Halcrow 1998). There are at least 15 000 to 20 000 active fishers and at least 3 500 registered fishing vessels operating from 168 landing sites (Fig. 2). The typical vessel is an open canoe (95% of all vessels) that ranges in size from 4 m (wooden dugouts) to >18m (larger canoes fishing Pedro Bank). The commercial ones use larger outboard engines. There are also decked, offshore vessels in the 12–20 m size range with inboard diesel motors fishing in adjacent oceanic banks. There is a small fishing port at Kingston that was built in 1980 with concrete berths and other facilities for larger decked vessels. It is presently in a somewhat poor condition.

The main landings are of coral reef fishes (Munro 1983; Aiken and Haughton 1987; Koslow et al. 1988; Aiken 1993). Though 445 marine bony and cartilaginous fish species have been recorded by Caldwell (1996), only 96 species of fish and two lobster species have been described from the Port Royal Reefs near Kingston by Munro. The main fishing areas are on the island shelf and on the nine small oceanic banks. Pedro Bank, a larger oceanic bank that is 5 500 km^2 and lies 150 km southwest of Kingston, is also regularly fished. The main fishing gears are fish traps (pots) and beach seine, tangle and gill nets, followed by handlines, spearfishing and some use of illegal explosives. Since 1980, there has been a steady increase in the number of fishers employing nets of various kinds in an attempt to avoid widespread pot stealing. By 1996, net fishing gears were 40% of all gears employed, equaling the use of pots (Fisheries Division 1997). Many fishers employ more than one type of gear (Espeut and Grant 1990). North coast fishers are mainly part-time while those on the south coast are mainly full-time. Marketing is through a large diffuse higgler system.

Fig. 2. Typical landing site showing boatside vending of catches.

Fish Pot Fishery

Fish pot fishing is conducted in two major locations: the island shelf and offshore banks and their cays. The great majority of fish landings are from reef fisheries, mostly from the southern island shelf. The primary gear is the Jamaican version of the Antillean fish trap or fish pot which consists of a hardwood frame over which hexagonal meshwire is stretched in a Z-shape with two horse-necked entrance funnels. These traps are set near (but never on) the fringing reefs at depths between 20 to 40 m. They are usually deployed singly, with simple baits, for up to 6 days. Newer pop-up floats are gaining popularity due to increasing fish pot piracy. Traps are retrieved by hand by a crew of about three persons in an open canoe. This fishery produces scalefish, spiny lobster, crab and some octopus (Fig. 3). Small quantities of shark and ray are caught in the net fisheries where catches are dominated by scalefish. Nearly 60% of all fishers operate on the south coast.

Offshore, the major activities center on Pedro Bank, which has three small, inhabited sand cays on the eastern fringe. Some 300 fishers live on and operate from these cays using traps and scuba to harvest reef fish, conch and spiny lobster. One thousand fishers and 200 boats are registered with the Fisheries Division for fishing on the Pedro and Morant Cays. Conch is taken by cay-based free divers, but mainly by scuba divers from industrial vessels. The resident cay fishers sell their harvest to larger carrier

boats, laden with ice, that take the fish to Kingston some 160 km away. Many open canoes with special insulated ice-holds also travel from south coast beaches to the cays to transport the catch.

The main fisheries resources are coral reef fishes, spiny lobsters, conch, small coastal pelagic finfish and large offshore pelagic finfish. The reef fish species of major importance come from families which include Lutjanidae (snappers), Serranidae (groupers), Carangidae (jacks), Mullidae (goatfishes), Scaridae (parrotfishes), Haemulidae (grunts), Balistidae (triggerfishes), Acanthuridae (doctorfishes), Holocentridae (squirrelfishes) and Holacanthidae (angelfishes).

In the 1970s it was reported that there were only 10 species on the south shelf that individually contributed more than 4% by weight to the catch and together these species comprised approximately 42% of the total catch. Spiny lobsters comprised 8% by weight (Munro 1983). In 1996, reef fishes constituted 80% of all landings (Fisheries Division 1997).

Recent information on species diversity in reef fish catches (Koslow et al. 1988; Clemetson 1994) can be compared with earlier findings from roughly similar areas made by Munro (1983). Hartsuijker (1982) and Nicholson and Hartsuijker (1983). The Fisheries Division has new data gathered between 1995 and 1998 for various landing sites around the island. Comparisons suggest that since the late 1970s there have been changes in species diversity with loss of the predatory species and replacement by less valuable ones. The Antillean Z-trap is the principal gear that impacts on reef fish diversity.

Spiny Lobsters

There are several reports on the lobster species taken and there are data on the biology of the spiny lobster (Aiken 1977, 1983; Munro 1983; Haughton and King 1989). The fishery is based on two species *Panulirus argus* and, to a lesser extent, *P. guttatus*. There are at least 4 other lobster species that are occasionally taken. The normal Z-trap used for fish and the Florida wooden lathe lobster trap are both used in the lobster fishery. Between 1980 and 1988 there was a large-scale Florida lobster trap fishery on Pedro Bank. This industrial fishery formed the basis of a very profitable export industry. The impact of this fishery on lobster stocks on Pedro Bank was probably quite serious as there has been virtually no large-scale lobster fishing since 1990. Some of the fishing effort has been transferred to the more profitable conch fishery. Lobsters are an incidental but very valuable catch in Z-traps. They comprised 5% of south coast landings in 1996 (Fisheries Division 1997).

Conch and Other Molluscs

The queen conch, *Strombus gigas*, is a large marine gastropod that was taken in small quantities up to about 1989. There are three other *Strombus* species but none is of commercial value. There was no industrial conch fishing using larger vessels. Since 1990, there has been a very rapid growth that has formed the basis of another highly profitable export industry. Estimated catches (based on export data) increased from 50 t in 1987 to 2 050 t in 1994. New management measures are attempting to bring better control to this profitable fishery (Aiken et al. 1997). The main conch fishery is on Pedro Bank and employs many divers equipped with scuba and hookah gear from large (25 m) mother boats, often leased from other countries, e.g., the Dominican Republic. The impacts of high fishing levels on the species are mentioned in Appeldoorn (1995). Generally, there has been a decline in abundance of medium and large conch due to the high level of fishing effort.

Other molluscs taken (from mangrove areas) include the bivalve mangrove oysters, *Crassostrea rhizophora*, and the flat or false oyster, *Isognomon alatus*. Stocks of the former species are declining.

Fig. 3. Trap catch of spiny lobster* (Panulirus argus) *and snappers.

Small Coastal Pelagics

A wide variety of surface dwelling fish constitute the smaller pelagics. These species include clupeids (sprats and herrings), engraulids (anchovies), schooling carangids (jacks), mugilids (sea mullet), scombirds (small kingfish mackerel), halfbeaks, needlefish (hemirhamphids) and barracuda. All of these are caught by gill nets that are set in the bays, mangroves and seagrass beds in nearshore waters. Smaller pelagics were extensively studied by the University of the West Indies, Mona, Fisheries Ecology Research Project between 1980 and 1984 (Goodboy 1986) and by Harvey (1986). Coastal pelagics contributed 12% to south coast landings in 1996.

Larger Pelagics

Data on the larger offshore pelagics may be found in Aiken (1985), Harvey et al. (1989), Mahon (1995) and Mahon (1996a, b). These studies examined the species diversity, catch rates and seasonality of these fishes. The large pelagics are taken mainly by trolling lines behind canoes. There is a season of increased catches from about October to March every year. Though these are commercially valuable species, there is no commercial fishery for larger pelagics in Jamaica as these have always yielded small, highly seasonal catches. There was a shortlived swordfishing venture using a handful of small vessels in 1989. These vessels fished 300 m deep baited longlines fitted with chemical lights. The main species taken in these waters include scombirds (tunas, mackerels), dolphin fish, blue marlins, sailfish, sword fish, pelagic sharks and barracuda. Most of these are highly seasonal due to a migratory lifestyle. This large-scale movement has implications for regional and international management of fisheries and biodiversity. There are a number of recreational fishing tournaments specifically targeting these pelagics species. Larger pelagics contributed 2.6% to south coast landings in 1996.

Form Shrimps

At least four marine shrimps species of *Penaeus* (dominated by *P. notialis* but including, *P. brasiliensis, P. duorarum* and *P. schmitti*) form the basis of relatively small artisanal fisheries. This fishery is limited to areas found near river outfalls on flat ground. Shrimp fishing has never been a large-scale activity as the stocks are small in biomass and cannot support such action. Nevertheless, some 2 000 people (including vendors) are involved in this fishery. Fishing for shrimp is likely to remain small in the immediate future. Some nine tons of shrimp were produced from the south coast in 1996 (Fisheries Division 1997; Halcrow 1998). A good recent summary of what is known of local shrimp biology, fisheries and production is given by Galbraith (1997). Shrimps made up 0.5% of all landings on the south shelf in 1996. Other crustaceans taken are crabs (*Callinectes*) by seines over muddy ground, spider crabs (*Mithrax*) and coral crabs (*Carpilius*) in fish pots.

Turtles

There are four marine turtle species of which the hawksbill, *Eretmochelys imbricata*, has been the most common catch in recent decades. The other species seen are the green, *Chelonia mydas mydas*, Loggerhead, *Caretta caretta*, and sometimes the Leatherback, *Dermochelys coriacea*. Though they are protected by the Wildlife Protection Act of 1981, they are still taken occasionally in nets. Isolated stretches of sandy beaches and the offshore and nearshore sandy cays function as nesting grounds for these species. The main threats to turtles is poaching by fishers and unregulated coastal development that destroys nesting sites.

Status of Fisheries

The fisheries of Jamaica are considered overfished. This overfishing has brought about changes in the species composition that have important implications for the fisheries. Fishes dwelling on the fringing reefs around Jamaica constitute the main fishery of Jamaica. Munro and his colleagues provided the first details of the biodiversity of the fish resources and recorded 96 fish species and two species of lobster from the Port Royal reefs and Pedro Bank. The high levels of fishing have produced changes in the species composition of catches, especially since the 1970s (Munro 1983; Aiken and Haughton 1987; Haughton 1988). The top carnivorous predatory fishes such as the higher-valued snapper, grouper and jack have been greatly reduced and have been replaced by lesser valued herbivorous and omnivorous species such as the parrotfish, surgeonfish and wrasse. Thus, the biodiversity has been directly affected by overfishing. Complicating the picture are the other elements like the severe hurricane damage to reefs in 1980 and 1988 and the poorly understood waterborne viral disease that killed nearly all the black sea urchins that are important algal croppers and ensure (with herbivorous fishes) that the reefs do not become overgrown with algae. Marine pollution and the loss of wetlands and seagrass nurseries due to coastal development also affect species changes.

Recreational Fishing

This takes place in a growing number of limited tournaments that targets the larger pelagics. The main vessels used are the cabin cruiser type with trolling lines. The main species taken are billfish (mainly *Makaira nigricans* and

some sailfish and white marlin), king mackerel, dolphin fish, wahoo and tuna. Biological data are provided from these tournaments to the International Gamefish Association. To reduce conflicts between this group and the commercial fishers, these tournaments have included sections for the latter to compete in. This tactic has proven very successful. Useful reviews of this sector are provided by Aiken (1985), Harvey et al. (1989), Harvey (1990) and Mahon (1996a, b).

Catches and Landings

Annual statistical data for 1996 indicate that some 14 000 t of aquatic resources were landed (Fisheries Division 1997). This is twice the figure of 7 220 t from the sample survey for 1981. There were no official published surveys of the fisheries between 1981 and 1996. It is important that more regular surveys are undertaken with appropriate funding and support.

Assessments

Several stock assessment studies of Jamaica's fisheries resources have been conducted, e.g., Munro (1983), 1969-1973; Cuba-Jamaica Cooperative Fisheries Research Project, 1977-1978; USSR-Jamaica Fisheries Research Project, 1979-1980; Hartsuijker and Nicholson (1983), 1979-1981; Koslow et al. (1988), 1986-1987; Haughton (1988), Koslow et al. (1994), 1989-1992; Pears and Sary (1997), 1995-1997; and Aiken (1998). These assessments are all reviewed in Halcrow (1998) and summarized and compiled in Aiken (in press). All show that very high levels of fishing are taking place on the island shelf, especially on the north coast. Other studies show that significant increases in yields can be obtained from the reef fishery by introducing slightly larger trap mesh sizes as a rehabilitative measure. An early estimate of the total potential harvest from Jamaica was approximately 16 000-17 000 t/yr, with the island shelf producing 7 300-8 500 t/yr and Pedro Bank producing about 8 200 t/yr (Munro 1983). Hartsuijker and Nicholson resurveyed the Pedro Bank reef fish resources and produced a much lower potential yield figure of 2 500 t/yr based on a more accurate estimate of "productive bottom". The USSR-Jamaica trawl fishing survey of that area produced figures similar to Munro's but suggested that surface longlines could catch approximately 3 500 t/yr of larger pelagics from coastal waters.

Queen conch stock assessments on Pedro Bank suggested that some 1 800 t/yr could be harvested from that area and approximately 18 t/yr from Morant Bank conch stocks (Stephens 1997). The industrial fishery for Pedro Bank conch has been harvesting close to 1 800 t/yr since 1996.

It seems unlikely that there are major fisheries resources that are yet to be discovered in Jamaican waters, but large pelagics need to be reassessed (Mahon 1996a, b).

Research and Management

The main organizations doing research have historically been the UNDP, FAO, UWI Mona campus (Zoology Department and Centre for Marine Sciences), Fisheries Division and Canada Fisheries Resources Assessment and Management Program (CFRAMP). Useful resource reviews have also been done by private consultancy firms, especially since 1990. Research has centered on assessments of fishable resources and the status of reef fisheries. The UWI Mona Zoology Department had a 17 m ferro-cement vessel, the *R.V. Caranx*, dedicated to fisheries research from 1969 to 1986. The Fisheries Division undertook exploratory fishing/training with UNDP and FAO between 1969 and 1974 and independently from 1970 to the present time with a 25 m vessel, the *M.V. Din*. Between 1996 and 1997, the Government of Jamaica (GOJ) Fisheries Division and the Government of Colombia in conjunction with CFRAMP undertook cooperative fisheries research on small oceanic banks in the southwest Caribbean Sea where there is a jointly managed regime around Banco Nuevo Bank and Serranilla Bank. The fishable resources were assessed and benthic habitats described. Many of the assessment projects had components that addressed management of the fishable resources (Munro 1983; Koslow et al. 1994; Aiken 1998 and Halcrow 1998) and a few economic and sociobiological aspects (Espeut and Grant 1990; Aiken et al. 1996). The capability of the Fisheries Division has been upgraded, some of it with the help of CFRAMP that has assisted with computer, licensing and registration systems, a data collection scheme setup, workshops and training. More technical staff have been hired over the last five years.

Technical Assistance

Fisheries in Jamaica have received assistance from the following organizations: UNDP-FAO, 1969-1974; Cuba-Jamaica Cooperative Research Programme, 1977-1980; USSR/GOJ Cooperative Research Fishing Project, 1978-1980 (USSR Ministry of Fisheries 1980); FAO-TCP Pedro Bank Re-survey (Hartsuijker and Nicholson 1983); Canada UWI/Trent University Fisheries Improvement Project, Discovery Bay, 1988-present; ICOD/UWI/GOJ/Belize Fisheries Management Planning Project, 1989-1992; CARICOM and CFRAMP, 1991-present. These have contributed technical training, specialized workshops, research vessel time, use of specialized equipment and grants of equipment.

The governments of the United Kingdom, South Korea and Japan have assisted in various ways. In 1998 the Japanese government began

a program of assistance with berthing piers, cold storage and fishers cooperative assistance in Bluefields, Westmoreland parish in western Jamaica.

Plans for the Future

In recent years, there has been serious concern about the poor status of the fisheries and decline in marine biodiversity. A major integrated multidisciplinary study for the sustainable development of the south coast fisheries conducted in 1998 (Halcrow 1998) aimed to identify ways to ensure rehabilitation and sustainability of fishery resources. A review of fisheries legislation with assistance from FAO has produced a new (draft) Fisheries Bill. This bill is being reviewed and is intended for introduction by the year 2000. The implementation of the plan for managing the marine fisheries compiled by the Fisheries Division with assistance from CFRAMP (Fisheries Division/ CFRAMP 1997) depends on this bill. It is a comprehensive plan for addressing the specific needs of each resource group (shallow shelf, deep slope, coastal and larger pelagics, conch, lobster, etc.). The plan includes the formation of an oversight Fisheries Advisory Committee with a multidisciplinary composition. There is a distinct move away from the largely unsuccessful top-down managerial approach to co-management and community-based fisheries resource management. There are several nongovernment organizations that have attempted to undertake fisheries management with various degrees of success. A few of the successful projects include the Fisheries Improvement Project (FIP) in Discovery Bay, St. Ann, and the Caribbean Coastal Area Management Foundation (CCAMF) in Old Harbour Bay, St. Catherine, the largest embankment on the island. Both have focused on the involvement of stakeholders in decision-making and enforcement of management measures. These projects could serve as models for island-wide management. The Fisheries Division would still have a role in coordinating activities and offering legal and technical advice as well as in the administration of the fishery.

Improvements of infrastructure to improve landing sites and support coastal fishing communities are planned as part of the program for sustainable fisheries development. The capacity of these communities to both understand and participate in co-management is to be strengthened. Regular catch monitoring and assessments will also be conducted. The main focus will be the prevention of further declines and/or increase of yields from overexploited shelf and bank areas by reducing fishing effort and stopping unsustainable fishing practices through a co-management approach. Options for increasing yields from larger pelagics and other enhancements will be identified. The introduction of small-scale long lining will be reassessed. Upgrading of processing, distribution and post-harvest handling standards are also planned. The Fisheries Division's capability to handle these issues will also be improved. Rehabilitated and properly managed, these fisheries have the potential to produce sustainable long-term yields of valuable, high quality seafood for both local and tourist consumption as well as for export.

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