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The Fish Sanctuaries Network: Jamaica's Quiet Fisheries Success Story

Karl A. Aiken[1]*, G. Andre Kong[2] , Oliver Squire[3] & Inilek Wilmot[4]
Fisheries Consultant, 33 Gerbera Drive, Kgn. 6, Jamaica[1] & Fisheries Consultant, Maven Avenue Apartments, Kgn. 6, Jamaica[2], Oliver Squire , National Fisheries Authority, East Bustamante Port, Kgn.[3], Inilek Wilmot, Goldeneye Foundation, St. Mary[4].
* Karlaiken2@gmail.com (corresponding author)[1]

Abstract

Jamaica formerly lagged behind other Caribbean nations in the introduction of fish sanctuaries, but this is no longer true. In 2009, the government introduced nine small fish sanctuaries distributed around the island; and in 2023, there were 18 such sanctuaries. The areas selected satisfied ecological and fisheries criteria and importantly, have an associated fishers group chosen to enforce these special protected areas. The initial introduction was the result of two years of collaboration by the National Fisheries Authority (formerly Fisheries Division), and fishers' groups, in conjunction with the then Fisheries Advisory Board. Nearly all sanctuaries include sheltered coastal habitats with mangroves, sea grass beds, sand patches, and coral while having modest fisheries resources, primarily juvenile in size. Close collaboration with and participation of fishers is a key feature of all the sanctuaries. The 18 MPA's now include one offshore at Pedro Bank, the island's major fishing ground and nearly all are doing well. Post-introduction studies have demonstrated that most fish sanctuaries have succeeded in increasing fish species diversity, abundance, and mean fish lengths as well as the restoration of several missing apex predator species over time. Algal cover has also significantly decreased compared to pre-sanctuary conditions. Coral restoration activities also occur in some sanctuaries with some success. One significant success indicator was the call by other fisherfolk groups for fish sanctuaries to be introduced in their areas as generally, Jamaican fish sanctuaries have been quietly succeeding in increasing coastal fisheries biomass.

KEYWORDS: Fish sanctuaries, Jamaica, fisheries management, reef fishes, conservation

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1. INTRODUCTION

In the mid-1970s the late Dr. John L. Munro suggested a need for fishery reserves in Jamaica in the summary volume Munro (1983). Soon after, Aiken & Haughton (1987) incorporated this suggestion into the first comprehensive management plan for the island's fisheries, naming several areas that could be considered as fishery reserves. However, this proposal elicited no government response. The development of fish sanctuaries was resuscitated in 2008 with the formation of a new Fisheries Advisory Board when a group was formed to establish Fish Sanctuaries. In 2009, the first 9 were designated. In 2023, there were now 18 marine protected areas (fish sanctuaries called Special Fishery Conservation Areas) around Jamaica. The effort has been a relatively successful collaboration between the National Fisheries Authority), the University of the West Indies (Mona), fishers groups, and a growing number of environmental non-government organizations (NGOs). This paper reviews ecological, legal, management issues and progress surrounding introduction of fish sanctuaries. Funding, enforcement of these areas, and the introduction of new sanctuaries are some of the challenges presently facing managers. It is our view that the successful introduction of these sanctuaries was a major positive step in promoting sustainable fisheries management in Jamaica.

Fish sanctuaries are now widely accepted as a valuable fisheries management tool that, once properly managed, can enhance fisheries resources in areas so designated. They achieved this by providing a refuge for fish and other living resources, thus slowly increasing productivity and catches in and around neighbouring fishing grounds (Edgar & Barrett 1999, McLanahan et al. 1999, Cowley et al. 2002, Fisheries Division, 2008).

This increase in survival results in a phenomenon known as the "spillover effect" where protected fishes attain maturity and spawn, allowing some young fishes within the sanctuary to migrate outwards into adjacent fished areas slowly increasing stocks and catches in those areas (Di Lorenzo et al., 2016). Records of benefits of marine protected areas have been found in various geographic areas worldwide, including South Africa (Cowley et al. 2002), the Philippines (Maliao et al. 2004), Florida and the Bahamas (Chiappone et al. 2000) and New Zealand (Willis et al 2003), where numbers, biomass and mean sizes of fishable resources within fish sanctuaries were reported to be significantly higher than in adjacent fished zones. One Caribbean study of reserves (Roberts et al., 2001) in Soufriere National Reserve, St. Lucia in the eastern Caribbean reported that five years after sanctuary implementation there were increased catches by fishers of between 46 and 90% as a direct result of the introduction of the sanctuary.

In Bangladesh, Ul Haque (2013) demonstrated that fish sanctuaries in coastal wetlands produced benefits in fish biodiversity as well as to local livelihoods. Similarly, Bruno et al., (2018) found that fish stocks and earnings to coastal communities increased impressively due to the presence of fish sanctuaries around the United States. In Jamaica we suggest that the fish sanctuaries have slightly improved the status of reef fisheries.

2. DEVELOPMENT OF FISH SANCTUARIES

Jamaica had an unenviable record of high coastal fishing effort and has been considered overfished since the early 1980s (Munro 1983, Aiken and Haughton, 1987, Haughton, 1988, and Aiken 1993). This overfishing resulted in losses of species composition and biodiversity. The top carnivores such as snappers, groupers, and jacks were largely replaced by lower-valued herbivorous fishes such as parrotfishes and surgeon fishes. In a database on the biology and population dynamics of Jamaica's fishable stocks, which made the first overall deductions on stock status, Munro (1983) was the first to mention introducing fishery reserves. He stated that Jamaica's fisheries would benefit from the introduction of such areas. However, although the reports and recommendation of Munro and his colleagues were well received by the Government in 1983, no reserves were introduced. A review of the status of fisheries of Pedro Bank and south shelf fisheries was made in the early 1980s (Hartsuijker and Nicholson, 1983). It confirmed their poor status but still no reserves were introduced. The first basic fisheries management plan by Aiken and Haughton (1987) set out a number of coastal areas around the island for consideration as fishery reserves. Still, no network of reserves was set aside. In 2003, a Fisheries Advisory Council was created but its activities ceased before any sanctuaries were recommended.

In 2008, the Ministry of Agriculture & Fisheries created a Fisheries Advisory Board which had, as part of its mandate, the introduction of fish sanctuaries. The policy was to use them as enhancement tools. A sub-committee was given the responsibility to examine data and to closely collaborate with the then Fisheries Division to create the sanctuaries. This step was a key decision in our opinion. A number of coastal areas were assessed and the process for their introduction initiated. It is important to record that historically, two small "paper" sanctuaries existed before the ones currently the subject of this paper, and were:

i) Bogue Island Lagoon, St. James, near Montego Bay (introduced in cooperation with the Natural Resources Conservation Department in 1972), and,

ii) Bowden Harbour, St. Thomas (introduced for oyster culture purposes around 1979).

These two areas were never properly enforced over the years and were not run by NGOs.

3. SELECTION OF FISH SANCTUARIES

The criteria used for the assessment and designation of coastal areas for the newer sanctuaries were as follows:

1. Should possess healthy and relatively undamaged coral reefs, which in turn,
2. Have relatively moderate to large numbers of coral reef fish and associated species present on a permanent basis (i.e. all times of the calendar year),
3. Should ideally be associated with adjoining healthy mangrove growth (not an absolute requirement in all cases),
4. Be relatively unpolluted (free from industrial or agricultural chemicals and/or large amounts of suspended matter from terrestrial run-off, or proximity to landfills),
5. Should not be surrounded by substantial human habitation or physical development in close proximity,
6. Ideally, be associated with at least one functioning Non-Government Organizations (NGO) which will operate the sanctuary and enforce the regulations protecting it (this may be

considered on an individual basis),
7. Should not be an area where the designation of the area as a fish sanctuary will cause massive and irreparable displacement of large numbers of fishers (who have no alternative location or fishing grounds to turn to),
8. Should have significant conservation support for the adjoining fisher community, and
9. Should have a minimum area of 10 km^2 (estimate modifiable).

Though there was some flexibility in criteria, all candidate marine areas were surveyed by technical experts led by the NFA prior to declaration, then assessed by the Sanctuaries sub-committee, chaired by the first author. If approved, gazetting (printing in government document) followed and finally declaration, after the requisite due diligence checks.

4. MANAGEMENT

Initially, eight areas were considered but this grew in number to 10 by 2010 and to 18 by 2023. Once ecological criteria were satisfied, ground-truthing of boundaries was done by the NFA. Legislation setting out the description comprising what was termed the Fish Sanctuary Order was then drafted for approval by the Chief Parliamentary Counsel's Office. This approval however, could take several months. One of the key steps for the management of the new fish sanctuaries was the identification of stakeholder interest and the presence of an organized stakeholder group including fishers among its members. The Fisheries Division would then enter into a formal agreement (Memorandum of Understanding or MOU) with each group for the management of the fish sanctuary prior to the disbursement of start-up funds. Most of the due diligence was done by the staff of the NFA. The role of NGOs is not to be underestimated as these were a key requirement in setting up and approval of each sanctuary. NGO-support was critical for success as responsibility for operation was theirs. Before any handover of start-up funds by the NFA, NGO attendance was compulsory at a series of training workshops for administrative and enforcement staff organized by the Fisheries Division (now NFA). Other details are contained in a review paper by Aiken et al.,(2012) on the introduction of fish sanctuaries. During the lionfish invasion period starting around 2007, the terminology of fish sanctuaries was altered to Special Fishery Conservation Area (SFCA) to allow spearfishing only for lionfish to exterminate them or significantly reduce their numbers. Though the peak of the lionfish invasion has now passed, this term for sanctuaries remains.

5. IMPLEMENTATION

A total of 18 sanctuaries are now in place in 2023. A list of these and the groups operating them, and their size in hectares, is provided in Table 1 (modified from the Fisheries Division, Jamaica website). For historical perspective, the older "paper" fish sanctuaries are included in the table.

TABLE 1. Fish Sanctuaries in Jamaica in 2023 indicating operator(s) & relative size (Ha)

Names of Declared Fish Sanctuaries	Parish/ Regions	Year Declared	Managed by	Approximate sizes (Ha)
Three Bays Fish Sanctuary	Hellshire, St. Catherine	July 28, 2009	C_CAM Foundation	1211.002
Galleon Harbour Fish Sanctuary	Old Harbour, St Catherine	July 28, 2009	C-CAM Foundation	1668.965
Salt Harbour Fish Sanctuary	Salt River, Clarendon	July 28, 2009	C-CAM Foundation	1031.983
Galleon Fish Sanctuary	Crawford, St Elizabeth	July 28, 2009	Breds Foundation	253.236
Bluefields Bay Fish Sanctuary	Belmont, Westmoreland	July 28, 2009	Bluefields Bay Fishermans Friendly Society	1359.409
Orange Bay Fish Sanctuary (NEPT)	Orange Bay, Hanover	July 28, 2009	Negril Area Environmental Protection Trust	535.514
Montego Bay Marine Park Fish Sanctuary	Airport Point, Montego Bay, St James	July 31, 2009	Montego Bay Marine Park Trust (MBMPT)	302.796
Discovery Bay Fish Sanctuary	Discovery Bay, St Ann	July 28, 2009	Alloa Fisherman's Cooperative	168.385
Sandals Boscobel Fish Sanctuary	Boscobel, St Mary	Feb 23, 2010	Sandals Foundation Foundation/	
Oracabessa Bay Fish Sanctuary	Oracabessa Bay, St Mary	Feb 23, 2010	Oracabessa Bay fisherman's Group	
East Portland Fish sanctuary	East Portland	2016	Alligator Head Foundation	
White River Fish Sanctuary	White River St. Ann	2016	White River Trust	

Names of Declared Fish Sanctuaries	Parish/ Regions	Year Declared	Managed by	Approximate sizes (Ha)
South Cay (Bird Cay)	Pedro Cay, Pedro Bank	2016	C-CAM Foundation	
Ocho Rios Fish Sanctuary	Ocho Rios, St. Ann	2016	Jamaican Inn Foundation	
Bowden Harbour Fish Sanctuary	Bowden, St Thomas	May 13, 1986	National Fisheries Authority	
Bogue Island Lagoon Fish Sanctuary	Bogue, St. James	July 25, 1979	Montego Bay Marine Park Trust	

Significantly, one Private Sector group, the Sandals Hotels Foundation, introduced a series of very small fish sanctuaries in front of their hotels in St. Mary on the northern coast. This private group worked closely with the sanctuaries sub-committee from the early stages 2008-2010. A second private sector group is the White River Trust, St. Ann which operates the White River Fish Sanctuary since 2016. Another group is the Jamaican Inn hotel which operated the Ocho Rio sanctuary since 2016. The importance of Government support is not to be underestimated. We opine that it was the interest and encouragement of the then Minister of Agriculture & Fisheries, Dr. C. Tufton, who in 2008 first demonstrated serious interest in & support for fisheries management matters at the policy level that made fish sanctuaries finally become reality. Subsequent ministers with fisheries responsibility have followed in his footsteps.

6. SANCTUARY NETWORK

In 2023 there is a network of small fish sanctuaries around Jamaica. These are distributed around the entire island as shown in Figure 1. Note especially the small offshore sanctuary on Pedro Bank to the south of Jamaica.

A typical fish sanctuary in Jamaica is thus often comprised of: 1. Mangroves, 2. Seagrass beds, 3. Coral reefs, 4. Sandy/muddy areas near to shore, and 5. fishable populations of various marine species. Such a sanctuary is illustrated in Figure 2, which follows. The zone shown is from a study carried out by MGI Blue Mona Geoinformatics (a GIS group at the University of the West Indies, Mona Campus). This shows that mangroves, seagrass beds, coral reefs sandy areas and where various fishable resources exist are included in the fish sanctuary. An effort was made to include as many of these areas as possible in each sanctuary.

Figure 1. Map of Jamaica with fish sanctuaries (from Jamaica Fish Sanctuaries Network)

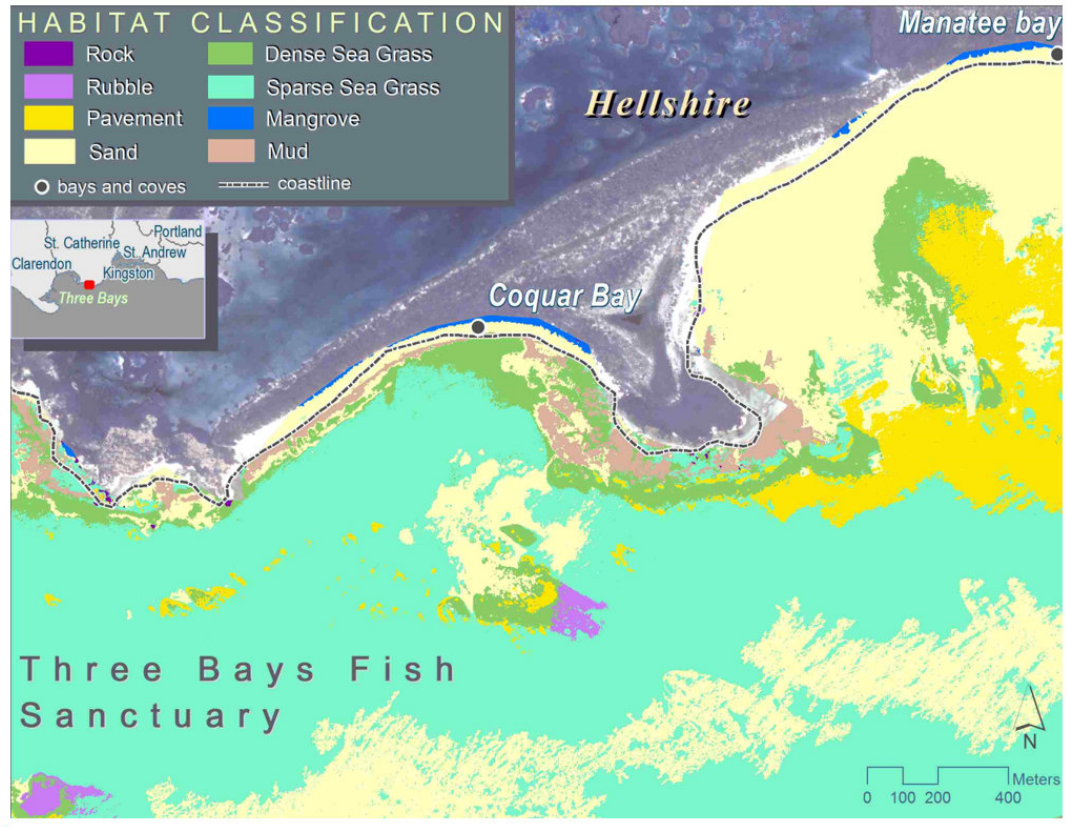

Figure 2. Three Bays Fish Sanctuary showing varied habitat types (courtesy MGI Blue, Mona Geoinformatics)

This sanctuary (Three Bays) is the eastern part of the largest coastal bay in Jamaica which earlier studies had shown was a giant fish nursery (Aiken et al. 2002). This entire area, called Old Harbour Bay (central south coast) was found by these researchers to be an area of high marine biodiversity and possessed four types of critical habitats:

i) Coastal mangrove lagoons,
ii) Red mangrove prop root - seagrass complexes
iii) Sea grass beds, and
iv) Wetland drainage - sea grass bed interfaces.

A total of 58% of all 92 fish species found in Old Harbour Bay (also called Portland Bight) were commercial species (Aiken et al., 2002). The establishment of fish sanctuaries there was therefore of high importance. The island's largest fish landing site (Old Harbour Bay beach lands 33% of all national catches) is located on the northern edge of this area.

7. ANALYSIS & EVALUATION

Jamaica finally joined the rest of the Caribbean and the world, in 2009/2010 by establishing a network of small fish sanctuaries run by ENGOs around the island. This took place some 26 years after the initial fish sanctuary proposals by Munro. In 2023, were a total of 18 fish sanctuaries. There are perhaps several lessons that could be gleaned from the experiences during the aforementioned period. We summarize these in Tables 2 and 3.

TABLE 2. Problems encountered in introduction of fish sanctuaries.

DIFFICULTY	CONSEQUENCE	SOLUTION
Chief Parliamentary Counsel (CPC0) Office drafting legislation	Protracted delays in implementation, repeated re-drafting	Closer collaboration with CPC Office
Transport for ground-truthing boundaries	Delays in implementation	Increased sanctuary funding for National Fisheries Authority (NFA)
Intra-NGO difficulties (rare)	Delay in MOA signing & funding	Harmony within NGO
Continuity funding for sanctuaries after start-up	Continuity problems and Stalling	Increased dedicated sanctuary funding for NFA
Insufficient NGOs for support of new sanctuaries	Slow increase in new fish sanctuaries	Encouragement of new NGO formation

TABLE 3. Observations on implementation of fish sanctuaries.

ACTIVITY	COMMENTS
Non-implementation of 1980s plan for fish sanctuaries	Lack of political will
Positive change in Government attitude towards fish sanctuaries since 2008	Further declines in catches, pressure from fishers
Location of new fish Sanctuaries	Key inputs from scientists and Fishers
Introduction of new sanctuaries	Lack of NGOs to support new sanctuaries
Operation of fish sanctuaries	Guarantees from NGOs under terms of Memoranda of Understanding
Final implementation of fish sanctuaries 2009/ 2010	Critical support from fisheries Minister as well as fishers and NGOs.
Assessment of the status of fishable resources and bio-physical environment within fish sanctuaries.	Continued links with the University of the West Indies, Faculty of Science & Technology, Life Sciences Dept. & Centre for Marine Sciences, Mona campus.
Drastic drop in sanctuary funding when conch industrial fishery closed 2020-2021	Conch industry was major source of funds given to sanctuaries
Sluggishness in continuity of operational funding from NFA	Administrative issues with funds from MOA to NFA

Anecdotal information has dominated the reports of significant improvements in most fish sanctuaries. Foremost among those which have undertaken scientific assessments is the Oracabessa, St. Mary sanctuary. Studies done in 2021, eleven years after establishment showed, for all species recorded, the highest distribution of individuals were recorded in the 6-10 cm size class. In the case of the commercially important species such as the parrotfish, grunts and groupers, high number of individuals were also recorded in the 11-20 cm size class. No species had individuals >21 cm in size. This indicates that the fish population within the study area was mostly comprised of the juvenile to sub-adult class ranges. (See Oracabessa Bay Fish Sanctuary Management Plan)

Observations by divers repeatedly showed that fish numbers and mean sizes had significantly increased compared with pre-sanctuary dives.

In 2016 South Cay (also called Bird Cay) was made a small fish sanctuary managed by CCAM Foundation. This tiny cay and the waters 1.0 km around it are the westernmost of three sandy cays on the south central edge of Pedro Bank. There is great need to expand the protected zone around this cay. However, there is also great need for the eastern and extreme western portions of Pedro Bank to be made into fish sanctuaries as these same areas are critical for (a) nursery recruitment value and (b) mature deep conch biomass reserve (spawning stock) value, respectively.

If we examine some of the major developments since the 2012 paper by Aiken et al., what do we observe? Six new fish sanctuaries have been introduced. Significantly, one of them was an

offshore sanctuary introduced at South Cay, a small offshore part of the Pedro Cays on southern Pedro Bank some 160 km southwest of Kingston. This is considered important for it establishes a small foothold for conservation efforts on Jamaica's largest fishing ground

With the slow decline of Jamaica's live coral cover since around 1980, one of the activities undertaken in several sanctuaries is coral restoration by the outplanting of coral stubs. Table 4 lists some of the outputs of those sanctuaries Data are from the National Fisheries Authority.

Table 4. Coral restoration outplanting by selected fish sanctuaries in 2022 (NFA data)

Fish Sanctuary	Annual output (outplantings/yr.)
East Portland	1,500
Oracabessa Bay	6,000
Sandals Boscobel	4,000
White River	4,000
Sandals Whitehouse	4,000
TOTAL	19,500

So, have the sanctuaries been successful in increasing fishes? We support the view that they are successful in this objective. Table 5 shows recent data (from the NFA) which suggest this is correct.

Table 5. Changes in fish biomass in C-Fish-supported sanctuaries (using CLIF Methodology & AGRR data from TNC). Data from NFA

Sanctuary	Changes in fish biomass Outside (%)	Change in fish biomass Inside (%)
Oracabessa	850	140
Sandals Boscobel	57	313
Bluefields Bay	255	242
Galleon Bay, St. Elizabeth	65	37
Galleon Harbour (St. Catherine)	-68	12

8. THE FUTURE

The most difficult of the sanctuary site selection criteria to satisfy is the presence of a supportive NGO to operate the future sanctuary. The overall final objective is to have approximately 30% of Jamaica's coastline set aside as fish sanctuaries and other types of marine protected areas (MPAs), in keeping with the policy of many other coastal nations around the world. This will add to Jamaica's resilience in the increasingly difficult situation worldwide with Climate Change, especially as it affects fishable resources and their sustainability.

9. SUMMARY

Nearly 40 years after the very first suggestions were proposed, a network of 18 NGO-supported fish sanctuaries were in place in 2023 after the very first real ones were introduced in 2009/2010 by the Jamaican government. The sanctuaries are scattered around the entire island. Though there were some snags in organizing their introduction, this paper suggests that it was a major first step in advancing the sustainable management of the fishable resources of Jamaica. Several additional ones are planned. It is our opinion that major factors in finally achieving the sanctuary network introduction, were firstly, the support from the then Agriculture & Fisheries Minister, Dr. Christopher Tufton, secondly, poor and declining reef fisheries production, then growing fisherfolk demand for these sites as well as creation of environmental NGOs to operate the sanctuaries. All 18 sanctuaries are up and running, though not without some occasional administrative snags. It is hoped that the momentum previously attained will be maintained indefinitely into the future as we head towards the goal of 30% of our coastal zone in some variant of Marine Protected Area including fish sanctuaries.

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