CONTRIBUTION 6.1

Historical Local and Traditional Knowledge and Key Messages for Present-Day Holistic Fisheries Management – An Example from Haiti

Susan Singh-Renton[1], Wilner Romain[2], Sherry Constantine,[3] and Bruce Lauckner[4]

PO Box 10, Layou, St. Vincent and the Grenadines. Tel: +1784 533 7621, Email: singhrenton@hotmail.com[1]
49, Rue Palestine, Delmas 75, Haiti. Tel: +509 3403 8455, Email: wromain2002@yahoo.fr[2]
Monier, Gros-Islet, Saint Lucia, Tel: +1758 484 2655 Email: sherryconstantine@gmail.com [3]
44 White Drive, Five Rivers, Arouca, Trinidad and Tobago. Tel: +1868 642 4129 / +1868 221 6654 Cell/WhatsApp: +1868 707 1660. Email: brucelauckner@live.com[4]

Abstract

A sample-based fisher interview survey throughout Haiti during 2002-04 provides comprehensive characterisation of Haiti's marine capture fisheries sector, information about fisheries performance and fishers' views/perceptions about management needs. The major resource types targeted by fishers were: reef fish (95%), small coastal pelagics (81%), lobster (43%), large pelagics (28%), and conch (27%). These target species also had good catch value. Over 88% of fishers fished to feed their families and targeted several resource types opportunistically. Catches were destined mainly for local use, although lobster was identified as a priority species for export. Decreases over time were reported for catch amount, catch size caught, and numbers caught for the main resource types. This was mainly due to heavy fishing, as well as adverse weather and environmental conditions.

Fishers were knowledgeable and logical-minded, noting the importance of controlling fish sizes harvested, introducing closed seasons, and protecting spawning areas. The harvest and post-harvest practices provide insight about social resilience capacity of community level arrangements, which should continue to play a role in present-day initiatives for post-COVID recovery and the blue economy. Fishers expressed strong confidence in their capacity for conflict resolution and for supporting sustainable development of the industry, via: strengthening of fisher cooperation; cooperation with industry managers with regard to fisher education, innovation ideas; and improved industry controls. This provides a strong incentive for advancing a community/ co-management approach to fisheries management, especially considering Haiti's extensive coastline and numerous coastal fishing communities. The co-management approach is encouraged also as a medium for preparing the coastal fishing communities to cope with the impacts of climate change.

KEYWORDS: Haiti, fisheries survey, local and traditional knowledge, fisheries management, catch and effort.

CITATION: Singh-Renton, S., W. Romain, S. Constantine And B. Lauckner, 2026. Historical Local and Traditional Knowledge and Key Messages for Present-Day Holistic Fisheries Management – An Example from Haiti. Contribution 6.1, p385-397 *IN* CRFM, 2026. Volume I: Technical Papers. Presented at the CRFM 20th Anniversary Scientific Conference, 28-31 August 2023. CRFM Special Publication No. 37, CRFM Secretariat https://www.crfm.int/index.php?option=com_k2&view=item&id=931

1. INTRODUCTION

Small-scale fisheries (SSF), which typically apply 'hunter-gatherer' strategies, largely owe their long-standing success to application of local knowledge (LK) and traditional knowledge (TK). FAO (2005a) noted that LK is a fundamental component of a country's knowledge system and a product of learned and evolving livelihood skills and experiences. LK is closely related to TK, the latter being formally recognised as the body of information and understanding supporting established traditional practices. LK and TK integrate environmental, ecological, social, cultural and economic considerations. Such knowledge is therefore very valuable for informing the Ecosystem Approach to Fisheries (EAF), as well as the overall Sustainable Livelihoods Approach (SLA) goal of poverty eradication (Batia, 2003).

Considering the multi-faceted role of fisheries, FAO's Code of Conduct for Responsible Fisheries (CCRF) (FAO, 1995) includes provisions for investigating and documenting fisheries TK; for its use in decision-making, alongside the 'best scientific evidence available'; and consideration of social, economic and environmental information. As LK/TK often include social, cultural and economic perspectives that reflect local and community interests and traditional practices, LK/TK forms a key component of the overall Institutional Knowledge used for supporting successful implementation of the CCRF (Webster and Collins, 2005). In addition, LK can be valuable for validating conventional scientific knowledge and filling knowledge gaps. In view of this, a systematic approach to LK/TK incorporation in fisheries research and management systems is recommended (FAO, 2001; Webster and Collins, 2005).

In the absence of formal documentation, there is a danger of loss of LK/TK (FAO, 2004), and its attendant wisdom for guiding 'local' social and economic resilience during periods of natural, social and/or economic instability. This is particularly important in view of the emergence of globalisation, which has promoted global uniformity of technologies, standards and practices at the expense of discard and subsequent loss of LK/TK and its capacity for rendering local resilience. For example, when global markets and trade in perishable goods were disrupted during the COVID-19 pandemic, LK/TK and its marketing platforms provided essential resilience for the fisheries sector in the Western Central Atlantic region, especially small-scale operators who were able to adjust their strategies more quickly to cope with the disruption than larger-scale operations dependent on imported raw materials, as well as external marketing and trade arrangements (Singh-Renton, 2022). In another example, following extensive damage to Grenada by Hurricane Ivan in 2004, the small-scale fishers were among the first to resume commercial activities and contribute a valuable source of fresh protein to the local population. The available LK/TK capital enabled the small-scale fishers to use local resources, skills, and customary practices to support rapid recovery from disaster (Grenada Fisheries Division staff, pers. comm.).

Considering the case of Haiti, LK/TK has been a major strength for community networks to sustain fisheries economic activities, especially for the rural poor, through recurring periods of natural disasters and political instability throughout the country's history (Schwartz, 2012; World Bank, 2022). Classified as a fragile state, Haiti is characterised by poor governance and institutional weaknesses that have contributed to widespread poverty and inequality, and which have stifled social and economic development (World Bank, 2006). In 2020, Haiti's national poverty rate was estimated to be close to 60% (World Bank, 2022). An estimated 41% of the population was multidimensionally poor, i.e. not having access to good health, education and living standards. Moreover, this figure was higher in rural areas (58%-2016 estimate) where most fisheries households are located (World, Bank 2022).

In the fisheries sector, severe limitation of human and financial resources has stymied development of a system for routine collection and management of data to inform responsible

fisheries management (MARNDR, 2010). A National Programme for Development of the Fisheries Sector (MARNDR, 2010) acknowledged the need for a multi-pronged approach to address four main areas of weakness: institutional framework and arrangements, social and economic development, marketing, and fisheries management. MARNDR (2010) also emphasized the need for improving management of the artisanal fisheries in a manner that would guarantee equitable distribution, among rural communities, of the anticipated benefits of economic growth and wealth creation.

In this paper, we consider the special status of the artisanal fisheries for development in Haiti, the recognition of the capacity of community networks and civil society to support resilience during times of shock and crisis, and the need to improve institutional strength. The national sample-based fisher interview survey of 2002-2004 yields time-specific LK/TK about the characteristics and performance of the Haiti's capture fisheries sector, management needs, and fishers' perspectives about the future. This compiled historical LK/TK expands the available Institutional Knowledge for Haiti's capture fisheries sector. We consider it alongside changes in Haiti's fisheries management environment since 2004, and present recommendations for addressing current interests and challenges, particularly post-COVID recovery, the blue economy, and climate change. Such challenges highlight the urgency to protect and reinforce the role and contribution of the fisheries sector to food and nutrition security and to overall social and economic stability.

2. METHODS

A national sample-based fisher interview survey was conducted in Haiti during 2002-2004 to gather LK/TK on: characteristics of fishing and sales operations, including fishing effort and catches; the industry's management; and future development needs. The field team of interviewers comprised seven technical staff of the Fisheries and Aquaculture Division in Haiti, who were fluent in Haitian Creole, and who had been trained for the purpose. Efforts were made to conduct proportional sampling of fishing communities throughout Haiti (Figure 1). To promote more active and honest participation by fishers, the interviewer first met with the head of each fisher cooperative to explain the rationale and purpose of the survey, and to obtain support for effective fisher engagement.

The interview survey form consisted of three parts. Part I included questions to inform compilation of a list of fishers at each site, and to gather information about: types of fishing done by each named fisher, and means of access to the fishing grounds. Part II included questions aimed at gathering general information on: the fisher interviewed and vessel owner (e.g., age, education, experience); vessel and gear specifications; fishing practices; fish handling at sea and post-harvest arrangements. Fishers' perspectives on conflict management and compliance with regulations were also sought. Part III focused on gathering information and views about: trends in catch, effort, fishing trips, and the use of fishing grounds; catch value, sales arrangements, and catch usage; as well as control and compliance practices. Fisher interviews were conducted at 206 sites distributed among 65 parish locations throughout Haiti (Figure 1). A total of 8065 fishers from 41 parish locations participated in Part I of the survey. A total of 2243 fishers from 65 parish locations participated in Parts II and III of the survey. Parts II and III requested more detailed responses. In view of this, not all questions in Parts II and III were answered by every fisher interviewed, and for some questions, multiple responses were possible and were recorded. Hence, in presenting the results, the relevant number of responses (n) is indicated.

Data analyses were undertaken using Microsoft Excel, SPSS version 11, and R software for statistical computing and graphics. For the present paper, descriptive analyses were completed

for demographic data, characteristics of harvest practices, and trends in fishing (catch) performance. Fisher views on conflict, and management compliance and controls were also examined and summarised.

Figure 1. Chart of Haiti, showing locations of 65 parish locations investigated during the 2002-04 national fisher interview survey.

3. RESULTS

3.1 Demographics and Description of Fisheries

Demographics - At the time of the study, nearly all fishers were male (99.7%, n=2243) and usually both boat owners and captains of fishing vessels (74.1%). Only 5% (n=2241) had received education up to the high school level, and as much as 35% never went to school. Fishers' age ranged from 15 to 84 years (n=2243), with the most common reported (modal) age being 35 years. On average, fishers had 22 years of active experience. When asked about their main reasons for working as fishers, 27% (n=2214) indicated that profit was important, 89% (n=2215) fished to feed their families, and 28% (n=2215) acknowledged that no other jobs were available. Only 97 fishers indicated that they did other jobs of which farming (55%, n=97) and carpentry (12%) were the most important ones. These other jobs were reportedly done every day by 70% of those concerned, and mainly to earn extra money (75%, n=97).

Fishing gear and effort - Those who owned boats usually worked as the captain for their fishing vessels (74%, n=2232). Fisher and vessel registrations were virtually nil (99%, n=2238 & 99%, n=2196 respectively). Vessels were usually wooden canoes or sailboats (97%, n= 2198), and averaged 12.7 m in overall length. In 91% of cases (n=2184), vessels were powered by sails or oars. On average, fishing trips were eight hours in duration (n=2189). Fishers usually carried out six trips per week (n=2235) and an average of 24 trips per month (n=2236). A fair percentage of fishers (85%, n=2219) fished also at weekends, mainly on Saturdays. Fishers generally did not use advanced fishing aid technology (94%, n=861), but regularly used marks along the coast to guide their fishing trips safely, identify fishing areas, and to retrieve set gear, such as pots.

A variety of gears were used by fishers. A total of 1922 responses about the use of net gear indicated that gillnets and beach seines were the most common nets used, operated by 75% and 20% (n=1922) respectively. Gillnets averaged 550 m long by 6 m deep, with beach seines having a mean length of 600 m and mean depth of 10 m. Regarding line gear, over 70% (n= 2254) indicated use of troll lines, handlines, and bottom lines, while 23% deployed longlines. Of 945 responses concerning the use of traps, most made use of the "Z" trap (75%, n=945)), while 23% reported using special lobster traps. Of 608 responses concerning diving operations, 95% of fishers did free diving, while 4% used 'hooka' apparatus. Only 1% had access to SCUBA gear.

Catch - In Parts I and III of the survey, fishers were asked about the resource types targeted. The most frequent target resource types reported in Parts 1(n=22990) and II (n=8461) respectively of the survey were: reef fish (95% and 96%), small coastal pelagic fish (83% and 79%), lobster (42% and 44%), large pelagic fish (23% and 33%), conch (26% and 28%), octopus (3% and 27%), crab (4% and 27%), shrimp (9% and 23%), squid (0.6% and 16%), and turtle (1% and 5%) (Fig. 2a). Most frequently, fishers identified up to three target resource types (Fig. 2b).

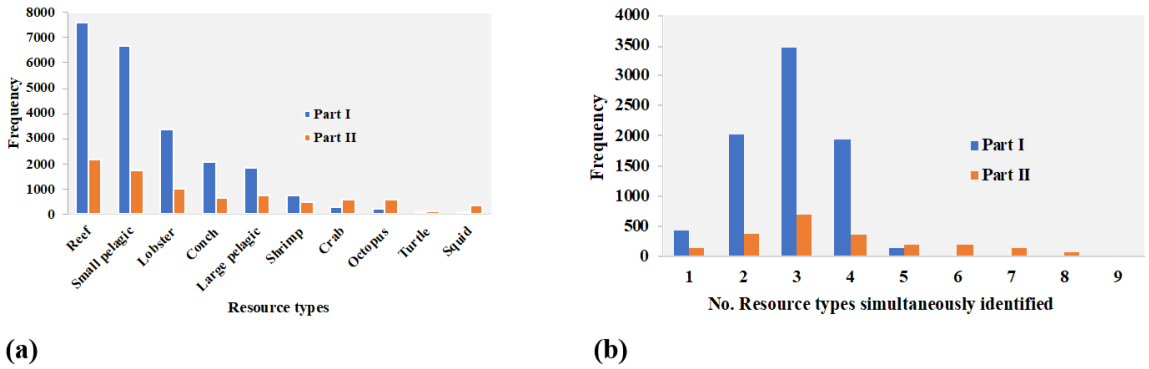

Figure 2. Histograms of (a) frequency of identifications of resource types targeted, and (b) frequency of number of target resource types simultaneously identified, during Parts I and II of the survey.

Part III of the survey received 10,426 species identifications for primary target resources, which spanned 85 species/ species groups. Positive catch amounts were provided in 10,147 instances. Using the catch amount data provided by species, table 1 lists, in order of response frequency (n=10,147), the top 20 target species/species groups. Many of these species were also frequently reported as the most valuable (in terms of price) species for fishers (Figure 3).

Table 1. Top 20 target species, listed in order of frequency of identification as a target species and with provision of catch amount data. Fishers used local names to identify species/ species groups.Figure 3. Species/ species groups identified most frequently by fishers as primary target

Target Species – Local Creole name (Standard English name & Scientific name or family classification)	Resource Type	Target Species – Local Creole name (Standard English name & Scientific name or family classification)	Resource Type
1. Sad/ sad roz (snapper/ red snapper, mahogany snapper – Lutjanidae)	reef	2. Ajante (lane snapper – *Lutjanus synagris*, mahogany snapper – *L. mahogoni*)	reef
3. Roma (Caribbean spiny lobster – *Panulirus argus*)	lobster	4. Karang (jacks - Carangidae)	small coastal pelagic
5. Taza (Mackerel - Scombridae)	small coastal pelagic	6. Bonite (blackfin and skipjack tunas – Scombridae)	small coastal pelagic
7. Lambi (Queen conch – *Strombus gigas*)	conch	8. Kola (yellowtail snapper -*Ocyurus chrysurus*)	reef
9. Dorad (dolphinfish – *Coryphaena hippurus*)	large pelagic	10. Vivano (blackfin snapper – *Lutjanus buccanella*)	reef
11. Babaren (goatfish-Mullidae)	reef	12. Bekin (barracuda - Sphyraenidae)	large pelagic
13. Ronn (Vermillion snapper- *Rhomboplites aurorubens*)	reef	14. Paroket (parrotfish - Scaridae)	reef
15. Soley (Glasseye snapper - *Heteropriacanthus cruentatus*)	reef	16. Me balaou (Swordfish – *Xiphias gladius*)	large pelagic
17. Melan (wahoo – *Acanthocybium solandri*)	large pelagic	18. Krevet (Shrimps)	Crustacea
19. Juif/Jwif (Red grouper – *Epinephelus morio*)	reef	20. Kapiten (Hogfish - Labridae)	reef

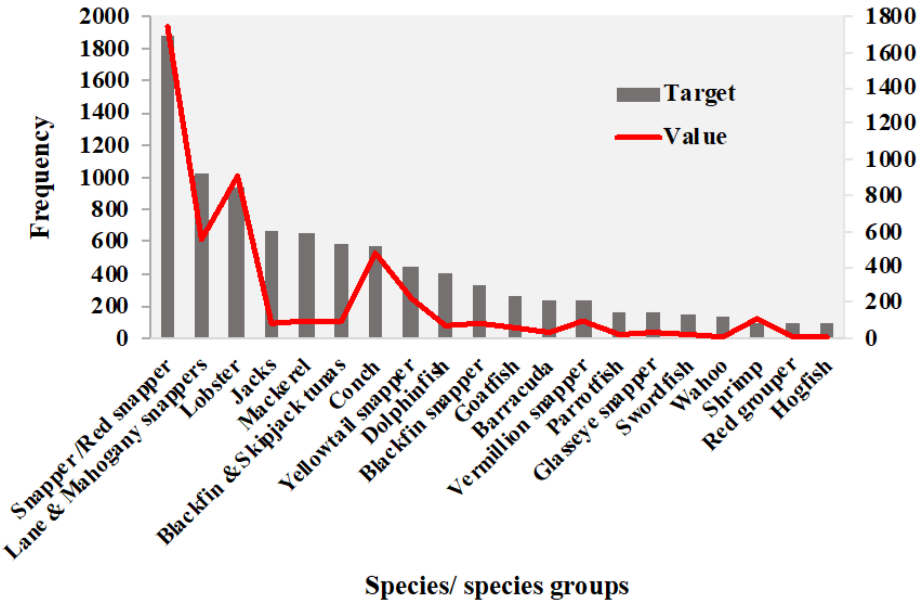

Figure 3. Species/species (histogram series) and most valuable (profitable) species (line series). The secondary y-axis provides the 'value' frequency data.

Post-harvest practices – Regarding the storage of the catch to prevent spoilage, just over 62% (n= 2048) indicated fish was simply covered, with a few fishers indicating use of palm or banana leaves. About 8% noted that fish were gutted, and under 5% used ice. The rest of fishers stored their catch in a basket or in the bottom of their boat. A small number (~2%) used water or sprinkled water over the catch at intervals to prevent spoilage.

Regarding use and distribution of the catch, 4862 responses were received concerning multiple uses of the various species/ species groups harvested. Over 91% (n=4862) noted species/ species groups for local use: snapper/ red snapper, lane and mahogany snapper, lobster, conch, and yellowtail snapper were the most frequently listed (72% of 'local use' responses). Catch retained for personal use averaged 24% (n=2872) and included many key target species, especially reef and small pelagic fishes. An estimated mean 15% (n=2859) of the unsold catch was given away. Discards of most of the fourteen desirable target resources were reported to be zero; 157 fishers reported discards of parrotfish and goatfish, averaging less than 0.5% of the unsold catch.

In the event of sale of catch, 98% of 2206 responses listed that catch sales were done shortly after arrival at the shore. A total of 4605 responses listed and ranked buyers of fish. The most common listed buyers (n=4611 responses) were market vendors (47%), the public (36%), hotels and restaurants (10.5%), and/or an agency (4.7%) presumably for onward sale. Market vendors were also most frequently ranked highest as major buyers of catch (40%, n=4605), with the second highest ranked buyer being the public (27.5%, n=4605). There were only 621 responses on catches destined for export: lobster was the most frequently identified for export (72%), with responses also indicating that on average, 72% of the lobster catch was exported. Shrimp was the second most important species/ species group exported, followed by snapper/ red snapper, and conch, each identified in less than 10% of responses (n=621): average percentages of catch exported were estimated to be 57%, 63%, and 58% respectively.

3.2 Fisheries Performance

Based on 7078 responses about fishing trips by resource type, a fishing trip averaged eight hours, with average search time and fishing time estimated at two hours and four hours respectively. Except for large pelagic fishing trips, average times were similar across the resource types (Fig. 4), perhaps reinforcing the point that fishing trips were opportunistic and searched simultaneously for multiple resource types.

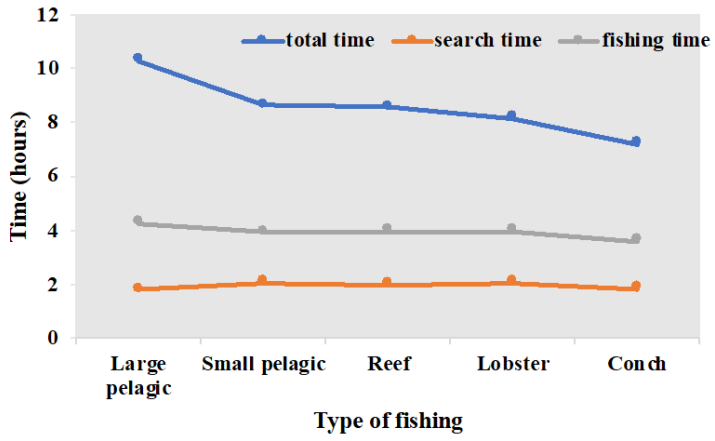

Figure 4. Average total trip time, search time and fishing time (hours) reported by fishers for the top five resource types.

In Part II of the survey, approximately 74% (n=2210) respondents indicated that they experienced a change in the amount of fish being caught, while about 49% (n=2214) reported changes in fish sizes as well. That said, 63% (n=2212) and 61% (n=2212) indicated no change in their fishing and search time respectively, and 89% (n=2202) used the same fishing areas.

In Part III, when asked specifically about changes over time in amount of catch and catch size, 96% of responses (n=4898) on catch amount and 97% of responses (n= 2942) on catch size identified decreases; in this regard, seven resource types were most frequently identified (Fig. 5). Certain resource types/ species groups were also appearing less in catches, with the highest frequencies noted for snappers (red snapper – 31% and blackfin snapper – 11%, n=1155). Common, reported reasons for observed decreases in catch amount (n=4654) and catch size (n=2782) over time were: (i) many fishers (95% & 75% respectively), (ii) adverse weather and environment conditions (4% & 5% respectively), and (iii) small sizes were regularly taken (1% and 19% respectively) (Fig. 6). Multiple explanations (n=4089) for an increase in the number of fishers using the same fishing areas were provided by 74% of 2200 fishers. These included: decreased availability of other jobs (49%), more persons taking up fishing (30%), and decreased fish availability (12%). The concerns about weather and environment conditions included: lack of rain, low sea productivity, deforestation, erosion, and pollution.

Lobster and Conch – Concerning the performance of lobster and conch fisheries, fishers expressed concern, noting decreased catch in both instances: 99% (n=985) responses for lobster, and 98% (n= 628) for conch. For both lobster and conch, over 80% reported a decrease in catch numbers, while over 70% reported a decrease in catch size. The primary reasons for the decrease in overall catch were heavy fishing (54% of lobster responses and 84% of conch responses) and harvest of under-sized animals (51% of lobster responses and 47% of conch responses).

3.3 Fisher views on industry challenges

Conflict management – Only 18% of 2226 fishers reported that conflict was a challenge, with under 2% identifying conflict with fishers from the Dominican Republic. Of these, 742 fishers explained that conflicts arose mainly due to disputes about fishing zones (61%, n=742); conflicts arose usually 1-2 times per month (84%, n=709). Theft of equipment or catch (10%), damage of equipment (9%), and financial disagreements (6%) were also reported. Fisher association and committee arrangements were considered the most important services for conflict resolution (66%, n=727). About 13% indicated that intervention by those responsible for law enforcement was required. Among 716 recommendations received for improving conflict management, 73% supported development of fisher associations and committees. The second most popular recommendation (24%) related to improved monitoring, control and surveillance, including assignment of fishing zones and effective use of the law court.

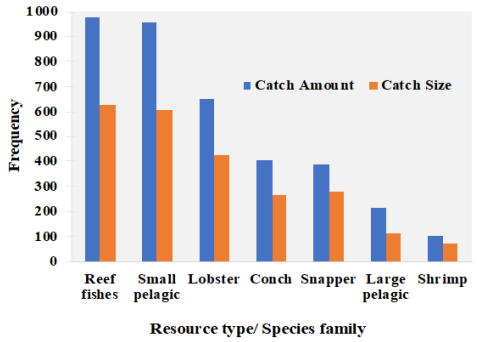

Figure 5. Frequency of the top seven resource type identifications concerning decreased catches and catch size.

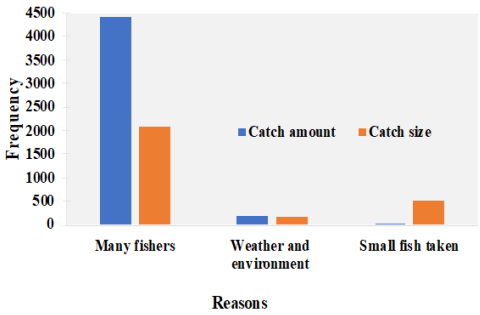

Figure 6. Reported frequency of the main reasons for decreased catch amounts and catch size (n=4654 and n=2782 for decreased catch amount and catch-at-size, respectively).

Management measures – Most fishers (89%, n=2169) believed that there were no management measures in place. Among 312 responses that noted some understanding of management measures: 43% noted fishers were not to catch lobster bearing eggs; 21% and 11% said that under-sized lobster and conch respectively were not to be caught; 17% indicated that under-sized fish were not to be harvested. Of 1772 responses about respect for management measures, 54% indicated consistent non-compliance, with another 23% indicating partial compliance ("sometimes"). In order of importance, reasons for non-compliance (n=1283) included: a lack of choice by fisher (38%); little government assistance and control (34%); lack of information (25%); and, economic problems (3%). Nearly all fishers did not think that illegal methods or substances were used (99.8%, n=2196). That noted, 98.6% (n=2180) agreed that management measures and supporting measures were needed. In order of importance, 2082 responses identified the following six practices as priority control and control support measures: closed seasons (24%); technical and financial assistance (20%); protection of young, under-sized fish, lobster and conch (18%); improved overall control by the authorities (17%); education of fishers (10%); and spawning stock protection (9%).

Almost all fishers (99%) agreed that regulations should be introduced for lobster and conch resources. To improve catches of lobster, commonly proposed control measures (n=963) were: protection of lobsters in breeding condition and creation of fishing seasons (74%); protection of under-sized, immature lobsters (31%). To improve catches of conch, commonly proposed control measures (n=598) were: protection of under-sized, immature conch (45%); creation of fishing seasons (32%); control of SCUBA (13%).

Management of future - Over 87% (n=2143) of fishers had a positive outlook about the future. To guarantee such a future, approximately 40% (n=938) proposed actions, primarily: technical, financial and information support (67%), and development of fisher cooperation/ organisations (11%),

4. DISCUSSION

In 2002-04, Haiti's capture fisheries sector primarily encompassed artisanal, opportunistic harvest operations. Fishers typically used wooden vessels, powered by sails or oars, and targeted multiple coastal marine resources, predominantly reef fishes, coastal pelagic fishes, lobster, and conch. A variety of gears facilitated the broad catch composition. Nearly all fishers were male, and close to 90% fished to feed their families. Fisher and vessel registration were

virtually nil, and hence fishers enjoyed an open access arrangement. This resulted in fishers joining the fishery with little or no education, and arguably as young as seven years old, as the mean fisher age was 35 years, with 22 years of experience on average. Post-harvest handling was minimal, with catch commonly kept covered, and sold mainly to market vendors and the public at or near landing points. On average, fishers indicated that over 90% of the catch was destined for local use, while an estimated mean of 24% was kept for personal use.

These practices clearly illustrate that in 2002-04, there was a high dependence on the harvest sector to provide food and livelihood security for Haitian males, with little or no education, and for their families. There was also a notable level of local (community/national) dependence on the harvest sector for a daily supply of fresh seafood protein. Subsequent studies in later years suggest that the characteristics of fishing and marketing operations have remained similar over time (MARNDR, 2011; IDB, 2015; FAO, 2023). These and other reports reaffirm limitations regarding capacity to exploit offshore resources, ranging from fishers' tools to seaworthiness of vessels and available fishing time for offshore trips, as well as availability of ice for maintaining product quality along the value chain (MARNDR, 2008, IDB, 2015).

Considering present-day interests in the blue economy, the contribution of coastal fisheries to national social, health and economic well-being is evident. In particular, the coastal community harvest and sales networks still play vital roles in facilitating daily fishing family subsistence needs, as well as local availability and use of freshly caught seafood. By this means, these networks directly influence food and nutrition security, livelihood security, and human health and social well-being at the community level. These benefits are wide-ranging and are linked to several globally agreed sustainable development goals (SDGs). They should therefore be formally preserved within any agreed blue economy / blue growth agenda.

More recent evidence suggested that fisheries production in Haiti supplies only about 30% of the national demand for seafood, and that post-harvest losses amount to about 40% of production due to weak infrastructure and public services (IDB, 2015). This seems to reinforce the argument to protect existing local sources of supply, and additionally, to ensure that the coastal fisheries are sustainably managed for maximum returns on their benefits. Traditional forms of preservation, such as sun-drying and smoking, did not appear to reduce post-harvest losses (Felix *et al*., 2012). Notwithstanding, Schwartz (2012) highlighted the extensive involvement of women in fish buying, processing, transport to markets, and resale. Often these women were part of the fishing households and communities, thereby safeguarding benefits at several points in the value chain. Hence, to minimize post-harvest losses while maintaining traditional skills and opportunities, consideration should be given to improving the hygiene standards of traditional forms of preservation, while also developing affordable and efficient means of cold chain management.

The seafood value chain for many of Haiti's coastal fisheries is shorter than those for internationally traded goods and has been negatively impacted by inadequate cold chain management. This noted, the benefits of the local and short value chains became obvious during the COVID-19 pandemic that caused immediate and lengthy disruptions to international trade (Singh-Renton, 2022). In view of the increased risk of future pandemics (e.g. Mariana *et al*., 2021), it makes sense to protect the local/ community seafood value chain and network, including enhancing its capacity to make use of virtual platforms for business operations. In doing so, the complementary roles of men and women in the value chain should be given equal attention.

Recognising the value of Haiti's coastal fisheries to national social and economic development, it is important to recall the concern in 2002-04 about decreasing trends in catch amount and catch size for several desirable target resources. Fishers acknowledged that these decreasing trends were due to an excess of fishers. Since 2002-04, imported gear such as gillnets were

manufactured in smaller sizes, to be more affordable to fishers, with the overall result of increased fishing effort (MARNDR, 2011). Related to this, the number of artisanal fishers increased from about 5,500 in 1980 to an estimated 50,000-52,000 by 2010, (MARNDR, 2010; FAO, 2023). A small percentage of the fishing population was involved in the offshore fishery, using more industrial methods and equipment, including fish aggregating devices (FADs) (Valles, 2016). Marine fisheries capture production, estimated at about 8000 t in 2005 (FAO, 2005b), increased to about 15000 t by 2010, with the increase attributed mostly to the introduction of FAD fishing operations (MARNDR, 2011, FAO, 2023). This suggests that fish stocks in coastal areas continued to be heavily fished and did not recover in the intervening years. Similarly, declines in catch per trip were noted by Anon (2015). Added to this, recent studies highlight the paucity of precise and updated information about fish production, fishing effort and fishing techniques applied in Haiti (FAO, 2023a; CRFM, 2020; Vendeville et al., 2022), which points to continued weak routine monitoring.

Nearly all the fishers agreed on the need for management measures. They identified several measures, such as closed seasons, protection of under-sized fish, lobster and conch, and protection of lobsters and conch in reproductive condition. Haitian fishers also called for assignment of fishing zones, which would give rural communities more ownership of their sections of coast. Many of these measures are in place for other countries today (e.g. Anon. 2013, CRFM, 2015). This noted, any regulations on catch and fishing zones would not be fully successful without establishing the most basic and powerful foundation for management control: a limited entry system in which all fishers are registered and licensed to fish. Appreciating the difficulty of removing fishers from the fishery, the limited entry system would be an investment for allowing more active management in the coming years.

To achieve effective, sustainable management, the 2002-04 fisher recommendations on fisher cooperation, education, and various forms of assistance remain relevant. Several initiatives over the years have incorporated activities aimed at strengthening fisherfolk associations and cooperation (MARNDR 2011, IDB, 2015), and assisting fishers with adopting new technologies, such as FADs. However, continued education is essential to keep pace with developments that may impact fisher livelihood security. It is possible to nurture the community-based co-management arrangement to support a level of self-regulation as well. Such a decentralised arrangement is likely to be most practical for Haiti, given its extensive coastline, and the need to use available resources efficiently. The practicality of such a decentralised approach to sector management was proposed by MARNDR (2011).

There is also the ongoing challenge of cli mate change. Climate change impacts for the Caribbean are expected to cause shifts in the distribution of living marine resources, with overall reduced species richness and overall catch amount reductions (Cheung *et al*., 2019). As a result, the entire seafood value chain will be impacted, and it will be imperative to strive for zero waste. Adaptation for food and livelihood security will be required not only of the fishers, but also the processors and consumers. In the case of Haiti, it may be best to support fisher education, cooperation and assistance through active fisherfolk associations and co-management arrangements. Community-based organisations and civil society organisations could be explored to determine their suitability as working platforms for educating and assisting other participants in the value chain, in collaboration with established national social development programmes. Social development programmes also give direct attention to social protection and poverty alleviation. The COVID-19 pandemic highlighted weaknesses in many of the Caribbean's social development/social protection programmes, particularly regarding their coverage of the informal labour force, which includes a large portion of artisanal fishery participants (Singh-Renton, 2022).

ACKNOWLEDGEMENTS

The national survey was completed as part of the Fisheries Component of the Integrated Caribbean Regional Agriculture and Fisheries Development Programme, with financial support provided by the Commission of the European Union to the Caribbean Forum. We wish to give posthumous acknowledgement of the statistical inputs of Mr. Marcus Jones, who worked with the Caribbean Agricultural Research & Development Institute (CARDI) at its headquarters, St. Augustine Campus, University of the West Indies.

LITERATURE CITED

Anon. (2013). Report of the Conch and Lobster Resource Working Group (CLWG). In *Report of Ninth Annual CRFM Scientific Meeting* – Kingstown, St. Vincent and the Grenadines, 10-14 June 2013. CRFM Fishery Report - 2013. Volume 1. p 15-19.

Anon. (2015). Haiti Programme de Developpement de la Peche Artisanale (HA-L1096). Proposition D'accord de Don. 23 pp.

Cheung, W. L., Reygondeau, G., Wabnitz, C.C.C., Tamburello, N. and Singh-Renton, S. (2019). Climate Change Effects On Caribbean Marine Ecosystems and Fisheries: Regional Projections. In *CRFM Research Paper Collection. Volume 9*. p10-97.

CRFM (2015). St. George's Declaration on Conservation, Management and Sustainable Use of the Caribbean Spiny Lobster (*Panulirus argus*). CRFM publication, Belize. 11 pp.

FAO (1995). Code of Conduct for Responsible Fisheries. Rome, FAO. 41p.

FAO (2001). Report of the third session of the Advisory Committee on Fisheries Research. Rome, 5-8 December 2000. FAO Fisheries Report. No.639. Rome, FAO. 44p.

FAO (2005a). "Building on Gender, Agrobiodiversity and Local Knowledge". Rome, FAO.

FAO (2005b). Country Profile: Haiti

FAO (2023a). Fishery and Aquaculture Country Profiles. Fisheries and Aquaculture Division. Rome. https://www.fao.org/fishery/en/collection/facp

FAO (2023b). Report of the fifth meeting of the CFMC/OSPESCA/WECAFC/CRFM/CITES Working Group on Queen conch, San Juan, Puerto Rico, 13–14 December 2021. FAO Fisheries and Aquaculture Report, No. 1403. Western Central Atlantic Fishery Commission. Barbados. https://doi.org/10.4060/cc5094en

Felix, M. (2012). Supply Chain Analysis for Fresh Seafood in Haiti. UNU FTP Publication. 22pp.

IDB (2021). Haiti. Rural Productivity and Connectivity Program with a Territorial Approach (HA-J0002; HA-G1050) Grant Proposal.

Marania, M., Katul, G.G., Pan, W.K., and Parolari, A.J, (2021). Intensity and frequency of extreme novel epidemics PNAS 2021 Vol. 118 No. 37. 4 pp. https://doi.org/10.1073/pnas.2105482118

MARNDR (2008) Programme National pour le Developpement de la Peche Maritime en Haiti. (Version Preliminaire). 71 pp.

MARNDR (2010). Programme National pour le Développement de la Pêche Maritime en Haïti 2010-2014. Ministère de L'Agriculture des Ressources Naturelles et du Développement Rural.

MARNDR (2011). Préparation d'un Programme d'Investissement Public en Faveur du Secteur de la Pêche Maritime Artisanale. Projet d'appui à la pêche maritime en Haïti (Coopération Technique Nº ATN/II-11593 HA). Rapport Final. 90 pp.

Satia, B.P. (2003). Promoting the ecosystem approach to fisheries in the context of small-scale fisheries. In [Satia, B.P.; Staples, D. (eds.) Advisory Committee on Fisheries Research. Presented at the second session of the Working Party on Small-scale Fisheries]. Bangkok, Thailand, 18–21 November.

Schwartz, T. (2012). Fishing in Haiti and the Fish Value Chain. GRC publication:Germany. 52 pp.

Singh-Renton, S. (2022). Effects of the COVID-19 pandemic on the fisheries and aquaculture sector in the region and responses for recovery. Background Paper for 18th Plenary Meeting of the Western Central Atlantic Fishery Commission (WECAFC). FAO.

alles, H. (2015). A Snapshot View of the Moored Fish Aggregating Device (FAD) Fishery in South Haiti. Proceedings of the 68th Gulf and Caribbean Fisheries Institute November 9 - 13, 2015 Panama City, Panama. p 427-435.

Vendeville, P., Celestin, W., Vallès, H. et Jean Marie, S. 2022. Les principales espèces marines d'Haïti - Leurs grands traits écologiques, biologiques et leurs intérêts pour la pêche artisanale. FAO, Circulaire sur les pêches et l'aquaculture no 1253. Rome, FAO and IRD. https://doi.org/10.4060/cc0012fr

Webster, J.G.; Collins, J. (2005). Fisheries information in developing countries. Support to the implementation of the 1995 FAO Code of Conduct for Responsible Fisheries. FAO Fisheries Circular. No. 1006. Rome, FAO. 127p.

World Bank (2006). Haiti social resilience and state fragility in Haiti. A country social analysis. World Bank Report. 114p.

World Bank (2022). Haiti systematic country diagnostic update: pathways to responding to recurrent crises and chronic fragility. 2022 Washington, DC, USA, International Bank for Reconstruction and Development / The World Bank. 52p.