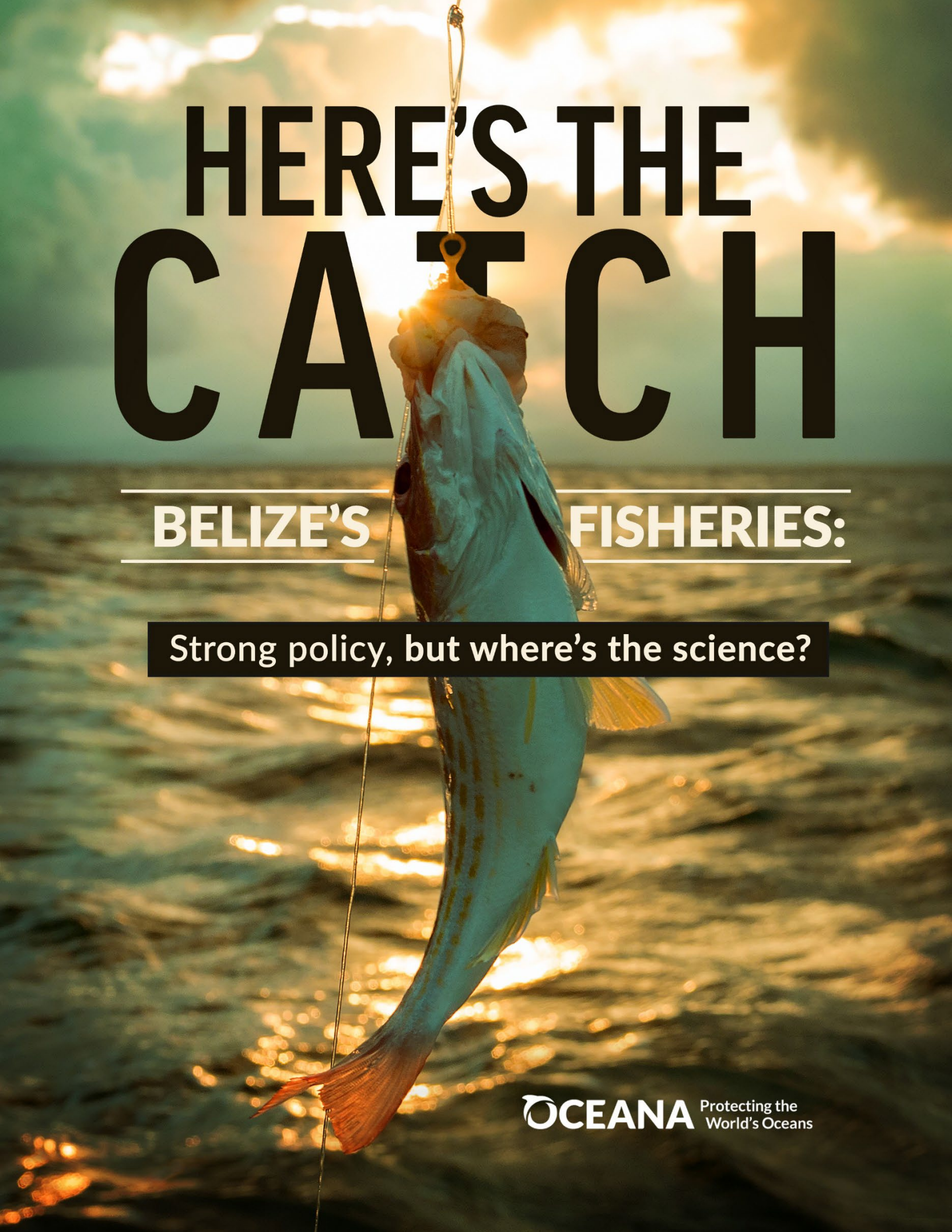
HERE'S THE
CATCH
BELIZE'S FISHERIES:
Strong policy, but where's the science?
OCEANA
Protecting the World's Oceans

Fisheries Audit Report - Belize 2021

Assessment of governance and status of stocks

Prepared for Oceana by Ocean Outcomes

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February 2022

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Acronyms

AIS	automatic identification system
AMF	adaptive management framework
B	biomass
B_0	biomass in the absence of fishing
B_{limit}	biomass limit reference point
B_{MSY}	biomass at MSY
BFC	Belize Fisheries Council
BHSFU	Belize High Seas Fisheries Unit
CITES	Convention on International Trade in Endangered Species
CPUE	catch per unit effort
EDF	Environmental Defense Fund
EBFM	Ecosystem-based fisheries management
EEZ	exclusive economic zone
F	fishing mortality level
FAO	Food and Agriculture Organization of the United Nations
FMC	Fisheries Monitoring Center
F_{MSY}	fishing mortality level at MSY
GPS	Global Positioning System
IUU	Illegal, Unregulated, and Unreported
MAP	Managed Access Program
MCS	monitoring, control and surveillance
MOU	Memorandum of Understanding
MPA	Marine protected area
MSY	maximum sustainable yield

MTU	mobile transceiver unit
NGO	non governmental organization
TAC	total allowable catch
UNCTAD	United Nations Conference on Trade and Development
VMS	vessel monitoring system
WCS	Wildlife Conservation Society

Executive summary

This is the inaugural report of the Oceana Belize Fisheries Audit, which aims to provide an evaluation of national fisheries management performance within the categories of fishery policy, transparency, and fish stock health and management. It describes scores for 22 indicators within the categories, and can serve as a baseline for continued progress tracking within those indicators. On the whole, Belize has a strong foundational policy for environmentally sustainable fisheries management embodied within the Fisheries Resources Act (2020). However, fisheries information, including landings data, do not appear to be systematically collected and reported, which hinders the ability to assess fish stocks and develop effective catch control measures. There is also a substantial need to improve transparency of decision-making processes.

Introduction

Fishing is a key activity for coastal communities in Belize, providing seafood for domestic consumption, generation of revenue for the tourism industry, and exports for specific stocks, specifically queen conch and spiny lobster. The fishing industry brings about 28 million Belizean dollars per year into the country (Statistical Institute of Belize, 2021), and Belize's fisheries employ on the order of 2,500 fishers directly and more than 15,000 Belizeans indirectly (UNCTAD 2020). However, a number of fish stocks are showing signs of decline and overexploitation, raising concerns about environmental sustainability and the effectiveness of fisheries management at maintaining these stocks upon which so many people depend, for food, culture, and livelihoods.

Since 2017, Oceana has conducted audits of fisheries management in different countries, as tools to drive best practices and public policies for sustainable fisheries. Examples include the Oceana Canada Fishery Audit and the Oceana Brasil Auditoria da Pesca. This is the first such audit for Belize that Oceana has conducted. The overarching objective for the audit is to evaluate performance of marine fisheries management at a national level, based on laws, regulations and the governance arrangements in force, based on publicly available information. Oceana's intention is to repeat this audit annually and use it as the basis for driving improvement in Belize's fisheries management.

Belize has made important strides in improving its fisheries management in recent years, as demonstrated by:

- Implementation of the Managed Access Program throughout the country and for all domestic fisheries in 2016;
- Bans on use of bottom trawls (in 2010) and gillnets (in 2020), gear types that are not very selective and have high rates of bycatch (Oceana 2010) (Government of Belize Press Office, 2020);
- Enactment of an updated national fisheries law, the Fisheries Resources Act, in 2020.

Belize also has a network of protected habitats including fourteen marine protected areas (MPAs) and thirteen protected fish spawning aggregation sites (The Commonwealth Blue Charter, 2020).

However, there is still significant work to be done within many aspects of management, as will be highlighted by this report. Especially considering the recent adoption of the Fisheries Resources Act, it is an opportune time to initiate regular assessment of the performance of the fisheries management system, to provide an independent perspective on how well management is meeting its obligations to maintain the resources on which local ecosystems and communities depend.

Methodology overview

The Belize Fisheries Audit Framework includes 22 indicators that are grouped into three categories based on affinity and the Unit of Evaluation (Table 1). These indicators were selected because they provide essential information for measuring progress towards improved fisheries governance, transparency within the management process, and maintenance of healthy fish stocks. The intent is to score these indicators annually to determine and track progress over time, highlighting areas within each category that need improvement. The indicators are scored using either a binary response (yes/no), a limited, discrete scale (yes/partial/no) or a continuous scale (as a percent). For more information on the framework, please refer to the appendix on the Belize Fishery Audit Framework.

Table 1. Audit categories and indicators.

Category and desired outcome	Indicators	Unit of Evaluation
Fisheries Policy There is robust and binding legislation underlying the legal framework for fisheries management	1.1 Long-term objectives 1.2 Obligation to maintain healthy stocks 1.3 Science-based management 1.4 Ecosystem approach to management 1.5 Defined roles and responsibilities	National fisheries laws
Transparency Decision-making processes are transparent, and fisheries information is publicly accessible	2.1 Belize Fisheries Council 2.2 Use of scientific information in management 2.3a Formal public consultations 2.3b Informal public consultations 2.4 Published estimates of production	The national fisheries management framework

	2.5a Data on registered fishers and authorized vessels operating in domestic waters 2.5b Data on authorized vessels operating outside of Belize's EEZ 2.6 Information on status of fish stocks 2.7a Tracking of domestic fishing vessels 2.7b Tracking of fishing vessels outside of Belize's EEZ	
Fish stocks Fish stocks are maintained at sustainable levels of exploitation	3.1 Stocks with known status as determined by a stock assessment 3.2 Overfished stocks 3.3 Stocks subject to overfishing 3.4 Stocks with defined catch limits 3.5 Stocks included in a fishery management plan 3.6 Stocks subject to catch effort control 3.7 Stocks whose landings are monitored	Individual fish stocks

Audit results

The audit team[1] completed the audit report in February 2022, after developing the audit methodology and indicators in December 2021. We based our findings on a combination of desktop research and interviews with five Belize fishery experts in the NGO space. In accordance with the audit methodology, supporting evidence for scores was required to be publicly available. Evidence therefore largely consisted of literature and reports available online. The team also submitted an information request to the Belize Fisheries Department to obtain information related to the indicators. Due to the condensed timeframe of the project, we were able to provide the Fisheries Department only one month to respond to the request, which they acknowledged but did not provide further response to.

These limitations undoubtedly affected our ability to provide a full picture of the efforts underway to develop and progress Belize fisheries management, particularly regarding work that is not being reported to the general public. Nonetheless, one intent for this audit is to highlight needs in terms of management transparency, and publicly verifiable information is a key component of such transparency. There is certainly opportunity for subsequent audits to incorporate additional information if it is made available.

[1] Jocelyn Drugan and Lisa Max, Ocean Outcomes

Table 2. Summary of 2021 audit scores.

Indicator	Score
Fisheries Policy	
1.1 Long-term objectives	Yes
1.2 Obligation to maintain healthy stocks	Yes
1.3 Science-based management	Yes
1.4 Ecosystem approach to management	Yes
1.5 Defined roles and responsibilities	Partial
Transparency	
2.1 Belize Fisheries Council	Partial
2.2 Use of scientific information in management	No
2.3a Formal public consultations	Partial
2.3b Informal public consultations	Partial
2.4 Published estimates of production	No
2.5a Data on registered fishers and authorized vessels operating in domestic waters	No
2.5b Data on authorized vessels operating outside of Belize's EEZ	Yes
2.6 Information on status of fish stocks	No

2.7a Tracking of domestic fishing vessels	13%
2.7b Tracking of fishing vessels outside of Belize's EEZ	100%
Fish stocks	
3.1 Stocks with known status as determined by a stock assessment	4%
3.2 Overfished stocks	0% (96% of stocks have unknown overfished status)
3.3 Stocks subject to overfishing	2% (98% of stocks have unknown overfishing status)
3.4 Stocks with defined catch limits	7%
3.5 Stocks included in a fishery management plan	0%
3.6 Stocks subject to catch effort control	7%
3.7 Stocks whose landings are monitored	2%

1. Fisheries Policy

The legal framework, usually embodied within national law(s) or policy, is the foundational pillar of a country's fisheries management system. It is important for the policy to include clear sustainability objectives, including those related to conservation and maintenance of natural resources. The legal framework also has the critical function of defining the roles and responsibilities of the different management bodies, access to fisheries resources, and the norms of monitoring, control and surveillance (MCS). A legal framework that lacks these essential elements will be less effective at supporting effective management, with serious consequences for ecosystems, fish populations, and the fisheries sector.

Unit of Evaluation

This category evaluates the national legal framework governing fisheries management. In Belize, the main legal framework is embodied in the Fisheries Resources Act No. 7 of 2020. The indicators identify the presence or absence of elements within the law that are essential for effective fisheries management, rather than the status of policy implementation, which is addressed by indicators in the other categories. This category focuses on the national level; any measures or regulations that are specific to regions within Belize, if present, are not evaluated.

The Fisheries Policy category includes five indicators. Of these indicators, four were considered met, and one was considered partially met.

1.1 Long-term objectives

This indicator evaluates whether the national fisheries law clearly states the overarching objectives for fisheries management in the country.

Score: Yes

Possible responses: Yes/No

Rationale

The main fisheries law for Belize is the Fisheries Resources Act, which was passed in 2020. This law effectively replaced the Fisheries Act (1948), Chapter 210, which had not been amended since 1989. The 1948 Fisheries Act was narrower in scope, lacking clear objectives and focused mostly on licensing and enforcement.

The primary objective of the Fisheries Resources Act is to "promote long-term conservation, management, and sustainable use of the fisheries resources of Belize." Under this overarching objective are the following principles, described in Part II of the Act:

> Fishing shall be commensurate with the sustainable use of fishery resources taking into account the impacts on non-targeted and associated or dependent species and the general obligation to protect and preserve the marine and freshwater environment;
>
> Measures and management decisions shall be based on the best information available and designed to maintain or restore stocks at levels capable of producing maximum sustainable yield, or any other approved reference points, as qualified by relevant environmental, social, and economic factors, and taking into account fishing patterns, the interdependence of stocks and species interaction;
>
> Inter-sectoral participation and broadening of stakeholder participation;
>
> Overfishing and excess fishing capacity shall be prevented or eliminated;
>
> Data on fisheries, including information relating to the ecosystems, social and economic systems in which fisheries occur, shall be collected, verified, reported and shared in a timely and appropriate manner;

Effective enforcement of, and compliance with, conservation and management measures shall be pursued to protect biodiversity;

Pollution and waste originating from fisheries operations, discards, by-catch, lost or abandoned gear and impacts on other species and marine ecosystems shall be minimized or eliminated where possible;

The welfare and livelihood of fishers and the fishing community shall be improved; and

The precautionary approach and an ecosystem approach.

Thus the current national fisheries law states clear objectives that are consistent with environmental sustainability principles. This indicator is considered met.

1.2 Obligation to maintain healthy stocks

This indicator evaluates whether the national fisheries law mandates the maintenance of fish stock health and the rebuilding of depleted stocks in general terms.

Score: Yes

Possible responses: Yes/No/Partial

Rationale

The Fisheries Resources Act (2020) states that "measures and management decisions shall be based on the best information available and designed to maintain or restore stocks at levels capable of producing maximum sustainable yield, or any other approved reference points, as qualified by relevant environmental, social, and economic factors, and taking into account fishing patterns, the interdependence of stocks and species interaction." This language is consistent with an obligation to maintain stocks at healthy levels and rebuild depleted stocks, so this indicator is considered met.

1.3 Science-based management

This indicator evaluates whether the national fisheries law requires that fisheries management be based on best available scientific information.

Score: Yes

Possible responses: Yes/No/Partial

Rationale

As described under Indicator 1.2, the Fisheries Resources Act (2020) states that "measures and management decisions shall be based on the best information available" and that "data on fisheries, including information relating to the ecosystems, social and economic systems in which fisheries occur, shall be collected, verified, reported and shared in a timely and appropriate

manner." This suggests that scientific information will be collected and used in the management process. This indicator is considered met.

1.4 Ecosystem approach to management

This indicator evaluates whether the national fisheries law mandates the government shall adopt ecosystem-based fisheries management (EBFM), a holistic approach to fisheries resource management that recognizes the importance of maintaining ecosystem functions and services. In practice, EBFM may involve ecosystem-level planning, improving understanding of ecosystem processes, prioritizing vulnerabilities and risks of ecosystems and their components, addressing trade-offs within an ecosystem, incorporating ecosystem considerations into management advice, and maintaining resilient ecosystems (National Marine Fisheries Service, 2020).

Score: Yes

Possible responses: Yes/No/Partial

Rationale

The Fisheries Resources Act (2020) states that "[a]n ecosystem approach shall be applied widely to the conservation and management of aquatic resources" (Part II (3)), meeting the requirements of this indicator. Although the law includes this explicit language, it will be important to monitor implementation to determine whether this approach is applied in practice.

1.5 Defined roles and responsibilities

This indicator evaluates whether the legal framework, with clear and binding wording, defines the agency(ies) responsible for fisheries management, and their roles in the decision-making process. Through these definitions and descriptions, the legal framework should largely describe the process for making management decisions.

Score: Partial

Possible responses: Yes/No/Partial

Rationale

The Fisheries Department is an autonomous government body within the Ministry of Blue Economy and Civil Aviation that holds the main responsibility to administer the Fisheries Resources Act (2020). The department is headed by a Minister and Fisheries Administrator. Under the Act, the Minister has the authority to declare fishery areas and marine reserves, set the number of fishing licenses that can be issued, determine requirements for fisheries management plans, and set catch restrictions such as TACs (total allowable catches) and minimum fish sizes. However, the act does not mandate the Minister to implement these actions.

Another government body relevant to fisheries management is the Belize High Seas Fisheries Unit (BHSFU) within the Ministry of Finance, which helps implement parts of the Fisheries

Resources Act, specifically those that pertain to fisheries that are operated outside of Belize's EEZ.

Part III of the Fisheries Resources Act establishes the Belize Fisheries Council (BFC) as an advisory body that advises and makes recommendations to the Minister regarding fisheries matters. As part of their responsibilities, the BFC is to develop fisheries policies, evaluate conservation guidelines and ecosystem-based management measures, and review fisheries management plans. Council members include ministry officers, representatives from fishing cooperatives and organizations, a fisheries science expert, and a representative from an NGO with conservation interests (CANARI 2021).

The website of the Belize Fisheries Department describes some of the department's responsibilities, such as: (1) data collection and analysis, (2) education and enforcement, (3) community management, (4) NGO collaboration & co-management, (5) local cooperatives & associations, and (6) regional/international programs and partners.

Although many responsibilities are described for these government departments and units, Belize also has multiple 'fisheries working groups' that play a significant advisory and management role for some specific fisheries that the Fisheries Department may not currently fill. For example, working groups may collect data and provide scientific information on specific stocks that would otherwise not be available. These groups are formed ad hoc based on stakeholder interest, and there is no formalized guidance for their formation, operations, and membership, although individual groups maintain terms of reference. These working groups generally have representation from the Fisheries Department, frequently have representation from NGOs and academia, and in some cases have representation from fishers as well. The role of these working groups is not well-defined in policy or on public websites.

Because roles and responsibilities are defined for some groups, but not well-defined for others, we determined this indicator to be partially met. In addition, the ways in which the groups and agencies interact with each other are not well defined.

2. Transparency

Fisheries management bodies must make decisions related to management of fish resources through a clear and pre-defined process. To ensure that the process is transparent and equitable, all fishery stakeholders (e.g. representatives of civil society, governmental and non-governmental organizations, the fisheries sector and their representatives, universities and research institutes, and other interested parties) should have the opportunity to participate in the process and discuss measures relating to the use and conservation of fisheries resources. Such consultations may happen via meetings or other public comment mechanisms. In addition to holding consultations, the government should describe how they considered, used or did not use stakeholder input. Stakeholder participation improves the effectiveness of measures and may help increase compliance.

Another key component of transparency is availability of information. The government should make essential information used for fisheries management (e.g. laws, regulations, landings data, and stock status) publicly available, ideally through published reports and/or on websites. This improves accountability and the ability to evaluate management performance. In addition, if stakeholders can access fisheries information, they will be better informed and able to participate in management consultations.

Unit of evaluation

This category evaluates the functioning of the country's fisheries management framework at the national level, with a focus on consultation processes, transparency of decision-making, and availability of information.

2.1 Belize Fisheries Council

Advisory groups are an important mechanism for providing oversight, review, and representation of stakeholder perspectives within the management process. The only advisory group for Belize fisheries legally designated within the Fisheries Resources Act (Part III) is the Belize Fisheries Council, which advises the Minister of the Fisheries Department on general fisheries management-related matters, covering all Belizean fisheries. For individual fisheries, the minister, in consultation with the BFC, may determine the TAC, whether a management plan is required, whether a fishery (or area or exploitation of a specific stock) should be closed, or if a fishery should engage in co-management. This indicator evaluates whether the BFC is functioning as legally mandated. If functioning properly, the BFC should meet regularly, include diverse representation from different interest groups, and report on its activities and decisions.

Score: Partial

Possible responses: Yes/No/Partial

Rationale

The BFC was inaugurated in July 2021, and there is evidence that they have held at least one meeting (San Pedro Sun, 2021). The audit team did not find publicly posted meeting minutes, agendas, or other reports describing details about the meeting and its outcomes. There is limited documentation describing the BFC's current activities and role in management, perhaps in part because they were established only recently. For example, the BFC has been tasked with reviewing the draft management plan for the multispecific finfish fishery (UNCTAD, 2021).

Because the BFC has been convened, but there appears to be limited public reporting on its meetings and activities thus far, this indicator is considered partially met.

Although not strictly within the scope of evaluation for this indicator, Belize has other groups involved in fisheries management processes, such as fisheries working groups and Managed Access Program (MAP) fishing committees. These groups serve roles in fisheries data collection and provision of management advice, though not necessarily in formalized ways.

The fisheries working groups focus on the management of specific species or areas (e.g. marine reserves); examples include lionfish, conch, lobster, coral-focused, and lionfish working groups. These groups typically include representation from the Fisheries Department and non-governmental stakeholders, such as NGOs and the University of Belize. However, there is limited public information about structure and requirements for these groups, and they do not appear to operate on a formalized basis.

The MAP is a rights-based fisheries management framework that was rolled out to the entire fishing sector in 2016 (Fujita et al., 2017). Under the MAP, territorial waters in Belize are separated into nine zones; each commercial fisher chooses two zones (of Zones 1-8) to access for fishing, and all fishers have access to Zone 9. To qualify for access, fishers must (a) hold a commercial fishing license; (b) be a Belizean resident; and (c) have a traditional history of using the fishing ground and landing catches in Belize. As part of the MAP, managed access (MA) committees, which include elected fisher representatives, were established for each zone to make recommendations on individuals qualified to receive fishing licenses. The MA committees do not currently appear to have other formal responsibilities, although there is some consideration of having these committees taking on more formal management responsibilities in the future.

2.2 Use of scientific information in management

Transparent, responsive, and resilient management processes are based on scientific information. This indicator evaluates whether there is evidence of scientific information being regularly collected and used to make management decisions.

To to be consistent with good practices, scientific information should be incorporated into management as follows:

- There are ongoing fisheries data collection and research programs led, supported, and/or recognized by the government;
- Decision-makers respond to serious issues identified in relevant research and monitoring;
- The government makes scientific information (that it collects or that co-management entities collect) available, through public sharing or on request;
- Methods used to collect scientific data are sound.

The scale and nature of monitoring and scientific research programs may vary. For example, data collection may consist of fishers reporting their landings to the government, directly or through an intermediary body such as a fishers association. Fisheries data may also be collected by fisheries working groups or academic groups. To demonstrate that scientific information is being used, the government should report how data and research findings affect the decisions they make. Regardless of which specific entities collect data, there should be sufficient description of the collection methods to determine whether the data are likely to be accurate, along with associated uncertainty and assumptions.

Score: No

Possible responses: Yes/No/Partial

Rationale

In Belize, fisheries science research can be conducted only with a license issued by the government. This restriction applied under the previous Fisheries Act and has been carried over to the Fisheries Resources Act (Part X). As part of the licensing process, the Fisheries Administrator may attach conditions to the research being proposed.

There does not appear to be a central, government-led program of fisheries research, although the Fisheries Department collects some fisheries-dependent data for conch and lobster fisheries. The department collaborates with co-management entities (e.g. those involved in fishery working groups and MA committees), fishing cooperatives, and seafood companies to collect fisheries-dependent data for a variety of species. It appears that fisheries-independent data, along with other habitats and ecosystem data, are also collected by some of the co-management entities.

As mentioned above under indicators 1.5 and 2.1, fisheries working groups often serve a data collection and research function for specific areas or species, and may provide science-based recommendations on management measures to the Fisheries Department (for example, the shark working group's recommendations resulted in banning of shark fishing within two nautical miles of Lighthouse Reef Atoll, Glover's Reef, and Turneffe Atoll) (San Pedro Sun, 2021). Within and outside of these working groups, fisheries-related research is sometimes conducted by academic groups (e.g. the Environmental Research Institute of the University of Belize) and NGOs, which may or may not function as co-management entities such as the Wildlife Conservation Society (WCS), Blue Ventures, and The Nature Conservancy (TNC). However, there is no evidence that data are collected for most stocks or fisheries as part of an ongoing monitoring program, and no current fisheries dependent or independent data were publicly accessible for this audit, or made available to the audit team prior to completion of the 2021 audit.

It is not clear whether decision-makers respond to serious issues identified in relevant research and monitoring, but there is evidence through the Fisheries Department's co-development of the adaptive management framework (AMF), which incorporates scientific research as the basis for adaptive management decisions, that science-based management is actively developing in Belize (McDonald et al., 2017).

Although the Fisheries Department has posted some reports on its website, and allows for information requests, the audit team did not receive any information in response to the request we submitted in December 2021. There are few published data for fisheries outside of those subject to external reporting requirements (i.e. conch and lobster, which are exported and subject to attention from CITES). One notable gap is the lack of landings or catch data for most species, which will be addressed more directly under Indicator 2.4. Since published research and

data are very limited, it is not possible to determine whether methods used to collect scientific data are sound.

Due to the gaps mentioned, this indicator received a 'No' score.

2.3a Formal Public consultations

To be consistent with best practices, relevant management bodies should have a defined process to solicit, receive, and consider input from public stakeholders. This indicator evaluates whether the general public has formal opportunities to provide input into management decisions, such as those relating to fishery access, harvest measures, and management plans. There should also be publicly accessible evidence that the process is being followed, such as public logs of consultations held.

Score: Partial

Possible responses: Yes/No/Partial

Rationale

While the new Fisheries Resources Act (2020) includes provisions for formal public consultations (specifically on fisheries management plans), there is limited, publicly available evidence of these consultations, justifying a score of 'Partial' for this indicator. The public was formally consulted during the drafting and approval of the Act, which went through several rounds of consultation and review sessions during the current and prior administrations before being enacted, and did take concerns raised by fisherfolk associations into account (CANARI 2021). Although this is valid public consultation, it is not clear whether formal consultations are held for other management decisions and components.

As stated in Part IV of the Fisheries Resources Act (2020), the Fisheries Administrator shall ensure consultation of stakeholders in the preparation and review of fisheries management plans. After a plan has been drafted, the Fisheries Department shall post a public notice describing the offices from which the public can obtain copies of the proposed plan. Stakeholders can then submit comments on the proposed plan between two and four months after the notice was posted.

A new finfish management plan was drafted by EDF and other stakeholders in close consultation with the Fisheries Department. The management plan development process started in 2016 and has involved informal stakeholder feedback as part of a series of workshops and other convenings, the most recent held in July 2021. While the draft plan is not available online, it appears to be under review (or may have completed review) by the BFC. Following this review there is a two month public consultation process to gather formal stakeholder feedback, as required under the Fisheries Resources Act (UNCTAD, 2021). Based on interviews conducted as part of this audit, there is evidence that formal public consultations within each of the MAP zones is underway, although there are no public consultation documents available online. At this

time, it is not possible to fully evaluate whether these mandated consultations are being held and whether their results will be considered by the BFC to inform management decisions.

While stakeholders informed the team that there are management plans for both conch and lobster that have been through formal public consultation processes, neither plan is available online, and there is no evidence from online sources that: (1) the public has played a formal role in management decisions for these species, or (2) that there were past formal public consultation processes for either fishery.

Although not strictly within the scope of fish stocks management, management of marine reserves has some relevance as it protects fish habitat in specific areas.The National Protected Areas Act (2015) mandated stakeholder and community consultation when designating or revoking protected areas (UNCTAD, 2020). Most MPAs are managed through co-management arrangements with NGOs including community-based organizations (The Commonwealth Blue Charter, 2020), which we categorize as the 'working groups' described under Indicator 2.1.

2.3b Informal Public consultations

This indicator evaluates whether the general public has informal opportunities to provide input into management decisions, such as those relating to fishery access, harvest measures and management plans. 2.3b differs from 2.3a in its focus on consultation processes that are not established through written regulations. We included this indicator because less-formalized processes appear to be important for the management of many stocks and/or fished areas in Belize. Even if not formalized, these informal consultation processes should allow for public input into decision making and serve as a mechanism for supporting co-management of marine resources.

Score: Partial

Possible responses: Yes/No/Partial

Rationale

There are avenues for informal public participation in the management process, namely under the MAP and through co-management entities.

The MAP was specifically designed to encourage greater participation of fishers as a stakeholder group in the decision making process of fisheries management. The public was consulted as part of the process to form the MA committees via a series of public meetings (San Pedro Sun, 2016). The committees, which are composed of elected representatives from fisher stakeholder groups, largely focus on recommending which individuals should receive fishing licenses in each zone, and it is unclear whether they carry out general outreach to the public, or if their role extends beyond licensing. In addition, not all of the MA committees have continued to be active, in part due to challenges convening individuals in person due to the Covid-19 pandemic.

Informal community level consultations are carried out by co-managers, such as those in fisheries working groups, via "boat-to-boat" outreach and via consultations on management plans. In "boat-to-boat" outreach, community liaisons, sometimes accompanied by Fisheries Department officers, engage with fishers about marine resource management at sea. Co-managers of marine protected areas consult with the public on the drafting of marine area-specific fisheries management plans. For example, the Turneffe Atoll Sustainability Association consulted with fishers when drafting the Turneffe Atoll Management Plan and includes fishers on the Turneffe Atoll Advisory Committee (CANARI, 2021).

It is important to highlight that while these informal consultation channels appear open for some areas or fisheries, they may not be completely effective, resulting in a score of 'Partial' for this indicator. For example, while fishers were consulted on the development of the Turneffe Atoll Management Plan, they felt their input was not influential in decision making (CANARI, 2021). Publicly available evidence of effective consultation processes for multiple fisheries working groups would also strengthen the case for a 'Yes' score.

2.4 Published estimates of production

This indicator evaluates whether there are publicly available data on annual fisheries production and landings. Such information is fundamental to fisheries governance and should be regularly reported and published.

The following should be considered when evaluating this indicator.

- Availability and accessibility of official fisheries monitoring data;
- The management bodies must regularly publish data related to national fishery production, at least annually. The data may be disseminated in a variety of formats (e.g. bulletin, report or article; on paper or shared via the internet).

The quality of the data, or the spatial or temporal coverage of the published data, are not explicitly evaluated for the purposes of this indicator. An exception would be if the data are known to be misleading or falsified.

Score: No

Possible responses: Yes/No/Partial

Rationale for scoring:

Information on national fisheries production is not publicly available online from the Fisheries Department. Prior to the nationwide implementation of the MAP, fishing cooperatives were required to collect and report catch data to the Fisheries Department. This may still be occurring, particularly on catch that is exported (namely conch and lobster). With the implementation of the MAP, each vessel captain is now required to collect and report logbook data directly to the Department. While catch data may be collected and reported, it is not disseminated to the general public outside of fishery stakeholders, justifying a score of 'No.' The

extent to which data is shared internally among fishery stakeholders and multilateral bodies is also not known.

The Food and Agriculture Organization of the United Nations (FAO) publishes species specific fisheries export and production statistics from Belize (current through 2019), which covers a limited number of species. It is unclear what percentage of total production the FAO data represent (FAO, 2021).

2.5a Data on registered fishers and authorized vessels operating in domestic waters

The Fisheries Resources Act states that the Fisheries Administrator shall keep a record of fishing vessels authorized to fish (Part XII). This indicator evaluates whether fisheries management bodies disclose or make available information regarding the Belizean fishing fleet and the number of licensed fishermen operating within Belize's EEZ, i.e. within the nine zones in the Managed Access Program.

Score: No

Possible responses: Yes/No

Rationale for scoring:

There have reportedly been some challenges confirming which fishers are fishing in which MAP zones. While each zone has a managed access committee comprised of elected stakeholders (including fishers) that is responsible for the vetting and approval of licenses within the zone, these committees appear to keep their lists of licensed fishers mostly internal. One requirement that aids transparency is that fishing boats are painted with the MAP zones to which they belong. Nonetheless, the general public cannot readily obtain a list of licensed fishers fishing in each of the MAP zones (Nembhard, 2018), and there is no published list of fishers, justifying a score of 'No' for this indicator. As of 2021 there are estimated to be more than 2,500 fishers in Belize (UNCTAD, 2021).

2.5b Data on authorized vessels operating outside of Belize's EEZ

As described under Indicator 2.5a, the Fisheries Resources Act states that the Fisheries Administrator shall keep a record of fishing vessels authorized to fish (Part XII). This indicator evaluates whether fisheries management bodies disclose or make available information regarding the Belizean fishing fleet (Belize flagged vessels) operating in waters outside of Belize's EEZ.

Score: Yes

Possible responses: Yes/No

Rationale for scoring:

The Belize High Seas Fisheries Unit (BHSFU) publishes a list of Belize's flagged vessels authorized to fish on the high seas pursuant to the High Seas Fishing Act (2013). This list currently contains 44 vessels and was last updated in April 2020 (Belize High Seas Fisheries Unit, 2020). BHSFU also lists deleted vessels that are no longer authorized to fish on the high seas (the current list has a total of 13 vessels) (Belize High Seas Fisheries Unit, 2021), as well as vessels suspected of IUU (illegal, unregulated, unreported) fishing (none are currently listed). This indicator is considered met because the relevant fisheries authority has made information on the fishing fleet operating outside of Belize's EEZ publicly available.

2.6 Information on status of fish stocks

This indicator evaluates whether fisheries management bodies disclose or make available information regarding the status of the majority of fish stocks in Belize, based on stock assessments (a majority is defined here as > 50% of the total number of fished stocks in Belize). These should include stocks that are commercially harvested, caught in recreational fisheries, or caught for use as bait. Only stock status information published or accepted by the Fisheries Department, which is the competent management body, will be considered. Information accepted by the Fisheries Department could include that developed by co-management entities such as fisheries working groups.

This indicator focuses on whether stock status information is readily accessible, whereas Indicator 3.1 evaluates the percentage of stocks that are assessed in a quantitative manner.

Score: No

Possible responses: Yes/No

Rationale for scoring:

Stock status information is not readily accessible from the Fisheries Department for any of Belize's marine fish or invertebrate stocks, justifying a score of 'No' for this indicator. There is information available on some of Belize's fish and invertebrate stocks in published literature (as discussed in the sections below), but this does not meet the threshold for a 'Yes' score.

2.7a Tracking of domestic fishing vessels

This indicator is an estimate of the percentage of registered domestic fishing vessels that are required to carry on-board tracking systems that communicate information on the vessel's location while fishing, such as VMS (vessel monitoring system) or AIS (automatic identification system). Domestic fishing vessels are defined as those used within Belize's EEZ and are part of the MAP.

Score: 13% (76 out of 594 fishing vessels)

Rationale

The Fisheries Resources Act (Part XVIII) authorizes the Minister to provide for the installation and use of mobile transceiver units (MTUs) on an individual vessel or a category of vessels, to facilitate surveillance and enforcement. An MTU is a VMS unit capable of transmitting Global Positioning System (GPS) position reports via satellite connection. In June 2020, WCS in partnership with the Fisheries Department, the Port Authority, the Coast Guard and the National Fishing Cooperatives began a program to install MTUs on local commercial fishing vessels. The Port Authority is responsible for monitoring vessel signals 24 hours a day, and the information enables fisheries managers to determine whether vessels are operating in accordance with their fishing licenses and fishing within their proper zones (Belize Port Authority, 2020). As of January 21, 2022, 76 MTUs have been installed on local commercial fishing vessels, and there are plans to install or replace MTUs on an additional 66 vessels. As of 2019, the Fisheries Department had recorded 594 registered local commercial fishing vessels in Belize (UNCTAD, 2020).

2.7b Tracking of fishing vessels outside of Belize's EEZ

This indicator is an estimate of the percentage of registered Belize-flagged offshore fishing vessels (which may or may not be locally owned) that are required to carry on-board tracking systems that communicate information on the vessel's location while fishing, such as VMS or AIS. These offshore vessels are defined as those operating outside of Belize's EEZ.

Score: 100% (44 out of 44 of fishing vessels)

Rationale

All vessels carrying the Belize flag operating on the high seas are required to have a MTU installed and it must be operational prior to the vessel leaving port, justifying a score of 100% for this indicator (Belize High Seas Fisheries Unit).[2] The Fisheries Monitoring Center (FMC), which was established under the authority of the BHSFU, is responsible for monitoring VMS vessel activity 24 hours a day in the following types of areas: "1) any maritime areas where specific rules on access to waters and resources apply; 2) the regulated areas of the regional fisheries management organization to which Belize is a party; 3) the jurisdictional waters of another country; 4) any other area, restricted or otherwise, which may be designated by Belize." It is worthwhile to note that the BHSFU signed a memorandum of understanding (MOU) with Global Fishing Watch to make its vessel tracking data publicly available (Oceana, 2021).

3. Fish Stocks

To maintain fish abundances, the status of fish stocks needs to be known, specifically in terms of whether they are overfished or subject to overfishing. Knowledge of the status of fish stocks presupposes that:

- There is up-to-date biological, ecological and fisheries information;

[2] Belize is an open registry state and some of the vessels flying its flag are not locally owned.

- That status is assessed through quantitative stock assessments that track an indicator of stock biomass and/or fishing mortality over time, and evaluate where estimates fall relative to appropriate, science-based reference points.

For the purpose of scoring audit indicators, information on fish stock status that is > 3 years old will be considered out of date. A combination of fishing effort controls, including catch limits and input controls such as limited entry for fishers/vessels, should be formally established for all fish stocks. Stocks should be managed under some type of fishery management plan.

Many governments maintain lists of their commercially important fish stocks, but the Ministry of Blue Economy does not appear to have such a list. Thus we compiled a list of marine fish stocks from several sources, including past research by Oceana staff and the list of finfish species being used to develop the draft finfish management plan. This list is provided in Appendix 1.

Unit of Evaluation

Individual fish stocks are the units evaluated in this category. A fish stock is defined as a population or sub-population of a particular species classified as a marine resource, sometimes in a way that corresponds to a unit of management. Because Belize does not define stocks based on management areas, species are used as the unit for evaluation, with all species assumed to consist of a single stock and evaluated as such. If future scientific research indicates the presence of more than one distinct population unit or stock within species, all of the identified stocks should be evaluated separately.

3.1 Stocks with known status as determined by a stock assessment

This indicator is an estimate of the percentage of fish stocks with known status, as determined through some type of stock assessment. For the purpose of scoring this indicator, recent (< 3 years old) stock assessments will qualify, ranging from data-rich to data-poor assessment methods; the quality of the assessment is not factored in. Determination of inherent vulnerability or other risk from fishing based on species/stock characteristics alone does not qualify as a stock assessment.

An overarching goal for responsible and sustainable fisheries management is to maintain fish stocks at healthy levels. Stock status information is therefore a critical piece in the management process, since it can be used to make informed decisions about harvest levels, as well as to evaluate performance of the management system. An increase in this indicator from year to year indicates that more stocks have the fundamental scientific information needed for a sustainable harvest strategy.

To score this indicator it is necessary to have information on hand at the time of the audit as to 1) whether stock status is known and 2) the basis for stock status.

Stock status is typically evaluated in terms of biomass and/or fishing mortality, two measures that are considered further in the following two indicators (3.2, 3.3). For some species,

particularly invertebrates, alternative assessment methods such as density estimates or tracking of body sizes through time may also be acceptable, as these can be appropriate based on the species' biological characteristics. We consider status known if there is a quantitative estimate of either biomass or fishing mortality in a publicly available assessment. Stock status information published by the Fisheries Department, a fisheries working group or working group collaborator, or in the public literature can be included for evaluation as well.

Score: 4% (2 out of 54 stocks) / 96% of stocks have unknown status

Based on information that is available to the general public, of all the marine fish stocks in Belize, seven fished reef fish species, queen conch, and spiny lobster have had their stock statuses determined. Of these, only the conch and lobster assessments were conducted within the past three years (Acosta et al., 2019 and Tewfik et al., 2019), resulting in the score of 4% for this indicator. Although we did not use assessments that are more than three years old for scoring, we describe available information here for reference.

For finfish, published information focuses on one specific area, Glover's Reef, for many of these species. Babcock et al. (2013) used length-based indicators, a data-limited method, to estimate biomass and fishing mortality to determine overfished and overfishing status for Glover's Reef black grouper (*Mycteroperca bonaci*), Nassau grouper (*Epinephelus striatus*), schoolmaster snapper (*Lutjanus apodus*), mutton snapper (*Lutjanus analis*), hogfish (*Lachnolaimus maximus*), French angelfish (*Pomacanthus paru*) and gray angelfish (*Pomacanthus arcuatus*). Overfished and overfishing status was also determined for stoplight parrotfish (*Sparisoma viride*), which is no longer legal to harvest in Belize. Co-management groups have likely determined stock status of some of these and other finfish species more recently, using data-limited metrics. However, any data-limited stock assessments that exist are currently held by those co-management entities, and were not publicly available for the audit team to include in this report.

As economically important species subject to export, spiny lobster and queen conch have been subject to more frequent assessments, although many of these are also not easily accessible by the general public. For example, the Fisheries Department carries out a nationwide conch survey every two years in compliance with Appendix Two of the Convention on International Trade in Endangered Species (CITES), measuring density and shell length (Belize Fisheries Department, 2013). The department also conducts pre-season, rapid conch assessments during odd years. None of these assessments appears to be posted online. Currently, conch surveys are conducted in and around Belize's marine reserves with some information available on density, shell length and lip thickness available on individual locations (Oceana, 2020).

In terms of published data, one study calculated queen conch and Caribbean spiny lobster abundance, mean size, and fishery productivity inside and outside Belize's marine reserves between 2001 and 2016 (Acosta et al., 2019). Tewfik et al. (2019) used length and morphometric measurements to determine overfishing status across a range of fishing grounds.

Prior to this, Babcock et al. (2015) estimated Glover's Reef spiny lobster spawning stock biomass per recruit to determine overfishing status.

A 2009 study characterizing the goliath grouper fishery in southern Belize does not provide biomass or fishing mortality estimates (Graham et al., 2009). The Belize National Spawning Aggregation Working Group monitors spawning aggregations of groupers, but the information they collect is not posted publicly.

3.2 Overfished stocks

This indicator is an estimate of the percentage of fish stocks with known status that are overfished, defined as stocks where the estimated biomass (B) is below a limit reference point that is often termed B_{limit}. (I.e. the percentage of stocks where $B < B_{limit}$.) B_{limit} is generally considered equivalent to a level below which population recruitment may be impaired, and hence management should aim to maintain stocks above this level. Examples of commonly used B_{limit} levels include ½ B_{MSY} and 20%B_0. B_{MSY} is defined as the biomass level at maximum sustainable yield, while B_0 is defined as biomass in the absence of fishing. Other indicators besides B may be considered particularly for species such as invertebrates for which biomass is difficult to estimate.

A decrease in this indicator from year to year indicates that more stocks are above a level of serious concern, based on estimated biomass. However, it should be noted that this provides a conservative estimate of the fraction of "unhealthy" or "depleted" stocks as it does not account for stocks that are between the target and the limit levels.

Score: 0% (0 out of 54 stocks) / 96% of stocks have unknown overfished status

As conveyed in the text for Indicator 3.1, based on publicly available information, 9 of the 54 stocks found in Belize's marine waters have been assessed at some point in time, with only two stocks assessed within the past three years (conch, lobster). Based on these recent assessments (Acosta et al., 2019 and Tewfik et al., 2019), neither conch nor lobster clearly appears to be overfished, resulting in an indicator score of 0%. However, we caution that the results are not definitive because these studies were not designed to serve as national level stock assessments, and that for the vast majority of stocks, overfished status is still unknown.

According to the most recent available national queen conch survey conducted in 2012, the population is healthy with both density and length increasing (density increased in each two year increment from 2006 to 2012 and shell length in each increment from 2008 to 2012). (Belize Fisheries Department, 2013). However, that result is quite outdated at this point. Recent surveys of individual marine reserves indicate a variety of trends (increases, decreases and unclear trends) in local queen conch populations (Oceana, 2020). In at least one reserve (Port Honduras Marine Reserve), there is strong evidence from a 2016 survey that conch densities are below the threshold needed for healthy reproduction (Foley et al. 2016). Acosta et al. (2019) compared CPUE (catch per unit effort) between MPAs and fished areas, and found no indication

of an overall decline in conch abundances from 2001-2016. In some ways this was unexpected because enforcement efforts had increased significantly during that time. The overall picture of conch status is uncertain, but it cannot be clearly said that the stock is overfished based on available evidence.

For spiny lobster, Tewfik et. al. (2020) determined that the stock is more overfished than it was in 2005, but the study did not definitively state whether the stock is overfished, so is not included in the evaluation of this indicator. Acosta et al. (2019) evaluated CPUE for lobster, and similarly to conch, found no indications of an overall decline in lobster abundances from 2001-2016. Again, though the data are not very clear, it appears that the stock cannot be said to be overfished.

Although published assessments of other species could not be used in scoring due to their age, we summarize some of that information here for reference. Using length-based indicators for eight species of reef fish at Glover's Reef (seven of which are currently fished), Babcock et al. (2013) determined that black grouper (*Mycteroperca bonaci*) is overfished, and Nassau grouper (*Epinephelus striatus)*, schoolmaster snapper (*Lutjanus apodus*) and mutton snapper (*Lutjanus analis*) were likely overfished at that time, and these stocks could potentially still be overfished.

In addition, as mentioned under Indicator 3.1, some finfish species may have had their status assessed using data-limited metrics. However, this information was not available for this audit and so could not be used.

3.3 Stocks subject to overfishing

This indicator is an estimate of the percentage of fish stocks with known status which are subject to overfishing, defined as stocks where the fishing mortality level (F) is above a reference point level (e.g. $F > F_{MSY}$). Fishing mortality is the removal rate of fish from the population by human harvests, including directed commercial fisheries, recreational fisheries, bait fisheries, subsistence (food-social-ceremonial) fisheries, and bycatch. F_{MSY} is defined as the fishing mortality level at maximum sustainable yield, which we consider an example of an appropriate reference point. Notably, the Fisheries Resources Act states an objective to maintain or restore stocks at levels capable of producing MSY.

A decrease in this indicator from year to year indicates that fewer stocks are subject to overfishing, based on estimated fishing mortality. Collecting data to estimate fishing mortality is a natural intermediate step to evaluation of overfishing status. This indicator does not account for stocks with unknown stock status.

Score: 2% (1 out of 54 stocks) / 98% of stocks have unknown overfishing status

As conveyed in the text for Indicator 3.1, based on publicly available information, only 9 of the 54 stocks found in Belize's marine waters have been assessed at some point in time, with only two stocks assessed within the past three years (conch, lobster). Only one stock, spiny lobster,

has had its overfishing status definitively determined, resulting in a score of 2% for this indicator. Conch is not included in this indicator because of the lack of clarity over its overfishing status.

As with the other Section 3 indicators, we provide some information that, although not used in scoring, is useful for understanding some of the relevant work that has been conducted. Using length-based indicators for eight species of reef fish at Glover's Reef, Babcock et al. (2013) determined that 6 of the 7 currently fished reef fish species evaluated were experiencing overfishing across a range of life history parameters: black grouper (*Mycteroperca bonaci*), Nassau grouper (*Epinephelus striatus*), schoolmaster snapper (*Lutjanus apodus*), mutton snapper (*Lutjanus analis*), hogfish *(Lachnolaimus maximus*), and gray angelfish (*Pomacanthus arcuatus*). Babcock et al. (2013) also evaluated stoplight parrotfish (*Sparisoma viride*) as experiencing overfishing, but because there is currently a fishing ban on this species it is not included as a fished stock in this audit.

Using a Bayesian depletion model, Babcock et al. (2015) found that spiny lobster at Glover's Reef is not experiencing overfishing but lobsters are often caught at very small sizes, indicating that the current size limit may be too low. Tewfik et al. (2019) updated this study, determining that overfishing was likely to be occurring across a wide range of fishing grounds (Tewfik et al., 2020).

3.4 Stocks with defined catch limits

This indicator is an estimate of the percentage of fish stocks with specified catch limits, such as a TAC, or other type of direct fishing mortality control such as a minimum size limit, which may be more appropriate for some species such as crustaceans. These types of controls are termed output controls, because they exert a restriction on harvest outputs from a fishery. In contrast, input controls, such as fishery opening and closure dates, are not considered catch limits. Catch limits are an important tool for harvest management because they directly affect how many fish (or what size of fish) are being removed. It is worth noting, however, that catch limits require effort to implement effectively without unintended consequences, such as high-grading or discards of fish, and are not the only mechanism available for rebuilding stocks.

An increase in this indicator from year to year indicates that more stocks are being managed using fishing mortality controls such as catch limits, typically involving more hands-on management than stocks that are subject to input controls alone.

Score: 7% (4 out of 54 stocks)

Belize has minimum size limits for queen conch (7 inches shell length or 3 oz meat weight) (San Pedro Sun, 2021), spiny lobster (3 inches carapace length or 4 oz tail weight) (Government of Belize Press Office, 2021), sea cucumber (10 inches or 7 oz weight) (Government of Belize Press Office, 2020) and an allowable size range for Nassau grouper (between 20 and 30 inches).

Importantly, although the conch and lobster size limits count towards this indicator, there is strong evidence from published literature the minimum size is too low to adequately protect

juvenile lobsters (Tewfik et al., 2020) and juvenile conch (Tewfik et al., 2019), contributing to the decline in health of these stocks. Scientists have suggested more appropriate minimum sizes for both species, and it is unclear to what extent the Fisheries Department is considering these suggestions, as information on relevant decision-making processes is not published.

It is also worth recognizing that the Fisheries Department has been working with scientists and local fishing communities to determine appropriate size limits for 21 species of finfish (Oceana, 2020).

Belize sets TACs for queen conch and sea cucumber on an annual basis (S.I. No 54 of 2012) (San Pedro Sun, 2016), which results in a closure of these fisheries once reached.

Four of the 54 stocks fished in Belize have defined catch limits, either based on a minimum size limit or a total allowable catch, resulting in a score of 7% for this indicator.

3.5 Stocks included in a fishery management plan

This indicator is an estimate of the percentage of fish stocks that are included in a fishery management plan.

The Fisheries Resources Act (Part IV) states that the Minister, in consultation with the BFC, has the authority to determine whether a fishery requires a management plan. Amongst other requirements, fishery management plans shall:

> (a) identify and address trends in the biological, economic, and social characteristics of the fishery, including issues requiring special attention;
>
> (b) identify the target and other fish stocks, and management objectives for each fishery;
>
> (c) address the proposed conservation, management and development measures to be applied to the fishery with due regard to the performance of historical measures;
>
> (d) determine the fishery or amount of the fishery resources to be made available to license holders.

Fisheries management plans are to be reviewed by the BFC and made available to the public for comments.

Ideally, all fished stocks should be included in a management plan that describes the management goals and strategy for the stock. An increase in this indicator from year to year suggests that more stocks are being managed in a proactive manner.

Score: 0% (0 out of 54 stocks)

There are currently no publicly available management plans (online) for any of Belize's fish or invertebrate stocks, though there is a finfish management plan in draft form covering 44 species grouped into 13 "baskets." This plan was drafted by EDF (Environmental Defense Fund) in collaboration with the Fisheries Department, with input from fishers (UNCTAD, 2021). Because this plan is not yet publicly available it does not count towards this indicator, although UNCTAD

will reportedly publish it soon. There is a regional fisheries management plan for queen conch due to its CITES listing (FAO, 2017), but this does not count towards this indicator because the plan is not specific to Belize. McDonald et al. (2017) developed a science-based adaptive management framework (AMF) for data limited stocks using conch and lobster, which the Fisheries Department may be using to develop a management plan for conch (Oceana, 2020), and which may be in use for lobster and in the development of the draft finfish management plan (UNCTAD, 2021). Based on information obtained during interviews conducted as part of this audit, there is a conch management plan in place and under implementation based on the AMF and a lobster management plan that is pending approval but may be under implementation based on the AMF. Because it was not possible to obtain copies or find hard evidence for any of these fisheries management plans, however, no credit was given for them in the scoring of this indicator.

3.6 Stocks subject to catch effort control

This indicator is an estimate of the percentage of stocks with measures to control fishing effort on the stocks. Such measures can include fishery time and/or area openings and closures, and limits on the number of fishers, vessels or gear deployment (e.g. number of traps, fishing hooks, etc.).

Score: 7% (4 out of 54 stocks)

Effort controls in Belize include protected areas, complete bans on specific gears and capture methods (gillnets, bottom trawls, scuba), bans on specific gears within marine reserves (spear guns, nets, long lines, fish traps, beach traps), closed seasons for certain species (conch, spiny lobster, sea cucumber, Nassau grouper) and a complete ban on the harvest of parrotfish and surgeonfish[3] as well as whale sharks and nurse sharks (Oceana, 2020) (pers comm EDF). We note that Nassau grouper is critically endangered under the IUCN red list, but fishing is allowed for this species in Belize.

In Belize there are 14 marine protected areas (MPAs) and 13 protected fish Spawning Aggregation sites (designed to protect spawning sites for Nassau grouper) (Perez and Tewfik, 2016). No-take zones account for 7.61% of territorial waters (approx. 0-20 nm offshore) and 6.28% of the EEZ (approx. 20- 200 nm offshore). Approved in April 2019, there is an ongoing process to increase no-take coverage with the implementation of “replenishment areas” (The Commonwealth Blue Charter, 2020). In 2021, new regulations prohibiting shark fishing within two nautical miles of Lighthouse Reef, Glover’s Reef and Turneffe atolls (covering approximately 1,500 square miles) went into effect (Rutger, 2021).

[3]All fish landed as filet must include a skin patch (5 × 2.5 cm) for species identification in order to prevent circumvention of this rule.

The MAP, implemented nationwide in 2016, curbs illegal fishing and controls effort by restricting access to specific areas via licensing.

Although these broad fishing effort controls are important, the scoring for this indicator is based on the number of stocks for which there are specific effort controls, out of the total number of stocks. There are specific effort controls for Nassau grouper (protected spawning aggregation sites, closed season), conch (closed season), lobster (closed season) and sea cucumber (closed season), representing catch effort control for four out of 54 possible stocks and a score of 7%.

3.7 Stocks whose landings are monitored

This indicator is an estimate of the percentage of stocks for which monitoring of landings is required by management regulations, and where there is evidence that data are regularly collected. Monitoring of landings can occur at the dock or immediately post landing at a processing plant.

Score: 2% (1 out of 54 stocks)

Part XIV of the Fisheries Resources Act, which covers monitoring, control and surveillance (MCS), notes that the Fisheries Administrator may designate persons to act as observers. These observers can collect scientific information and monitor fish catches.

Fisheries Officers are authorized to conduct inspections, seize property involved in suspected compliance violations, and make arrests.

As part of the MAP, fishers are required to collect and report logbook data on commercial catches, which are primarily consumed within Belize (CANARI, 2021). However, data collection as part of the MAP program is not consistently implemented, and there is no public record of this data. MAP data collection therefore does not count as credit towards this indicator.

Fishing cooperatives, which primarily catch conch and lobster for export markets, are required to collect data on their catches. The cooperatives are generally considered to produce higher quality, more consistent data than the MAP program. This data on exported seafood is reported to the FAO by species. One of the three national fishing cooperatives (the National Fisheries Cooperative) is currently piloting the traceability technology platform “Tally” from “ThisFish” for its lobster and conch catches (Resilient Central America, 2019).

Queen conch is a CITES listed species; as such its catch for both export and local markets is more carefully monitored than all other species caught in Belize.

Given that it is difficult to determine whether landings data collected on Belize’s fisheries stocks are reliable except for queen conch, this indicator is scored conservatively at 1 of 54 stocks, or 2%. It is likely that there are additional species, particularly finfish, whose landings are being monitored. However, this information is not available for this audit so cannot count towards this indicator’s score.

Conclusions and recommendations

Belize appears to be at a stage where foundational policy has been enacted to support environmentally sustainable fisheries management, whilst implementation of regulations and measures to support policy objectives is at early stages. This is reflected by the high proportion of 'Yes' scores for the Fisheries Policy indicators, and the low percentages of fish stocks with status information, catch regulations or limits, and inclusion in a fisheries management plan. Transparency is also generally weak, as only one of the indicators in this category received a 'Yes' score. Using the indicator scores and research conducted during the audit, we highlight challenges and opportunities for continued development of the fisheries management system below.

Challenges

Perhaps the greatest issue hindering effective management of Belize's fish stocks and fisheries is the limited monitoring and collection of fisheries data. There is no public, nationwide system for ongoing collection of landings data, nor regular monitoring of catch composition by species and fish size, even though this is required by the MAP. Queen conch is the only stock that has its landings monitored in a regulated and transparent way. While it is clear that a number of entities are collecting fisheries data (namely co-management entities, fishing cooperatives, seafood business and fishers), there appears to be very limited coordination and data sharing among these different groups. Without such information being collected at the national level with a uniform approach across all commercial fisheries, it is essentially impossible to evaluate stock health, make informed harvest management decisions, and evaluate management performance. As estimated in this audit, only 4% of fish stocks have known status information (Indicator 3.1), and only 7% have defined catch limits (Indicator 3.4). The limited availability of fisheries data precludes the effective use of scientific information in management, as reflected in the 'No' score for Indicator 2.2.

Transparency is another significant issue. The fisheries information that is being collected is not easily accessible by the general public. Co-management groups tend to keep the data they collect internal, and although information requests can be made to the Fisheries Department, these require time and effort to fulfill. Capacity limits are an understandable contributor to this lack of transparency; provision of information may be considered a low priority when government personnel and co-management entities are already tasked with addressing many fundamental management needs. They also may not be explicitly funded to share the information they collect.

Capacity limits for data management and sharing are likely exacerbated by the widespread use of paper logsheets for catch reporting. Paper-based data collection requires extra effort in terms of data entry, and it increases chances for errors to be made and propagated. Transitioning to electronic data collection country wide, across managed access zones, would likely be a

worthwhile investment for the longer term. Some cooperatives and a few MAP zones are reportedly using electronic data collection, as is the WCS national catch monitoring program, which is a positive development. Another way to improve transparency in management decisions is for the BFC and fisheries working groups to more systematically report on their meetings and activities to the general public.

In terms of the health of fish stocks, information was lacking for most 54 fished marine stocks in Belize (96% have unknown overfished status, and 98% have unknown overfishing status; see Indicators 3.2 and 3.3). Considering the lack of catch limits and other harvest controls for many stocks, it is likely that at least some are heavily exploited or possibly overexploited, but the information is simply unavailable. One significant limitation to this audit is that only recent, publicly available stock information could be incorporated into scores. Various co-management groups may conduct some monitoring and stock assessments, which can be evaluated in future audits if the information is made available.

If information is collected on fisheries landings and fish stock status in a more centralized and consistent manner, it can be used to develop fishery-specific management objectives and plans. There are no publicly available fisheries management plans for any marine species (although there are likely plans in place for conch and lobster), and closed seasons and size limits are only instituted in fisheries for conch, lobster, Nassau grouper, and sea cucumber. Management plans require upfront effort and capacity to develop, but they are an important foundation for effective management as they establish objectives, strategies, and measures tailored to the circumstances of specific stocks, fisheries, and/or geographic areas.

This audit evaluated some indicators relevant to MCS, specifically on lists of active fishers and vessels (2.5a and b), and use of vessel tracking (2.7a and b). For small-scale vessels operating within Belize's EEZ, transparency is limited; for example, lists of fishers and vessels are not publicly available. As the MAP and MA Committees develop, however, reporting may improve. Although the current percentage of small vessels with tracking units is not high (13%), the fact that some implementation has begun, and that there are plans to install more units is a positive sign. This audit did not specifically evaluate criteria related to enforcement of regulations, but our understanding from research and interviews is that Belize has somewhat limited capacity to enforce regulations, which is an area that merits attention.

Strengths

Belize has a solid policy foundation for an environmentally responsible, ecosystem-based approach to fisheries management, realized by the enactment of the Fisheries Resources Act in 2020. Four of five indicators within the policy category of this audit scored 'Yes,' with the exception being a 'Partial' score for Indicator 1.5 *Defined roles and responsibilities*. The Partial score was due to responsibilities being unclear for some groups that are significantly involved in fisheries management, such as the fisheries working groups.

MCS-related indicators for high seas vessels operating beyond Belize's EEZ (2.5b, 2.7b) received positive scores, likely because these are larger scale industrial fisheries subject to both internal and external regulations. The BHSFU vessel list is an example of high transparency; it is noteworthy that all of Belize's flagged vessels authorized to fish on the high seas are registered and their identities are made publicly available, their activity is tracked 24 hours a day via VMS, and as of 2021, all VMS data will be publicly available via GFW (at this time it is not yet available on the GFW map or as downloadable data).

Co-management is an important avenue to strengthen fisheries data collection and establish community-based monitoring and enforcement, as fishers are well positioned to collect key fisheries data (e.g. landings) and monitor fishing activities with help from co-management entities. For example, the MA Committees have been recognized as a potential means to develop such co-management and monitoring arrangements. More importantly, fishers and their livelihoods are greatly impacted by fisheries management decisions and should have an effective voice within decision-making processes. The consultation indicators in this audit (2.3a and 2.3b) received 'Partial' scores because while consultations do take place, it is unclear how consistent and open to the public they are. And while there is room for continued improvement, the various fisheries working groups and co-management entities appear to actively facilitate fisher participation in co-management models, which is a strength.

On a related note, Belize's AMF (adaptive management framework), the basis for developing its fisheries management plans, offers a strong foundation for continual improvement in data collection and science-based management, grounded in an iterative collaborative approach that takes the needs of the local communities, the ecosystem and fished species into account.

One notable strength that was not addressed directly in the audit is the use of selective gears for domestic fisheries within the EEZ. Belize's fisheries are reported to have minimal bycatch issues because non-selective gear types such as bottom trawls and gillnets have been banned. This is a significant and welcome feature in terms of environmental sustainability. The bans on bottom trawls and gillnets, as well as establishment of MPAs, indicate that there has been political will to implement conservation measures, which speaks to consideration of ecosystem impacts in management. Nonetheless, there likely needs to be continued capacity building for the Fisheries Department and fishing communities to actually implement EBFM, especially in terms of associated data monitoring and analysis.

Recommendations

Here we summarize some potential recommendations relating to high priority challenges identified in this audit. Some of these have been reflected in existing reports and papers, a few of which we link to below.

Table 3. Key challenges and recommendations for addressing them.

Challenge	Recommendations
Lack of coordinated collection of fisheries data, including landings data	• Encourage the Fisheries Department (or other appropriate entity) to coordinate data collection and sharing of data; • Implement electronic monitoring as feasible; • Formalize the responsibilities and terms of reference for fisheries co-management working groups to improve data sharing and consistency; • Establish landing sites and data collection procedures at these sites; • Clarify roles of MA committees and fisher associations in information collection.
Limited transparency of decision-making	• Build the Fisheries Department's skills in participatory approaches; • Strengthen existing fisheries working groups and other co-management arrangements, and potentially formalize them; • Publish reports on management decisions and meeting minutes for the BFC and working groups, online and in a timely manner.
Lack of an effective suite of catch controls and management plans for many stocks	• Continue using and adapting the AMF • Use lessons learned from development of the finfish management plan when developing plans for other stocks and fisheries • Strengthen capacity of MA committees and fisher associations to participate in co-management processes, including development of management measures and plans.

Additional thoughts

During the course of conducting this audit, the audit team learned about ongoing efforts to improve data collection for and collaborative management of Belize's fisheries, many of them led by NGOs. In some cases these have been realized as parts of the various fisheries working groups and committees, and progress is being made as fisheries management plans are built and continually refined based on Belize's AMF. These working groups help fill some of the management gaps that currently exist. Additionally, they generally aim to follow a co-management model that solicits input from fishers and fishing communities. This is a primary reason why this audit includes an 'Informal Public Consultations' indicator (2.3b). As they are not formalized, however, these groups may be at higher risk of becoming inactive unless they have consistent leadership support and ongoing interest from fishing communities.

Along the theme of collaboration, it is apparent that there are a variety of groups (e.g. NGOs, academic institutions, intergovernmental organizations) are working to support implementation of sustainable fisheries management in Belize. If they regularly and transparently communicate about their activities, there will likely be increased opportunities to identify complementary goals and coordinate efforts.

For further ideas on improving fisheries management in Belize, we suggest the following resources, which is not an exclusive list:

- Caribbean Natural Resources Institute (CANARI). (2021). Institutional analysis of enabling conditions for ecosystem stewardship in the fisheries sector of Belize;
- FAO. (2015). Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication.
- McDonald et al. (2017). An indicator-based adaptive management framework and its development for data-limited fisheries in Belize. Marine Policy, 76, 28–37.
- Oceana. (2020). State of Belize Fisheries Report 2020.

Next steps for the Belize Fisheries Audit

The goal for this inaugural Belize Fisheries Audit was to establish a baseline of fisheries management and governance performance for the country, within the categories of fishery policy, transparency, and health of fish stocks. Oceana may use the audit framework to periodically evaluate performance and track progress within these indicators. Fisheries are an important pillar of the Belizean economy that supports the livelihoods and nutritional needs of thousands of people, and the fisheries themselves are dependent on healthy fish stocks and ecosystems. This audit was designed to highlight some of the needs for supporting functional and sustainable management of these stocks. We hope it can be useful for the ongoing efforts of the many individuals working to develop and strengthen fisheries management in Belize, to help maintain healthy stocks and fishing communities into the future.

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Appendix 1

Stock List: List of the 54 marine fish and invertebrate stocks that were used to score Indicators in Section 3.

Species Name	Common name
Acanthocybium solandri	Wahoo
Caranx hippos	Crevalle
Carcharinus leucus	Bull shark
Carcharinus limbatus	Black tip shark
Carcharinus perezi	Caribbean reef shark
Carcharinus plumbeus	Sandbar shark
Centropomus undecimalis	Snook
Coryphaena hippurus	Mahi mahi
Diapterus auratus	Mojarra (pompano)
Epinephelus guttatus High	Red hind
Epinephelus itajara	Goliath grouper
Epinephelus striatus	Nassau grouper
Etelis oculatus	Queen Silk Snapper
Galeocerdo cuvier	Tiger shark
Gerres cinereus	Mojarra (yellowfin)
Haemulon album	Margate
Haemulon parra	Sailor choice
Haemulon plumieri	White grunt
Haemulon sciurus	Bluestripe grunt
Holothuria mexicana	Sea cucumber
Kajikia albida/ Kajikia audax	Marlin - white/ stripe
Lachnolaimus maximus	Hogfish
Lobatus gigas	Queen conch
Lutjanus analis	Mutton snapper

Species Name	Common name
Lutjanus apodus	Schoolmaster
Lutjanus buccanella	Deep water blackfin snapper
Lutjanus cyanopterus	Cubera snapper
Lutjanus griseus	Gray snapper
Lutjanus jocu	Dog snapper
Lutjanus mahogoni	Mangrove/Mahogany snapper
Lutjanus purpureus	Champagne snapper
Lutjanus synagris	Lane snapper
Lutjanus vivanus	Queen Silk Snapper
Menippe mercenaria	Florida stone crab
Mugil spp.	Mullet
Mycteroperca bonaci	Black grouper
Mycteroperca tigris	Tiger grouper
Mycteroperca venenosa High	Yellowfin grouper
Ocyurus chrysurus	Yellow-eye snapper
Ocyurus chrysurus	Yellowtail snapper
Panulirus argus	Spiny lobster
Pomacanthus arcuatus	Gray angelfish
Pomacanthus paru	French angelfish
Prionace glauca	Blue shark
Rhomboplites aurorubens	Vermillion snapper
Sardinella spp.	Sardine
Scomberomorus cavalla	King fish/mackerel
Scomberomorus maculatus	Spanish mackerel
Scomberomorus regalis	Cerro mackerel
Seriola dumerili	Great Amberjack
Sphyraena barracuda	Great barracuda

Species Name	Common name
Sphyrna lewini	Great hammerhead
Sprattus spp.	Sprat
Xiphias gladius	Swordfish