



Maldives Billfish Fishery Management Plan

DECEMBER 2020

UNOFFICIAL TRANSLATION

Government Gazette Reference: Volume 49, Issue 262, 17 December 2020



Ministry of Fisheries, Marine Resources & Agriculture

Malé, Maldives



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Management Plan**

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Acknowledgement:

The Ministry acknowledges the various government agencies and stakeholders that

contributed towards making this management plan holistic and inclusive. The Ministry also thanks the island councils for playing a crucial role in ensuring that the concerns of fishers and sector stakeholders are directly heard at the highest level of fisheries governance and policy making.

The Ministry highly appreciates the time, meticulous contributions and the wealth of knowledge shared by fishers, without whom this plan would not have been possible. Their meaningful insights and constructive suggestions have been invaluable.

The Ministry recognises Maldives Marine Research Institute's efforts to produce research on our marine resources and provide technical support for evidence-based policy making. Sincere thanks to the World Bank funded Maldives Sustainable Fisheries Resources Development Project (SFRDP) for providing the Ministry with the essential resources and financial support for the formulation of this plan.

For bibliographic purposes, this management plan shall be cited as:

Ministry of Fisheries, Marine Resources and Agriculture (2020) Maldives Billfish Fishery Management Plan 2020. MoFMRA, Malé, Maldives.

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Foreword



Praise be to Allah, the Creator of the oceans, marine life and other blessings upon the earth. Prayers and peace be upon our Prophet, Muhammad, who taught us the righteous way to make use of these blessings.

The oceans, lagoons and reefs are national heritages that are inextricably linked to our culture, tradition, and the Maldivian identity. The Maldives fisheries are heavily dependent on this heritage. Hence it is our utmost responsibility to ensure that they are faithfully passed down to our future generations. The Ministry is committed to working towards achieving this goal, and to implement the government's policies on the expansion of the blue economy agenda. To this end, we have compiled this plan to steer our efforts towards maximising long-term benefits of marine resources to Maldivians.

Since the time of our forefathers, the fishery sector has been a major pillar of our economy, upon which our incomes, our livelihoods and our sustenance are dependent. Therefore, the measures included in these fisheries management plans are geared towards the sustainable development and management of these fisheries resources. These legally recognised fisheries management plans mark a watershed moment in the history of marine resource management in the Maldives.

Fisheries resources are common goods, of which all Maldivians hold a share. These plans have been developed based on principles of

the Precautionary Approach, Ecosystem-Based Management, Sustainable Development and Equity, with due regard to the various and variety of interactions within an ecosystem and to ensuring timely and cost-effective measures are taken to safeguard ecosystems and prevent irreparable damage to them. This process has been informed by meaningful suggestions and constructive feedback from various stakeholders including fishers, others engaged directly and indirectly within the fisheries sector as well as civil society organisations working towards natural resource management, conservation, and protection.

The fisheries management plans will be the primary basis for guiding the authorities as well as stakeholders in the sustainable management of the fisheries sector in the Maldives. These plans comprise of developmental goals and objectives for each fishery, measures and actions to achieve them, the roles and responsibilities of stakeholder agencies in the implementation of these measures and an implementation timeline for the measures. It is my sincere hope that these plans contribute towards realising the vision set forth by the Fisheries Act of the Maldives.

—

Zaha Waheed

Minister of Fisheries, Marine Resources
and Agriculture

Abbreviations



FIS	Fisheries Information System
IGO	Intergovernmental Organisation
IOTC	Indian Ocean Tuna Commission
LGA	Local Government Authority
MCS	Monitoring, Control and Surveillance
MCS*	Maldives Customs Services
ME	Ministry of Environment
MFDA	Maldives Food and Drug Authority
MIRA	Maldives Inland Revenue Authority
MMRI	Maldives Marine Research Institute
MNDF - CG	Maldives National Defence Force – Coast Guard
MoED	Ministry of Economic Development
MoFMRA	Ministry of Fisheries, Marine Resources and Agriculture
MPS	Maldives Police Services
NBS	National Bureau of Statistics
RFMOs	Regional Fisheries Management Organisations
RFBs	Regional Fisheries Bodies
SDFC	SME Development Finance Corporation
SWIOFC	Southwest Indian Ocean Fisheries Commission
UCSB	University of California, Santa Barbara

Chapter 1



Preamble

1.1 Introduction and Title

This Plan is made pursuant to Article 18 of the Act No. 2019/14 (Fisheries Act of the Maldives) and provides for the management of the fishery stated in Section 17 (a) (4) of the Act. The plan will be the primary basis for guiding the authorities as well as stakeholders in the sustainable development of the billfish fishery and trade in the Maldives. This Management Plan shall be cited as “Maldives Billfish Fishery Management Plan”.

1.2 Overall purpose

The overall purpose of the management plan is to:

- (a) Improve the management and conservation of billfish stocks through adaptive management actions that are aligned with the management recommendations or requirements of relevant regional fisheries management organisations;
- (b) Ensure long-term benefits to the people of Maldives through the responsible management of the fishery; and
- (c) Guide the authorities and stakeholders in the sustainable development of the billfish fishery and trade in the Maldives.

1.3 Scope and Application

This Plan applies to all billfish species exploited in the Maldives (collectively referred to as “billfish” in this Plan) including the following;

1. Indo-Pacific sailfish (*Istiophorus platypterus*)
2. Sword fish (*Xiphias gladius*)
3. Black marlin (*Makaira indica*)
4. Indo-Pacific blue marlin (*Makaira mazara*)
5. Striped marlin (*Tetrapturus audax*¹)

This Plan applies to all activities carried out in the Maldives that may impact billfish resources, including but not limited to harvesting, processing, storage, trading, and exporting of billfish and billfish products from the Maldives. The Plan also applies to all parties, vessels, processing and export facilities or places engaged in or otherwise connected with any activity within the scope of this Plan.

1.4 Guiding Principles

1.4.1 Precautionary Approach: Timely and cost-effective measures shall be taken to safeguard ecosystems and prevent irreparable damage to them despite the lack of full scientific certainty.

1.4.2 Ecosystem-based management: The various and variety of interactions within an ecosystem, including anthropogenic elements, shall be recognised as opposed to accounting for matters, species, or ecosystem services in isolation.

1.4.3 Universal Responsibility: Local policies governing marine resource management shall be in harmony with global efforts to protect, conserve and manage biodiversity.

1.4.4 Sustainable Development: In developing the fishery, the needs of the present shall be met without compromising the ability of the future generations to benefit from the resource.

¹Currently accepted as *Kajikia audax* but recognised as *Tetrapturus audax* by the Indian Ocean Tuna Commission.

1.4.5 Equity: Resources shall be acknowledged as shared common good, and benefits obtained from the utilisation of resources shall be shared in a fair and just manner among all through the application of transparency, legitimacy, accountability and decentralisation.

1.4.6 Participatory Approach: All stakeholders, particularly those who are directly affected by a policy or a measure, shall be engaged in the decision-making process to ensure inclusivity and consensus-oriented outcomes.

1.5 Interpretation

Unless stated otherwise, words or expressions used in this Plan have been given the meanings specified in Annex 1: Glossary.

1.6 Entry into Force

This Plan shall come into force upon its publication on the Government Gazette.

Chapter 2



Biology, Habitat and Behaviour

Billfishes are a highly migratory and epipelagic fish that inhabit all of the world's oceans (Shimose et al. 2010). They are distributed throughout tropical, subtropical and warm temperate waters around the world (Restrepo et al. 2016). Although they live primarily in the upper 200 meters of the ocean, their general habitat preferences and horizontal distribution ranges vary by species. Both families found in the Maldives, Istiophoridae (marlins and sailfishes) as well as Xiphiidae (swordfish), usually inhabit warm seas (Nakamura 1985).

Billfishes are apex predators that have a broad diet (Kitchell et al. 2006). They are opportunistic feeders known to feed upon fishes ranging from large tunas such as skipjack tuna, yellowfin tuna, and bigeye tuna to other types such as dolphinfishes, flying fishes, barracudas and anchovies (Nakamura 1985; Potier et al. 2007; Elepathage et al. 2019). In shallow waters, they also feed on neritic pelagic fishes like mackerels and herrings. Studies of their gut content have revealed that cephalopods such as squids and cuttlefishes also contribute significantly to their diet (Potier et al. 2007; Loor-Andrade et al. 2017). However, the dietary composition differs between billfish species and the frequency of occurrence of prey species also varies by season (Loor-Andrade et al. 2017).

(a) Indo-Pacific sailfish

Scientific Name: *Istiophorus platypterus*
 Common Name: Indo-Pacific sailfish
 Local Name: Fangan'du Hibar
 Indian Ocean Stock Status: Uncertain



Stock distribution and habitat

Found throughout the tropical and subtropical regions of the Pacific and Indian Oceans, it is mainly found in surface waters above the thermocline, mostly close to coasts and islands in depths from 0 to 200 m. The stock structure of Indo-Pacific sailfish in the Indian Ocean is uncertain, however there may be local reproductively isolated stocks. At least one stock has been reported in the Persian Gulf with very little to no intermixing with open Indian Ocean stocks. However outside of the Gulf, no work has been carried out to differentiate stocks (i.e. the stock structure is unknown) (IOTC-WPB 2019).

Feeding and food

Sailfish feed on schools of smaller fish like sardines and anchovies, which they often shepherd with their sails, making them easy prey. They also feed on squid and octopus.

Growth rate and size at maturity

The Indo-Pacific sailfish is one of the smallest billfish species, but is relatively fast growing. Maximum length has been recorded at 348 cm lower jaw fork length, with maximum weight reported at 100.2 kg. It has been recorded to live for a maximum age of 13 years. Size at maturity has been reported as 203 - 210 cm (Girault et al. 2019).

(b) Sword fish

Scientific Name:	<i>Xiphias gladius</i>
Common Name:	Sword fish
Local Name:	Thungan'du hibaru, Kanneli hibaru
Indian Ocean Stock Status:	Not overfished and not subject to overfishing



Stock distribution and habitat

Swordfish is a cosmopolitan species found in the tropical, temperate and sometimes in cold waters of all oceans. Swordfish prefer water temperatures between 18 and 22 °C, but have the widest range of tolerance among billfishes, and can be found at temperatures from 5 to °°27C. They can typically be found from near the surface to a depth of 550 m, while it has been reported to dive as deep as 2878 m (Sepulveda et al. 2010).

Feeding and food

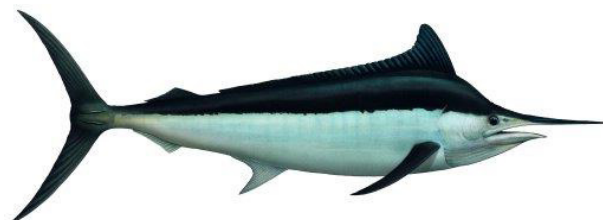
Swordfish feed on a wide range of pelagic fishes, such as mackerel, barracudinas, silver hake, rockfish, herring, and lanternfishes, but they also take demersal fish, squid, and crustaceans

Growth rate and size at maturity

They commonly reach a total length of about 300 cm, and a maximum of 455 cm fork length. The maximum reported weight is 650 kg. Swordfish are reported to mature at five years when they are around 221 cm, with size at first maturity ranging between 250 – 156 cm.

(c) Black marlin

Scientific Name: *Makaira indica*
 Common Name: Black marlin
 Local Name: Kalhu mashibaru
 Indian Ocean Stock Status: Uncertain



Stock distribution and habitat

Black marlin is a highly migratory, large oceanic apex predator that inhabits tropical and subtropical waters of the Indian and Pacific Oceans. Some rare individuals have been reported in the Atlantic Ocean but there is no information to indicate the presence of a breeding stock there. The black marlin usually occurs in surface waters, commonly in the 200 – 0 m depth, but has been recorded to depths of 915 m. They often occur in nearshore waters close to land masses, islands and coral reef areas (Nakamura, 1985).

Feeding and food

Black marlins feed on dolphinfish, squid, cuttlefish, octopuses, mackerels, trevallies, swordfish, and large decapod crustaceans, but prefers small tunas when abundant.

Growth rate and size at maturity

The black marlin one of the biggest fish in the world with a maximum reported length of 465 cm fork length, but common to 380 cm total length. The maximum published weight is 759 kg (Chi-Lu et al. 2007). Size of maturity for black marlin in the Indian Ocean was determined at 179.1 cm LJFL (Zhou et al. 2019).

(d) Indo-Pacific blue marlin

Scientific Name:	<i>Makaira mazara</i>
Common Name:	Indo-Pacific blue marlin
Local Name:	Noo mashibaru
Indian Ocean Stock Status:	Overfished and subject to overfishing



Stock distribution and habitat

Indo-Pacific blue marlin is a highly migratory species found throughout the tropical and sub-tropical waters of the Pacific Ocean and Indian Oceans. It is common in equatorial waters, but it is not usually seen close to islands and coral reefs. Indo-Pacific blue marlins are found in depths between 200 – 0 m.

Feeding and food

They prefer the higher temperature of surface waters, feeding on mackerel and tuna, but will also dive deep to eat squid. They are among the fastest fish in the ocean, and use their spears to slash through dense schools, returning to eat the stunned prey.

Growth rate and size at maturity

They can reach a maximum length of 500 cm total length, but the average is around 215 to 300 cm total length (Nakamura 1985). It has been known to reach weights of 906 kg (Nakamura 1985). The size at maturity was determined at 179.6cm for males and 178 cm for females (Zhou et al. 2019). Maximum age as reported by Allen and Steene (1988) is 28 years.

(e) Striped Marlin

Scientific Name:	<i>Tetrapturus audax</i>
Common Name:	Striped marlin
Local Name:	Galhijehi hibaru
Indian Ocean Stock Status:	Overfished and subject to overfishing



Stock distribution and habitat

Striped marlin is a highly migratory pelagic species with a distribution extending through equatorial to temperate waters in the Pacific and Indian Oceans. The highest catches and catch rates occur within sub-equatorial and sub-tropical areas, particularly in the Pacific Ocean (Nakamura, 1985). They are found between 200-0 meters. In the Indian Ocean, striped marlins are more densely distributed in equatorial regions with higher concentrations off eastern Africa, in the western Arabian Sea, the Bay of Bengal and off northwestern Australia (Pillai and Shoji 1978). This species are rarely seen in the Maldives.

Feeding and food

Striped marlin are opportunistic feeders of fish including mackerel, sardine, and anchovy. They also eat invertebrates, including crustaceans and squids.

Growth rate and size at maturity

Maximum length for striped marlin is 420 cm total length, although they commonly grow to 290 cm total length. It has been reported to mature at around 210 cm. The maximum published weight for striped marlin is 440.0 kg (Allen and Steene, 1988). Size of maturity for striped marlin in the Indian Ocean was determined at 183.7 cm LJFL for males and 211 cm LJFL for females (Zhou et al. 2019).

Note: Photos of billfish species were retrieved from the IOTC website <www.iotc.org>.

Chapter 3



Overview of the Fishery

3.1 Fishery

A small billfish fishery has existed in the Maldives for many years and had remained as an artisanal fishery until recently. As the tourism industry expanded in the Maldives, it opened up a new market for billfish fishermen to sell their catch, resulting in higher exploitation of billfish in the Maldives. Due to this demand created by the expanding tourism sector and export markets, billfish fishing had been shifting from an artisanal fishery to an increasingly commercialised fishery.

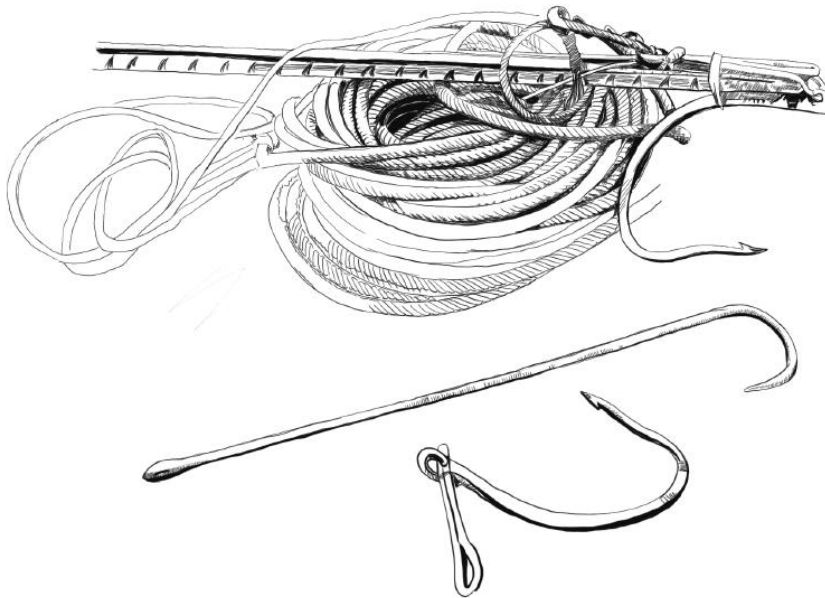
The true extent of billfish fishery in the Maldives is not yet fully understood as there is no mechanism to enumerate billfish landings in the country. However, some estimations can be determined through the fishery data collection mechanism that was established before 2010. The system then was organised such that the fishermen reported daily catches to a designated staff member at their respective Island Offices who compiled the information into a “Monthly Fishing Report” and forwarded to the then, Statistics and Data Management Section of the Ministry (Anderson, Adam and Hafiz, 2003). This system of data reporting remained until January 2018 but was gradually being phased out since introduction of the logbooks in 2010. At present, billfish catch data are reported through tuna and reef fishery logbooks.

Based on surveys conducted by the Ministry of Fisheries, Marine Resources and Agriculture, it is estimated that around 850 vessels and 1300 fishers are engaged in the fishery. However, it is difficult to determine what proportion of this figure constitutes full-time and part time fishers.

Small boats (15 - 10ft) that can accommodate 3 to 4 fishermen are commonly used in this fishery. These vessels (especially the smaller vessels) shift between reef fishing and billfish fishing interchangeably, depending on the season, catch likelihood, and the price of fish. Approximately 2300 metric tonnes of billfishes are landed in the Maldives per year.

There are two methods used by the fishermen to catch billfish, namely, Trolling and Drifting Droplines. The prominence of either of the two methods largely depends on the season. During the early months of Southwest monsoon, most fishermen are known to prefer trolling over drift lining. This is believed by the fishers to be the best period of the year for billfish fishing, and the trolling method is argued to be more efficient. During trolling trips, the boats use up to 5 lines, with a locally made artificial, hookless lure. This has wool strings attached, which entangle the billfish's rough bill when it attacks the lure. Once properly entangled, the fish is pulled towards the boat and the bill is secured before the catch is killed with a hard blow to the head. When using drifting droplines, fishers use a float, monofilament line, a swivel, a wire lead and a baited barbed hook (Jauharee 2015). A boat may deploy between 10 to 15 lines at a time. The most common species of bait used with drifting droplines are bigeye scads, mackerel scads and redtoothed triggerfish.

Another important and unique fishing method that was previously used is "*heymas helun*". This method is still practised in some parts of the Maldives even today. In this method, the fisher uses a stick with a baited rope attached to the end of it. The stick also has a gaff snapped onto it (Figure 1).



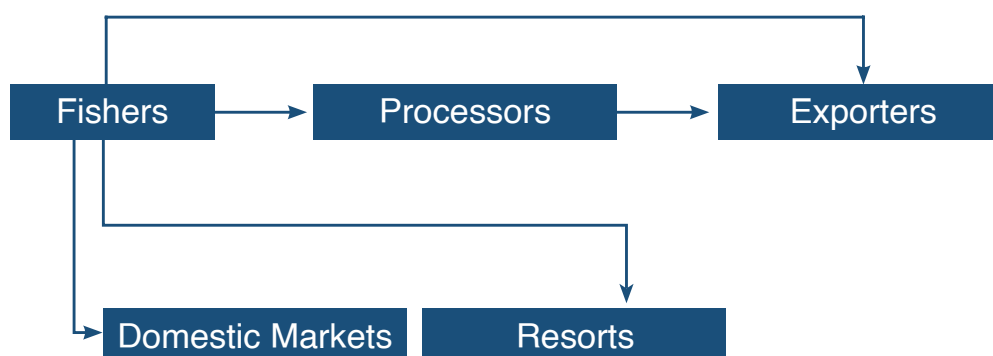
- **Figure 1:** The gear used in "heyman helun" method of fishing

The fisher sweeps the stick across the surface of the water to lure the billfish, and when close, the fish is gaffed, and the rope is quickly pulled up towards the boat (Naseer 1986). Billfish fishing vessels typically operate outside of the atoll. A typical fishing trip lasts for around 4 to 6 hours.

Billfish were also caught as bycatch in the longline fisheries targeting bigeye tuna that operated between 1985 and 2009 and then from 2011 and 2019. Swordfishes caught in the longline fishery accounted for more than half of the billfish bycatch landings in that fishery. Other tuna and reef fishers are also known to land billfishes.

3.2 Processing & Export

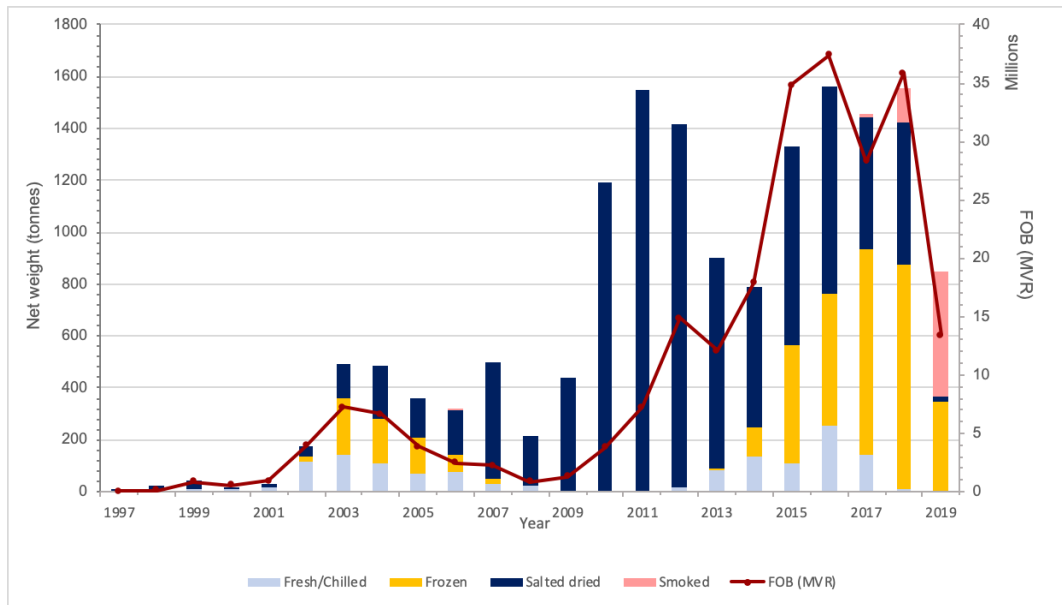
In most islands, the catch is sold to independent billfish processors, although in some islands the processing is done by fishers themselves. The typical supply chain is illustrated in Figure 2.



• **Figure 2:** Flow diagram of billfish supply chain

The bulk of the exports are salt dried. The drying process reduces the live weight of billfish up to a third of its bodyweight. Frozen billfish fillets are becoming an increasingly popular product as these fetch a higher price than salt dried billfish. Salt dried fish are primarily for export to the Sri Lankan market while frozen fillets are marketed domestically and also exported. The majority of the frozen and fresh/chilled billfish products are produced from the tuna longline bycatch landings.

Billfish fishers are not required to report their catch data and not all landings are exported, hence it is difficult to accurately gauge the quantity of billfish caught in the Maldivian waters. However, the export data compiled by the Maldives Customs Service provide some understanding of the catch trend, although not by species (Figure 3).



• **Figure 3:** Export of billfish products from 1997 - 2019

The bulk of the swordfish within the frozen and fresh exports in the last few years is likely to have been sourced primarily from the longline fleet. In 2009, the Government of Maldives ceased licensing of foreign longline vessels to allow for a completely localised fleet. This is likely to have contributed to an almost complete lack of frozen and fresh/chilled billfish exports in the Maldives during the subsequent years, as the majority of such forms of products are from the foreign longline bycatch landings of billfish.

In 1997 and 1998, all billfish products were exported exclusively to Sri Lanka. However, since 1999, the market has expanded to Europe, North America and several Asian countries.

3.3 Regional Management Efforts

The 1982 United Nations Convention on the Law of the Sea (UNCLOS), in its Annex I, lists sailfishes, marlins and swordfish as highly migratory species (United Nations Convention on the Law of the Sea 1982). The Fish Stocks Agreement (UNFSA), a multi-lateral treaty signed in 1995 for the conservation and management of straddling fish stocks and highly migratory species, forms the basis for cooperation in managing such stocks.

The Indian Ocean Tuna Commission (IOTC) was established in 1993 for the management of tuna and tuna-like species in the Indian Ocean. It works to promote cooperation among Indian Ocean coastal states and states and entities fishing for species under the management of IOTC, in order to ensure the conservation and appropriate utilisation of fish stocks. This is achieved through binding Conservation and Management Measures (CMMs) adopted by the Commission. Maldives became a full member of the IOTC on 13th July 2011.

The subsidiary bodies of the Commission, Scientific Commission and Working Parties contribute to the development of management measures and stock statuses on regular cycles for species of concern. The stock status of billfish species in the Indian Ocean is assessed by the Working Party on Billfish (IOTC 2019)

Chapter 4



Objectives and Strategies of this Plan

This management plan comprises of objectives, strategies, and actions that would contribute towards achieving the overall purpose.

The five specific objectives are;

- (1) Ensure that the harvesting, processing and trading of billfish is carried out through the application of principles of sustainability, ecosystem-based management and the Precautionary Approach;
- (2) Prioritise evidence-based policymaking through the collection of biological and socio-economic data on billfish fishery and associated resources;
- (3) Implement a Monitoring, Control and Surveillance (MCS) mechanism and strengthen data collection and data reporting mechanisms for the billfish fishery and trade;
- (4) Ensure equitable benefits to all Maldivians and improve their livelihoods through decentralised development of billfish fishery and trade;
- (5) Increase education and awareness on billfish and associated resources amongst stakeholders and the general public.

Strategies and actions developed to achieve these objectives are summarised in Table 1.

Table 1: Breakdown of each objective by strategies, actions, timeframe and responsible parties

Objective 1 Ensure that the harvesting, processing and trading of billfish is carried out through the application of principles of sustainability, ecosystem-based management and the Precautionary Approach			
Strategy	Action	Time frame	Responsible parties
1.1 Adopt precautionary approach for the management of the fishery in the absence of reliable data or full scientific certainty	1.1.1 In the event where catch limits or reductions are required by the IOTC, implement such measures at a national level and establish mechanisms to allow fair and equitable access to the resources	Within one year of implementation of this Plan	o Ministry o MMRI
	1.1.2 Implement and enforce the minimum size limits on billfish species, as required by the IOTC	Within one year of implementation of this Plan	o Ministry
1.2 Promote the use of environmentally friendly gears and techniques in the billfish fishery	1.2.1 Implement and enforce the restriction on the use of fishing methods or gears prohibited in the Act No.2019/14 (Fisheries Act of the Maldives) and its pursuant regulations	Immediate	o Ministry o MNDF - CG o MPS
	1.2.2 Promote the use of circle hooks amongst recreational and sport fishers targeting billfish	Short-term (1 - 3 years)	o Ministry o MMRI
1.3 Maintain a leading role in regional and international fisheries management organisations such as RFMOs and Regional Fishery Bodies (RFBs) in management and conservation of billfish	1.3.1 Actively participate in the scientific and management processes of IOTC, SWIOFC and other relevant regional and international bodies	Immediate	o Ministry o MMRI
Objective 2 Prioritise evidence-based policymaking through the collection of biological and socio-economic data on billfish fishery and associated resources			
Strategy	Action	Time frame	Responsible parties
2.1 Strengthen data collection on biological and socio-economic aspects of billfish fishery to support evidence-based policymaking	2.1.1 In order to inform the IOTC's stock assessment process, implement a nationwide size sampling and survey programme to estimate the sizes of billfish landed in the Maldives	Within one year of implementation of this plan	o MMRI

	2.1.2 Gather geographical information on fishing grounds using fishery data and field survey to understand the spatio-temporal exploitation patterns in billfish fishery	Immediate	o Ministry o MMRI
	2.1.3 Conduct a series of surveys to identify and understand socio-economic aspects of billfish fishery in the Maldives	Immediate	o Ministry o NBS o Local councils
Objective 3 Implement Monitoring, Control and Surveillance (MCS) and strengthen data collection and data reporting mechanisms for the billfish fishery and trade			
Strategy	Action	Time frame	Responsible parties
3.1 Establish an effectively monitored trade flow	3.1.1 Establish licensing arrangements for commercial billfish fishing vessels	Within one year of implementation of this plan	o Ministry o Local Councils
	3.1.2 Establish licensing arrangements for billfish processing facilities	Within one year of implementation of this plan	o Ministry o MFDA o Local Councils
	3.1.3 Establish registration arrangements in "Fisheries Information System - <i>Keyolhu</i> " for those engaged in billfish fishery and trade	Within one year of implementation of this plan	o Ministry o Maldives Customs Service
3.2 Establish an efficient documentation scheme for billfish fishery	3.2.1 Establish mechanisms to collect catch and effort data from harvesters through fishery logbooks, and conduct awareness programmes to improve accuracy of data submitted by fishers	Within one year of implementation of this plan	o Ministry o Local council
	3.2.2 Establish mechanisms to collect purchase reports from tourist resorts	Medium-term (3 - 5 years)	o Ministry o MoT
	3.2.3 Require facilities or individuals processing billfish to submit purchase reports to the Ministry	Within one year of implementation of this plan	o Ministry



	3.2.4 Require export companies to maintain and submit purchase records to the Ministry	Short-term (1 - 3 years)	o Ministry
	3.2.5 Require exporters to accompany an approved catch certificate with all consignments of billfish and billfish products that are exported	Short-term (1 - 3 years)	o Ministry o Maldives Customs Service
3.3 Establish an effective monitoring and enforcement system to ensure effective compliance to regulations related to billfish fishery and trade	3.3.1 Work with other government agencies to monitor exports of billfish and billfish products	Short-term (1 - 3 years)	o Ministry o Maldives Customs Service o MFDA o MIRA
	3.3.2 Ensure compliance to regulations related to billfish fishery and trade through fisheries rangers established in different regions of the country	Short-term (1 - 3 years)	o Ministry o Local councils
	3.3.3 Establish mechanisms to inspect fishing vessels, processing facilities, landing sites and airports to ensure compliance	Medium-term (3 – 5 years)	o Ministry o MMRI o Maldives Customs Service

Objective 4 | Ensure equitable benefits to all Maldivians and improve their livelihoods through decentralised development of billfish fishery and trade

Strategy	Action	Time frame	Responsible parties
4.1 Assist in the promotion of fish products and foster new market opportunities for billfish fishery and trade	4.1.1 Support the diversification of value-added billfish products and foster new business opportunities to maximise economic returns to billfish fishers and traders	Long-term (5 – 10 years)	o Ministry
4.2 Increase profitability for billfish fishing communities	4.2.1 Facilitate and encourage billfish fishers to participate in existing benefit schemes that are targeted for fishers	Immediate	o Ministry



4.3 Identify and engage stakeholders to ensure that policy decisions are made through a Participatory Approach	4.3.1 Establish, maintain, and update a fishers' registry, <i>Masveringe Dhaftharu</i> , to identify fishing communities dependent on billfish resources	Within one year of implementation of this plan	o Ministry
	4.3.2 Engage with stakeholders and take their views and feedback into account in the implementation of management measures	Immediate	o Ministry
	4.3.3 Work in close liaison with key billfish fishing communities, traders, civil society and the tourism sector	Immediate	o Ministry

Objective 5 | Increase education and awareness amongst stakeholders and the general public

Strategy	Action	Time frame	Responsible parties
5.1 Promote awareness and understanding of the billfish fishery in the Maldives, its contribution to the economy, and management interventions	5.1.1 Based on data availability, compile and disseminate information on: <ul style="list-style-type: none"> • status of fishery; • trade and exports; and • revenue to Maldives 	Short-term (1 – 3 years)	o MMRI o Ministry o MoED o MIRA o Maldives Customs Service o NBS
	5.1.2 Educate fishers, traders, processors, exporters and enforcement officers about new and existing regulations via workshops, trainings and awareness campaigns	Immediate	o Ministry o MMRI o Maldives Customs Service o MPS o MNDF – CG

Chapter 5



Management measures

In the best interest of fishing communities and industry, it is critical that timely management measures are introduced so that this resource is sustainably managed to the benefit of stakeholders and future generations. Measures that will be implemented to achieve the objectives and strategies of this Plan are summarised below.

5.1 Establishment of an advisory committee

An advisory committee will be established to advise the Ministry on management of billfish stocks, fishery and trade. The committee will also give recommendations to the Ministry on research and sustainable development of this fishery. The meetings of the committee will be convened at least once per year.

The committee will comprise of the following members:

- (a) A Chairperson (representative of the Fisheries Department);
- (b) Representative of MMRI;
- (c) 3 (three) representatives of billfish harvesters;
- (d) 2 (two) representatives of billfish exporters;
- (e) A representative from the Ministry of Environment;
- (f) A representative from the Ministry of Economic Development;

- (g) A representative from Local Government Authority;
- (h) A relevant locally registered NGO.

A public announcement will be made by the Ministry, calling for Expressions of Interest for the following Committee positions:

- (a) Representatives of billfish harvesters;
- (b) Representatives of billfish exporters;
- (c) Representative from the NGO

The responsibilities of the Committee will include:

- (a) Monitoring the implementation of this Plan and briefing the Minister on its progress on an annual basis;
- (b) Reviewing technical and other reports pertaining to the billfish fishery;
- (c) Advising on management measures in response to the outcomes and recommendations from the technical reports and stakeholder workshops and consultations;
- (d) Advising the Ministry on implementation of relevant regional and international management measures on a national scale; and
- (e) Advising the Ministry on the implementation, monitoring and review of this Plan.

5.2 Licensing

One of the overarching aims of establishing a licensing mechanism is to identify parties that are engaged in the fishery and those who are economically dependent on the fishery resources. Such a mechanism also supports the collection and management of fisheries data. Furthermore, the licensing mechanism plays a crucial role in providing the Ministry with information that contributes towards the development of the fisheries sector and the extension of essential services to fishers.

In addition, a licensing mechanism also allows for the formal recognition of stakeholders engaged in the fishery and trade, which in turn facilitates

the Ministry to safeguard their rights and ensure their social and economic security. Maintaining records of the fishing fleet and crew members, as well as information on fish processing facilities, through a licensing system assures the international community that the Maldivian fisheries are effectively and responsibly managed. Such records also serve as an important basis for planning and implementing fishery development projects.

In light of these considerations, the following parties operating within the billfish fishery and trade will be required to acquire a license:

- (a) All commercial fishing vessels;
- (b) All commercial parties that perform any form of processing of billfish.

The general process of application for and issuance of licenses, their renewal and revocation as well as conditions of the licenses will be set forth in the relevant regulations. The Ministry will establish, maintain and update a database of licensed parties.

5.3 Data collection and Management

Collection and management of comprehensive catch and effort data and maintenance of fisheries statistics is an important measure that contributes towards assessing changes in the abundance of fish stocks in response to fishing. It also plays a critical role in ensuring that stocks are fished at sustainable levels and that future generations continue to benefit from these resources. The fundamental tool used for this purpose is the fishery logbooks, in which catch composition, fuel usage, fishing grounds and other trip details, for each fishing trip, are recorded and submitted by the licensed vessels. Other vital information collected on the fisheries sector include details on processing and trade of fish and fishery products.

Some of this information is shared with regional and international fishery management bodies that Maldives is party to, one of which is the Indian Ocean

Tuna Commission (IOTC). IOTC was established to facilitate cooperation among member states in the conservation, management and optimum utilisation of straddling fish stocks and highly migratory species in the Indian Ocean. The catch and effort data shared with IOTC informs regional fishery management decisions and will contribute towards ensuring fair and equitable allocation of fishery resources to the Maldives.

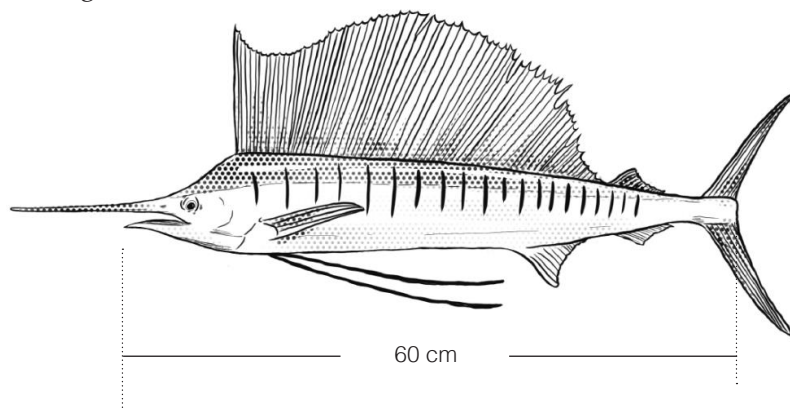
In consideration of the aforementioned factors, an integrated data collection system will be established and used to collect the following information:

- Logbook / fishery data from licensed fishing vessels;
- Purchase reports from licensed billfish processors / processing facilities;
- Purchase reports from parties exporting billfish and billfish products.

5.4 Size limit

The IOTC has implemented a number of Conservation and Management Measures (CMMs) to ensure that billfish stocks in the Indian Ocean are fished and managed sustainably. Among these, is the establishment of a minimum size limit on billfish species. This measure will be locally implemented, and harvesting, retaining on board, storing, transshipping, landing, trading or processing any specimen smaller than 60 cm in Lower Jaw Fork Length (LJFL) of any of the billfish species will be prohibited.

Guidance on how to measure lower jaw fork length of a billfish is illustrated in Figure 3.



• **Figure 4:** Illustration of how to measure a billfish

5.5 Catch certification

Catch certification is an essential instrument that helps prevent, deter and eliminate Illegal, Unreported and Unregulated (IUU) fishing. Through such a scheme, the catch is certified to have been made in accordance with applicable laws, regulations and international conservation and management measures, fully assuring consumers that the fish traded in the Maldives are sourced from a sustainably and responsibly managed fishery.

The catch certification scheme established by the Ministry will be expanded to include billfish exports, and all exporters will be required to submit an approved catch certificate with all consignments of billfish products. Details of the fishing vessel, date of catch as well as information on the processing facility will also be collected through the scheme. This will help to track the flow of the product through the supply chain, ensuring product traceability at all stages, from 'hook to plate'.

5.6 Precautionary Measures

The Precautionary Approach promotes the application of timely and cost-effective measures to safeguard ecosystems and prevent irreparable damage to them, despite the lack of full scientific certainty. This approach falls within the purview of international best practices for sustainable management of natural resources (UNCED, 1982). In this regard, additional measures that are not stated in this Plan may be taken to protect and manage billfish stocks. These measures may include but are not limited to the following:

- (a) Declaring the closure of a specific area within Maldives and prohibiting the extraction of billfish from the no-take zone;
- (b) Prohibiting the capture, processing or export of a specific species of billfish;
- (c) Adjusting size requirements of billfish that can be harvested;
- (d) Implementing a species catch / export quota;
- (e) Impose other restrictions on activities that may affect billfish stocks.

Chapter 6



Implementation of this Plan

The Ministry is responsible for the implementation of each objective in this management plan, by strategies and actions, as outlined and in coordination with the relevant agencies. The Ministry shall also formulate a regulation, under the Fisheries Act of the Maldives, to implement and enforce all billfish fishery management measures stated in this Plan. The Maldives Marine Research Institute shall formulate and implement a plan of action to undertake all research activities that the institute is responsible for under this Plan.

Chapter 7



Reviewing the Management Plan

This Plan will be reviewed and revised every 5 (five) years. The Ministry will ensure the engagement of billfish fishing communities, licence holders, processors, exporters, civil society and other stakeholders in the review process. Where there is an immediate need to revise any part(s) or measures of this Plan, the Ministry shall carry out such revisions in consultation with the Committee.

References



- Allen, G. R., and R. C. Steene. 1988. Fishes of Christmas Island Indian Ocean. Page Christmas Island Natural History Association, Christmas Island, Indian Ocean, 6798. Australia.
- Chi-Lu, S., C.-S. Liu, and S.-Z. Yeh. 2007. Age and Growth of Black Marlin (*Makaira indica*) in the Waters off Eastern Taiwan. Pages 21–1 Scientific Committee Third Regular Session. Western and Central Pacific Fisheries Commission, Honolulu, United States of America.
- Elepathage, T. S. M., D. Tang, and L. Oey. 2019. The Pelagic Habitat of Swordfish (*Xiphias gladius*) in the Changing Environment of the North Indian Ocean. Sustainability (Switzerland) 19–1:(24)11.
- Girault, I., P. S. Sabarros, E. V Romanov, and P. Bach. 2019. Billfish size-at-maturity in the western Indian Ocean.
- IOTC-WPB. 2019. Assessment of Indian Ocean Indo-Pacific Sailfish (*Istiophorus platypterus*) using catch-only methods. Page IOTC–2019–WPB–24.
- IOTC. 2019. Report of the 17th Session of the IOTC Working Party on Billfish. La Réunion, EU, France.
- Jauharee, A. R. 2015. The Maldives billfish fishery – an update.
- Kitchell, J. F., S. J. D. Martell, C. J. Walters, O. P. Jensen, I. C. Kaplan, J. Watters, T. E. Essington, and C. H. Boggs. 2006. Billfishes in an ecosystem context. Bulletin of Marine Science –669:(3)79 682.
- Loor-Andrade, P., J. Pincay-Espinoza, M. Carrera-Fernández, and R. Rosas-Luis. 2017. Feeding habits of billfishes (Carangaria: Istiophoriformes) in the Ecuadorian Pacific Ocean. Neotropical Ichthyology 3)15). Sociedade Brasileira de Ictiologia.
- Nakamura, I. 1985. Billfishes of the world. An annotated and illustrated catalogue of marlins, sailfishes, spearfishes and swordfishes known to date. Page FAO Species Catalogue. Fisheries Research Station, Kyoto University, Kyoto, Japan.
- Naseer, A. 1986. Heymas helun : Dhivehi masverikamuge baavatheh. Rasain 77–6:76.
- Pillai, P. P., and U. Shoji. 1978. Distribution and biology of the striped marlin , *Tetrapturus audax* (Philippi) taken by the longline fishery in the Indian Ocean. Bull. Far Seas Fish. Res. (32–9):(16.

Potier, M., F. Marsac, Y. Cherel, V. Lucas, R. Sabatié, O. Maury, and F. Ménard. 2007. Forage fauna in the diet of three large pelagic fishes (lancetfish, swordfish and yellowfin tuna) in the western equatorial Indian Ocean. *Fisheries Research* 72–60:(1)83.

Restrepo, V., M. J. Juan-Jordá, B. B. Collette, F. L. Frédou, and A. Rosenberg. 2016. Tunas and Billfishes. Page First Global Marine Assessment (World Ocean Assessment).

Sepulveda, C. A., A. Knight, N. Nasby-Lucas, and M. L. Domeier. 2010. Fine-scale movements of the swordfish *Xiphias gladius* in the Southern California Bight. *Fisheries Oceanography* 289–279:(4)19.

Shimose, T., K. Yokawa, and H. Saito. 2010. Habitat and food partitioning of billfishes (Xiphiidae). *Journal of Fish Biology* 2433–2418:(10)76.

UN General Assembly. 1982. United Nations Convention on the Law of the Sea.

Zhou, C., X. Wang, F. Wu, L. Xu, J. Zhu, and X. Dai. 2019. Length at maturity of four billfish species in the Indian Ocean based on Chinese longline observer data IOTC-2019-WPB14-17.

Annex 1: Glossary



(a) Commercial fishing	Fishing or Harvesting for the purpose of obtaining a financial benefit.
(b) Enforcement officer	Any officer designated pursuant to Section 57 of the Act No. 2019/14 (Fisheries Act of the Maldives) to enforce regulations made under the Act.
(c) Fisheries Ranger	Persons who are appointed for and by the Ministry under Section 58 of the Act No. 2019/14 (Fisheries Act of the Maldives).
(d) Fishing / Harvesting	<ol style="list-style-type: none"> (1) searching for the purpose of catching, taking, killing and harvesting of fish; (2) attempting to search for, catch, take, kill or harvest fish; (3) engaging in any other activity that results in the searching, catching, taking, killing or harvesting of fish; (4) placing or searching or retaking of any fish aggregating device or equipment including “radio beacons”; (5) undertaking any operation at sea or on an island in preparation for any activity mentioned in subsections (3) ,(2) ,(1) or (4).
(e) Fishing vessels	Any type of vessel, ship or any other thing which is used for fishing, which has been prepared for fishing, or which is usually used for fishing or related activities.
(f) Logbook	Any instruments provided by the Ministry to record data on fishing trips, including catch and effort data, submitted electronically or via any other medium determined by the Ministry.
(g) Lower jaw-fork length	Projected straight distance from the tip of the lower jaw to the shortest caudal ray (fork of the caudal fin).

(h) Management plans	The plan with regard to fisheries planning, management and development in relation to Chapter Three of the Act no.: 2019/14 (Fisheries Act of the Maldives).
(i) Master / Captain	Person holding the most responsible position at any given time on-board a fishing vessel.
(j) Minister	The minister responsible for fisheries, including aquaculture.
(k) Ministry	The ministry responsible for fisheries, including aquaculture.
(l) Offence	Administrative offences prescribed in this Plan
(m) Precautionary measures	In the absence of complete information based on scientific research or where a matter has not been proved, measures adopted to manage the natural resources in a sustainable manner considering the possibility of an adverse outcome if such measures are not taken.
(n) Processing	Activities undertaken to clean, package, pack or bring any change to fish in order to preserve fish for a long period or add value to it.
(o) Processing facilities	Lands, buildings, or such other places on or in which: <ol style="list-style-type: none">(1) fish or aquaculture products are cleaned, packaged, dried, salted, chilled, frozen or otherwise processed for sale in and outside the Maldives; or(2) fish or aquaculture products are stored for the purposes of packaging, canning, drying, cleaning, salting, chilling, freezing or otherwise for processing for sale in and outside the Maldives.

(p) Protected
species

All species, including those with size restrictions, protected from targeting, extraction, retaining, processing or trading under any regulations or management plans made pursuant to Act No.: 2019/14 (Fisheries Act of Maldives)

(q) Owner

The person who fulfils the duties and obligations of, represents as having the rights of, or accepts the obligations of, whether in personal capacity or through another person, the owner; and person or persons associated with the owner, or the manager, director or secretary of a legal entity.



Ministry of Fisheries, Marine Resources & Agriculture

Malé, Maldives