In the name of God

"Evaluating the Status of Large Pelagic Fisheries in Iran: A Focus on Sustainable Management of Billfish fisheries

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Abstract

The fishery for tuna and tuna-like species is a major component in large pelagic fisheries in Iran and is one of the most important activities in the Persian Gulf, Oman Sea, and the high seas.

In 2021, the country produced nearly 1.2 million tonnes of aquatic products, with marine capture fisheries accounting for approximately 702 thousand tonnes. Additionally, aquaculture activities contributed an additional 556 thousand tonnes to the national output. The production of large pelagic fishes amounted to around 334 thousand tonnes, representing approximately 48% of the country's total catch in 2021.

The estimated total quantity of tuna and tuna-like species is approximately 274 thousand tonnes. The catch of billfish accounts for about 25 thousand tonnes, representing 7.6% of the total large pelagic catch. The dominant species within this category are as follows: Sailfish (16,566 t), followed by black marlin (4,637 t). Additionally, swordfish accounted for 1,152 t, striped marlin for 823 t, and other billfish species amounted to 2,237 t. While billfish are not typically targeted species, they are considered as by-catch species. However, in accordance with Iran's domestic regulations for tuna and tuna-like species, all data regarding the billfish catch will be collected and reported.

Approximately 11 thousand fishing vessels, including fishing boats, dhows, and ships, are actively engaged in fishing within the Iranian coastal waters of the Persian Gulf, Oman Sea, and the high seas. There are four primary fishing methods employed to target large pelagic species: gillnetting, purse seining, longlining, and trolling. It should be noted that gillnetting is the predominant fishing gear used in the IOTC area of competence. The majority of production originates from gillnet vessels operating within the EEZ and the high seas. Longlining is employed to a limited extent by certain traditional dhows, while trolling is utilized by small boats involved in coastal fisheries.

In order to effectively manage the exploitation of large pelagic stocks within the country, the primary approach revolves around focusing on the policy of reducing and adjusting fishing effort in this sector. This policy aligns with that of the Indian

Ocean Tuna Commission, which seeks to strike a balance between the harvest levels of these stocks and the maintenance of sustainable fishing conditions.

Annually, dedicated efforts are undertaken in Iran to adapt and implement the recommendations set forth by the Indian Ocean Tuna Commission (IOTC). The primary objective is to identify appropriate locations for implementation that foster cooperation and active involvement from the fishing community.

It is imperative to enhance the education and training workshops aimed at emphasizing the significance of sustainable fishing practices for large pelagic species. These workshops are deemed essential for effectively managing the sustainable exploitation of tuna and tuna-like species, including billfish stocks within the country.

This paper aims to provide an overview of the catch trends for large pelagic species, including billfish, in the country from 2012 to 2021. Furthermore, it evaluates the effectiveness of the conservation and management measures that have been implemented to secure the long-term sustainability of these valuable marine species in the region.

1. Introduction

Billfish are a group of large, epipelagic, and highly migratory fishes that inhabit the tropical, subtropical, and temperate waters of the world's oceans. They can be found in the Indian Ocean specifically in the FAO major fishing areas 51 (Western Indian Ocean) and 57 (Eastern Indian Ocean), where six species of billfish reside, including the black marlin (*Istiompax indica*), Indo-Pacific sailfish (*Istiophorus platypterus*), striped marlin (*Kajikia audax*), blue marlin (*Makaira nigricans*), short bill spear-fish, and swordfish (*Xiphias gladius*).

These apex predators not only contribute to the ecological balance of the marine ecosystem but also hold significant cultural, economic, and recreational value. However, increased fishing pressure, habitat degradation, and unsustainable practices threaten the survival of billfish populations. As their numbers dwindle, it not only affects the balance of marine ecosystems but also jeopardizes the livelihoods of countless communities that rely on these fish for **sustenance** and income.

To address these issues, conservation efforts are necessary. Implementing stricter fishing regulations and enforcing sustainable fishing practices are essential to protect billfish populations.

2. Iran marine capture fisheries and aquaculture production

Iran's fisheries production consists of two parts: aquaculture activities and marine capture fisheries activities. Each of these activities has its own social and technical considerations that are specific to their respective requirements. The fishing community, which constitutes a large percentage of the population in coastal areas of the Persian Gulf, Oman Sea and Caspian Sea, has always been a center of attention and sensitivity in fishing management plans.

In 2021, Iran's overall fish production amounted to 1,258,910 tonnes of fish, with 672,596 tonnes (54%) originating from the Persian Gulf, Oman Sea and High Seas; around 29,864 tonnes (2%) from the Caspian Sea, and 556,450 tonnes (44%) through the aquaculture. (Fig. 1)
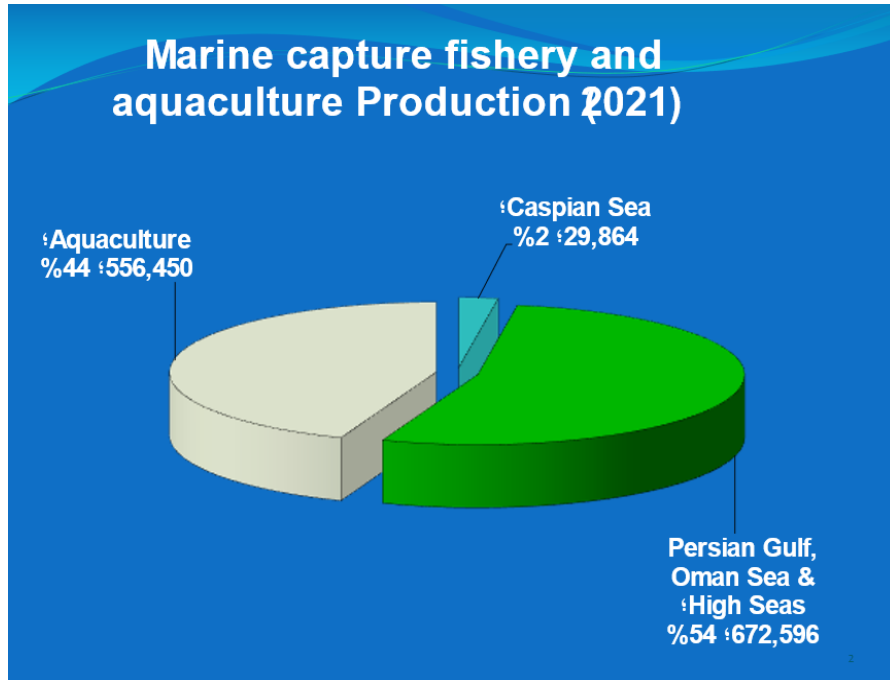
Figure 1: Total marine capture fisheries and aquaculture production of Iran (2021)

Figure 2 presents the historical data of Iran's marine capture fisheries and aquaculture production from 1995 to 2021. The pie chart illustrates the average catch for a period of 27 years. Approximately 60% of the total catch is accounted for by the Persian Gulf, Oman Sea, and the High Seas. The production from aquaculture represents around 3%, while that from the Caspian Sea accounts for 4%. (See Figure 2)
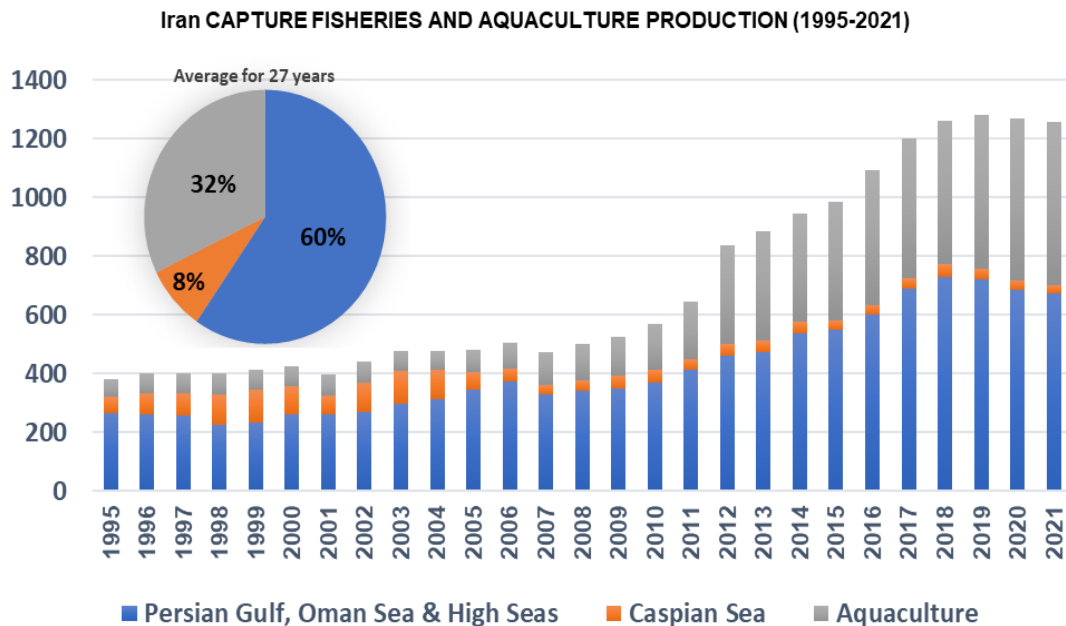

Figure 2: Total marine capture fisheries and aquaculture production of Iran (1995-2021)

3. Marine capture fishery (Iranian southern Fisheries)

In 2021, the total capture fisheries production in Iranian southern fisheries was approximately 673 thousand tonnes. However, capture fisheries in the Persian Gulf, Oman Sea, and High Seas have declined since 2018.

The following chart (Fig. 3) displays the trend of total catch harvested from the Persian Gulf, Oman Sea, and High Seas from 2001 to 2021. The data indicate an upward trend, peaking at 731 thousand tonnes in 2018. However, this trend was followed by a slight decrease to 673 thousand tonnes in 2021.
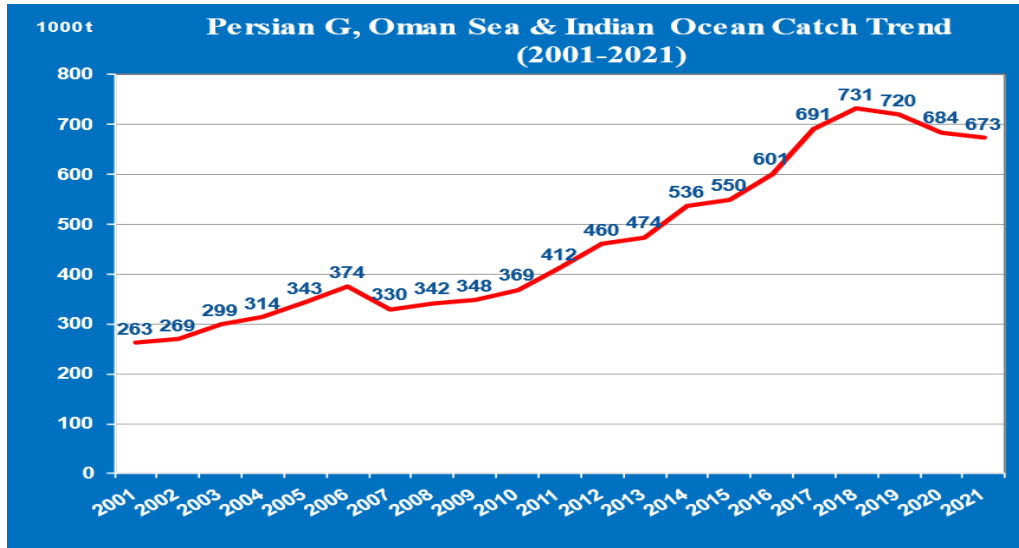

Figure 3: Trends in catch data for Iranian southern Fisheries (2001-2021)

The following pie chart (Fig. 4) provides a clear breakdown of the catch for 2021 by species group. Large pelagic species make up the largest portion of the catch, accounting for 334 thousand tonnes (50%). Demersal species constitute the second-largest portion, representing 229 thousand tonnes (34%) of the total catch.

Small pelagic species make up 101 thousand tonnes (15%) of the catch. Shrimp, on the other hand, comprises only 9 thousand tonnes (1%) of the total catch.

This pie chart provides important information for stakeholders in the fishing industry, helping to identify the dominant species groups being caught and assisting with the development and implementation of effective management and conservation measures.
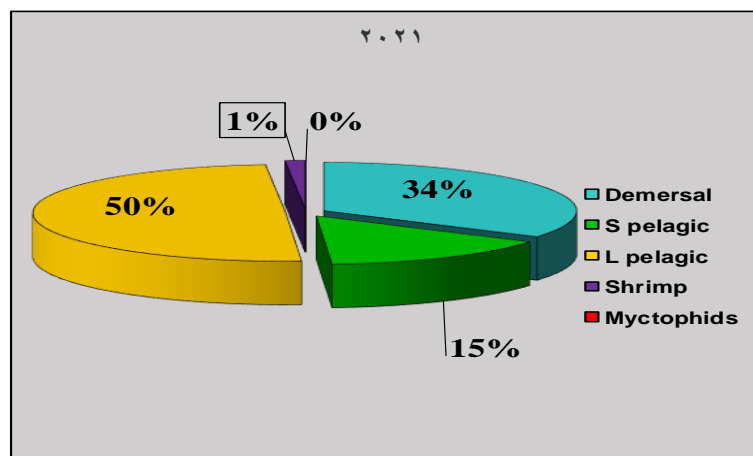

Figure 4: Catch by species group (2021)

The illustrated line chart (Fig. 5) represents the trend of the catch for various species groups in the Persian Gulf, Oman Sea, and High Seas from 2001 to 2021, providing valuable insights into the performance of the fishing industry in these regions. The chart shows an overall increasing trend in catch for large pelagic, small pelagic, and demersal species over the years, indicating the successful capture of these species.

However, the catch trend for shrimp and myctophids remained steady over the years. Interestingly, since 2019, there has been a decline in the catch trend for demersal species, decreasing from 283 thousand tonnes to 229 thousand tonnes in 2021. In a similar vein, the myctophids catch rate experienced a significant decline from 32 thousand tonnes in 2019 to zero in 2021, primarily due to the imposition of a seasonal ban on this particular species.

These trends could be attributed to a variety of factors, such as changes in environmental conditions, fluctuations in market demand, or the implementation of new fishing regulations. It is critical to monitor the catch trends for each species group closely, especially in these regions, which are known for their rich and diverse marine ecosystems.
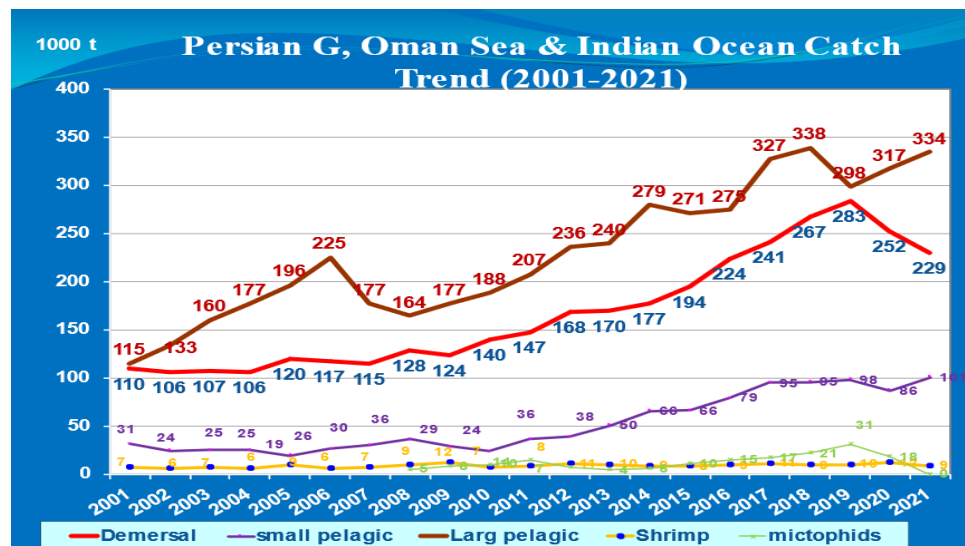

Figure 5: Trends in Catch for Different Species Groups (2001-2021)

4. Fishing gear and fleet structure

The fishing methods targeting large pelagic species in Iran include gillnet, purse seine, longline (traditional boats), as well as trolling by small boats in coastal fisheries. The gillnet fleet, in particular, consists primarily of locally made wooden and fiberglass vessels.

### a. *Total No. of fishing vessels in Iranian southern fishery*

The total number of fishing vessels in Iranian southern fisheries is nearly 10,739, of which around 6,118 fishing vessels are engaged in tuna fishing activities. Of all fishing vessels, 7,230 are boats, 3,387 are dhows, and 122 are industrial fishing ships. The number of fishermen directly engaged in fishing activities is about 126,527 individuals.

Table 1 Number of crafts operating in the IOTC area, by gear type and size

GEAR GROUP	Capacity GT	No. of cratfs
Purse seine	500 to 1000 t	2
	>1000 t	5
Total Purse seine fishing Craft		**7**
Coastal Artisanal Longline (seasonal and temporal)	< 3	280
	51 to 100	70
	100 to 200	0
	>1000	1
Total Coastal Artisanal Longline (seasonal and temporal) fishing Craft		**351**
Gillnet	< 3 t	3,168
	3 to 20 t	226
	21 to 50 t	271
	51 to 100 t	297
	>100 t	377
Total Gillnet fishing Craft		**4,339**
Trolling	< 3 t	1,771
Total Trolling fishing Craft		**1,771**
Total all Gear fishing Craft		**6,118**

b. Total No. of fishing vessels engaged in tuna and tuna-like fishery

In 2021, there were approximately 6,118 fishing vessels engaged in catching large pelagic species in the IOTC area of competence. This included five active purse seiners above 1,000 GT, 377 gillnet fishing dhows over 100 GT, 297 gillnet dhows between 51 and 100 GT, 497 gillnet dhows between 3 and 50 GT, and 3,168 gillnet fishing boats under 3 GT. Additionally, 1,771 trolling boats under 3 GT with outboard engines were also involved in day-long coastal fishing operations. *Table 1* shows the number of fishing vessels by gear type and vessel capacity.
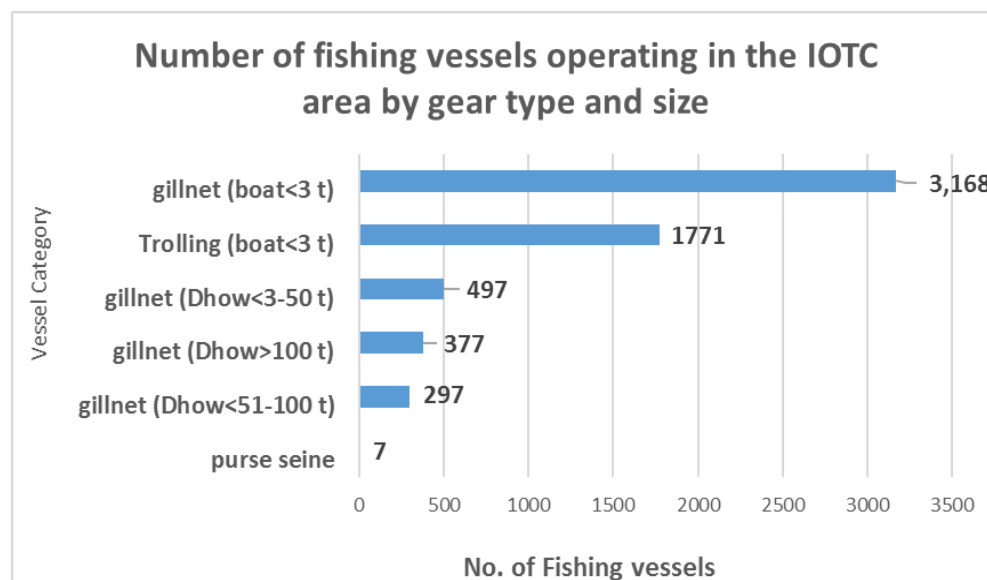
Figure 6: Number of fishing vessels operation in the IOTC area by gear type and size (2021)

Around 351 gillnet fishing dhows were active as longliners in 2021. These vessels were not included in the overall count of fishing vessels, as they are seasonal and temporary, operating only during certain fishing seasons.

5. Catch and Effort data (By gear and Species)

For this study, catch and effort data were collected from 69 landing centers located along Iran's southern coast. A stratified random sampling method was employed to ensure that the data was representative of the entire fishing fleet. Approximately 10% of the fishing vessels, including dhows and boats of various types, were randomly selected, and their fishing data were collected through questionnaires by trained field samplers.

In addition, the number of fishing days at sea is recorded in the data collection software, for all active fishing vessels. These data are raised based on the total fishing effort.

There is specific *scientific capture fishery statistic committee* at both the provincial and national levels, and fishery research experts and administrative officers are members of these committees. In these committees, trends of data collection and raising are evaluated and ultimately approved.

6. Fishing effort management

There is growing concern about the increasing fishing effort and the potential overfishing of these species. Fishing effort refers to the amount of fishing activity, including the frequency of fishing trips, and the fishing gear used. Excessive fishing effort can lead to a decline in fish populations, which can have significant ecological and economic impacts.

To mitigate the effects of fishing effort on tuna and tuna-like populations, Iran has taken several conservation and management measures. These include implementing limitations on engine power and dimensions for active fishing vessels according to the *Vessel Replacement Guidelines*, enforcing a 20-day moratorium or cessation of all fishing activities by fishing vessels in all provincial fishing grounds, establishing a seasonal fishing cessation for specific tuna species, including Narrow-barred Spanish Mackerel (COM), and implementing a *Fishing Effort Management Plan* in a designated area of the fishing grounds to control and adapt fishing effort. This plan will involve managing and adjusting the activities of various groups of vessels within the active fishing fleet.

Furthermore, several measures have been put into effect to decrease fishing efforts in specific regions. These measures include restricting the number of vessels permitted to fish in a particular area, regulating the use of fishing gear, shortening fishing seasons, reducing fishing days, increasing the mesh size in fishing nets, and promoting the adoption of selective fishing techniques that exclusively target the intended species. By adopting these measures, it is possible to sustainably manage tuna and tuna-like populations and guarantee the long-term sustainability of the fishing industry, which is heavily depends on them.

Table 2 provides an overview of the annual fishing effort for large pelagic species by various types of fishing fleets, including *purse seine*, *gillnet*, *longline* (traditional boats), and *trolling*, from 2012 to 2021.

Table 2 Annual fishing effort by different vessel categories (days)

GEAR GROUP	Capacity GT	Fishing effort by gear(days)									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Purse seine	500 - 1000	0	0	0	0	0	0	0	0	0	0
	1000 - 2000	450	981	727	1,005	1,164	1,085	715	1,164	401	376
Total Purse seine fishing effort		450	981	727	1,005	1,164	1,085	715	1,164	401	376
Coastal_Artisanal_Longline **	< 3	0	0	0	0	18,000	19,440	24,300	20,000	34,000	45,000
	21 to 50	0	0	0	0	3,200	6,600	14,025	11,040	9,520	0
	51 to 100	0	0	0	0	560	560	1,190	1,200	0	16,800
	Mechanised	0	0	0	0	0	0	0	0	0	0
Coastal_Artisanal_Longline ** fishing		0	0	0	0	21,760	26,600	39,515	32,240	43,520	61,800
Gillnet	< 3	515,372	557,434	538,550	552,367	487,646	438,046	516,149	487,646	764,432	541,066
	3 - 20	100,809	43,303	40,985	44,374	41,682	43,035	44,779	41,682	43,369	77,334
	21 - 50	176,132	195,643	184,070	72,121	74,870	58,114	51,045	74,870	44,594	60,629
	51 - 100	82,637	91,293	91,790	33,749	30,337	54,873	52,410	30,337	36,904	93,199
	101 - up	45,020	57,662	60,400	51,260	50,530	59,746	68,535	50,530	72,941	46,197
Total Gillnet fishing effort		919,970	945,335	915,795	753,871	685,064	653,815	733,918	685,064	962,241	818,425
Trolling	< 3	139,161	125,446	123,450	254,934	229,190	196,440	224,708	258,713	133,500	127,260
Total Trolling fishing effort		139,161	125,446	123,450	254,934	229,190	196,440	224,708	258,713	133,500	127,260
Total all Gear fishing effort		1,059,581	1,071,762	1,039,972	1,009,810	937,178	877,940	998,856	977,181	1,139,662	1,007,861

Figure 7 illustrates the trend of fishing effort for tuna and tuna-like species over the last ten years, from 2012 to 2021. The diagram suggests that the majority of the fishing effort, approximately 74%, was carried out by fishing boats. Fishing dhows, on the other hand, accounted for around 26% of the effort. While purse seine vessels were the least prevalent and responsible for less than 1% of the effort.
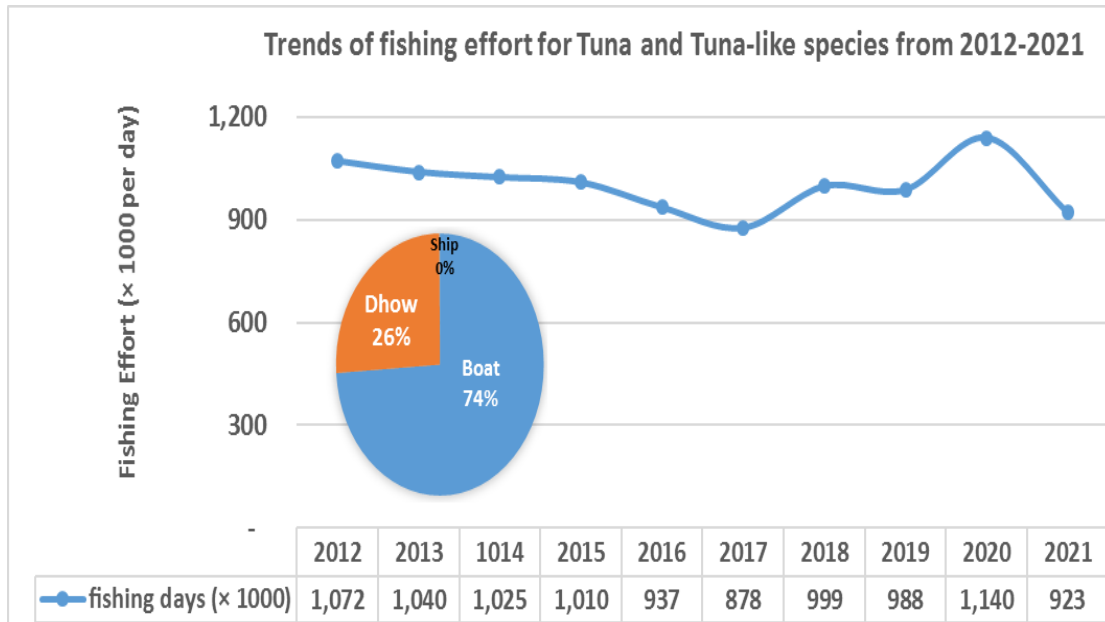

Figure 7: Trends of fishing effort for tuna and tuna-like species from 2012-2021

7. Billfish Species

The billfish species found in various fishing grounds of Iran and IOTC areas of competence are diverse. They can be found in the Indian Ocean specifically in the FAO major fishing areas 51 (Western Indian Ocean) and 57 (Eastern Indian Ocean), where six species of billfish reside, the dominant species including the black marlin (BLM), Indo-Pacific sailfish (SFA), Striped marlin (MLS), blue marlin (BLM), short bill spear-fish, and swordfish (SWO).
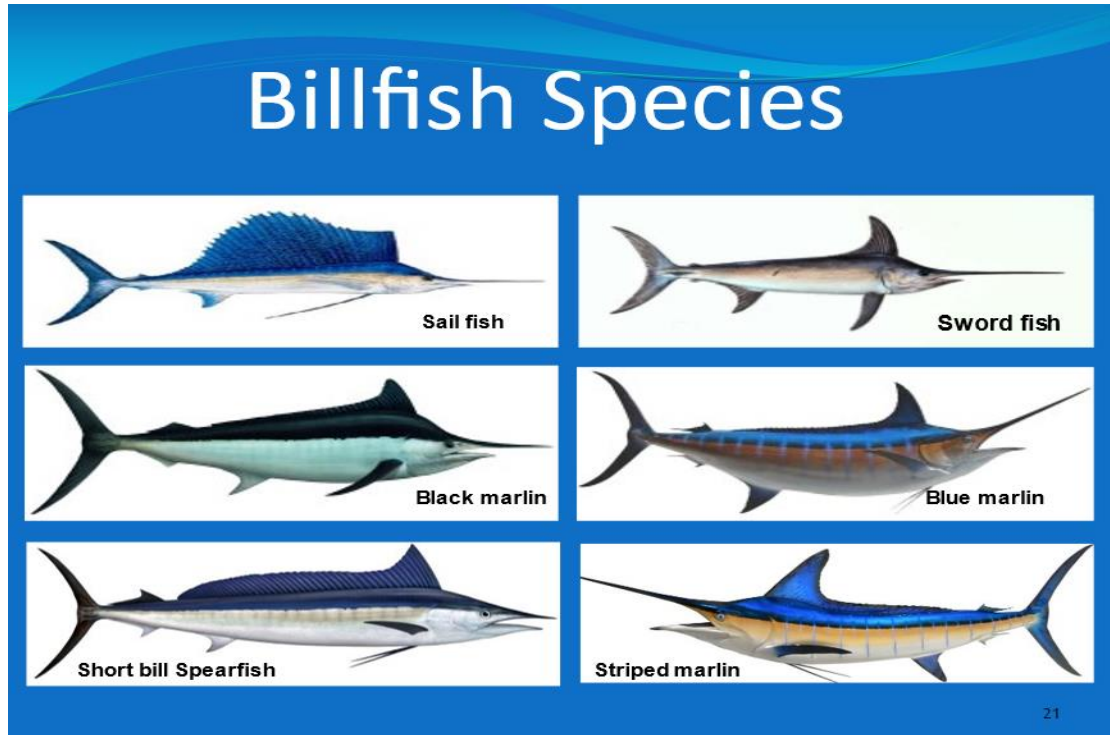
8. An Overview of the billfish catches in Iran

The billfish population in the Indian Ocean has been a topic of concern due to its declining status. Overfishing and habitat degradation have significantly affected their numbers, leading to a decrease in stock levels. The primary species of billfish found in this region include marlins, sailfish and swordfish. Billfish is capture by the Iranian pelagic gillnetters that operate in the region. Tuna is the main target species of these gillnetters; however, fishermen also consider billfish as an important by-catch species.

In 2021, the billfish catch was around 24,919 tonnes, which is approximately 7.5% of the large pelagic species and 2% of the total country catch.

The following diagram (fig. 8) depicts the average catch of various species of billfish over a 10-year period from 2012 to 2021. Out of the total catch of 24,919 tonnes, the sailfish was the dominant species, contributing 55% (10,145 t). Black marlin accounted for 27% (4,943 t), swordfish for 6% (1,006 t), and striped marlin for 4% (718 t). Other billfish species made up 8% of the total catch.
The major catch was attributed to two main billfish species, sailfish and black marlin, which accounted for 82% of the total billfish catch. Other species contributed only 18% of the total catch.

Species-wise contribution of Iran Billfish catch in the Indian Ocean (An average for 10-year catch from 2012-2021)

MLS : 718 : 4%

Other billfish : 1,520 : 8%

SWO : 1,006 : 6%
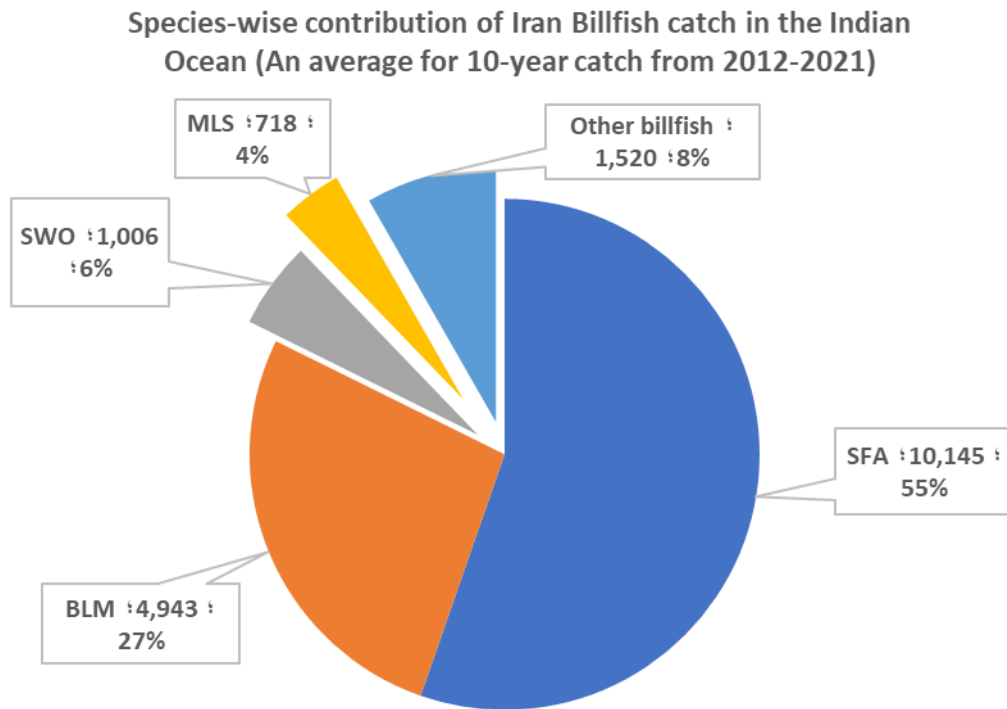
SFA : 10,145 : 55%

BLM : 4,943 : 27%

Figure 8: An average 10-year Catch for billfish Species (2001-2021)

The following chart (Fig. 9) presents a clear picture of the catch quantities of billfish species over a period of 2012 to 2021. As depicted in the chart, the sailfish and black marlin constituted the majority of the total billfish catch, making up around 82%. Other species of billfish contribute the remaining 18% of the overall catch (see Fig. 9).

Iran Billfishes catch trend by Species (2012-2021)

Catch (× 1000 tones)

SFA: 6, 7, 12, 10, 8, 10, 11, 8, 13, 17

BLM: 3, 4, 6, 6, 4, 5, 6, 6, 4, 5

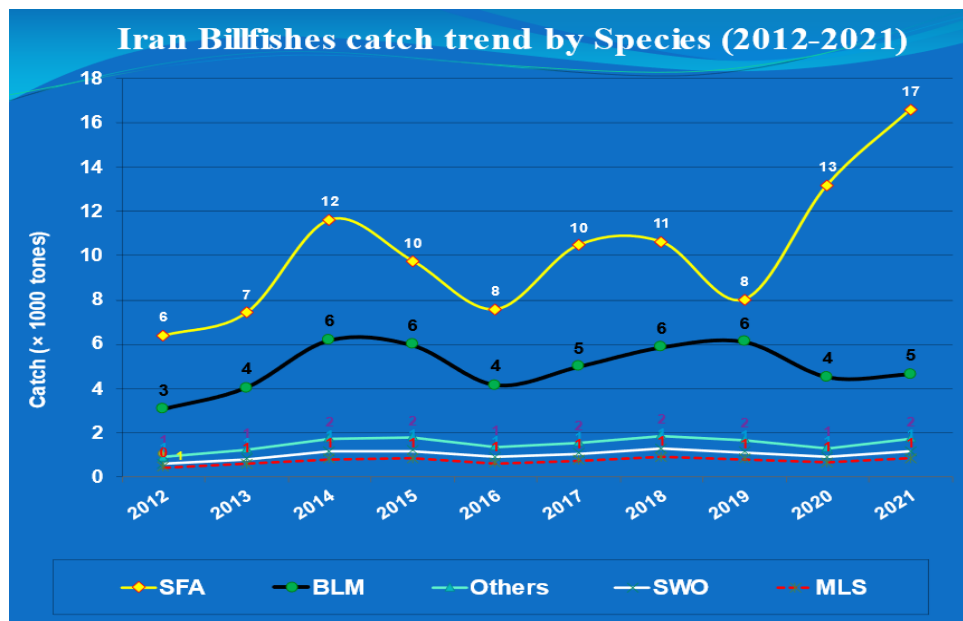—◆—SFA —●—BLM —Others ——SWO --- MLS

Figure 9: Nominal catch of billfish from 2012-2021

The line chart above (Fig. 9) indicates that SFA dominated the catch between 2012 and 2021 with a 10-year average of 10,145 tonnes (55%) in total billfish catch.

Black marlin, which came in second place, accounted for 4,943 t (27%) of the 10-year catch. The least catch was recorded for swordfish (SWO), stripped marlin (MLS), and other billfish species.

9. Seasonal variation of billfish

Figure 10 shows the seasonality of the catch component of billfish from 2012 to 2021. The quantity of catch tends to drop to its lowest levels between June and August due to the monsoon season. On the other hand, for the rest of the year, the quantity of catch gradually increases until the next monsoon season. During the months of the monsoon season, a large number of fishing vessels are alongside, resulting in a decrease in the catch of tuna and tuna-like species (see Fig. 10).
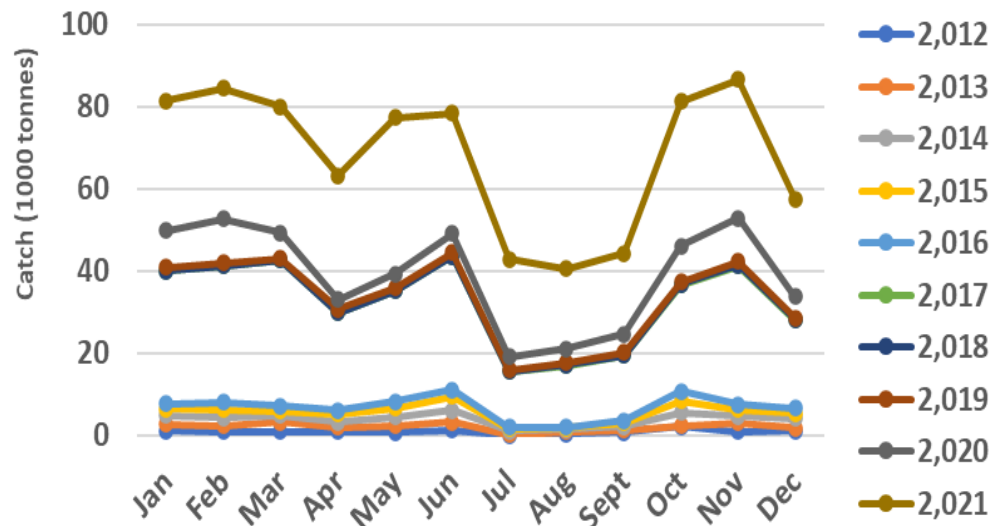

Figure 10: Seasonal variation of billfish catches from 2012 to 2021.

The following chart displays the large pelagic catch by different fishing gear from 2012 to 2021. The majority of the catch, accounting for 93%, was captured by the gillnet fishery. Trolling ranked second in terms of the amount of catch harvesting (3%). Furthermore, the harvesting activity by purse seine (PS) was approximately equivalent to that of traditional longline (LL), accounting for 2% of the total catch (see Fig. 11).

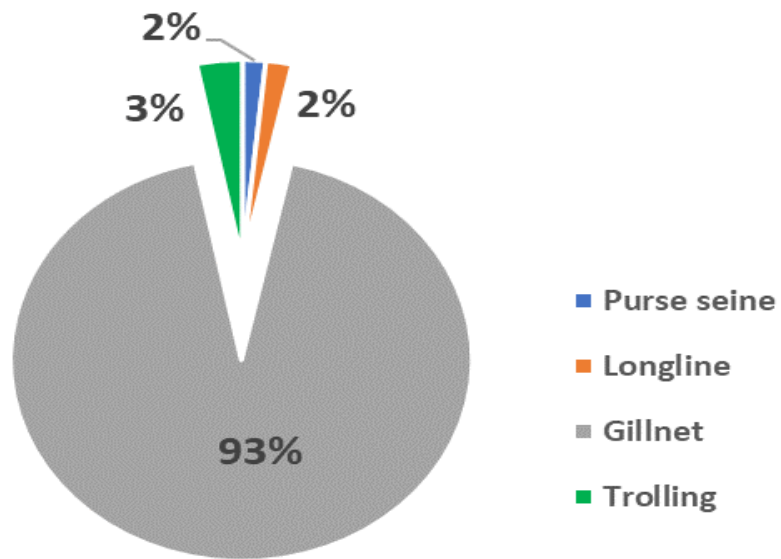Average Gear-wise tuna and tuna-like species and by-catch from 2012-2021

Figure 11: Average Gear-wise tuna and tuna-like species and by-catch from 2012 to 2021.

Tuna is one of the most iconic large pelagic species and is extensively exploited by fisheries around the globe. The chart below shows the trend of catch for various large pelagic species from 2012 to 2021.

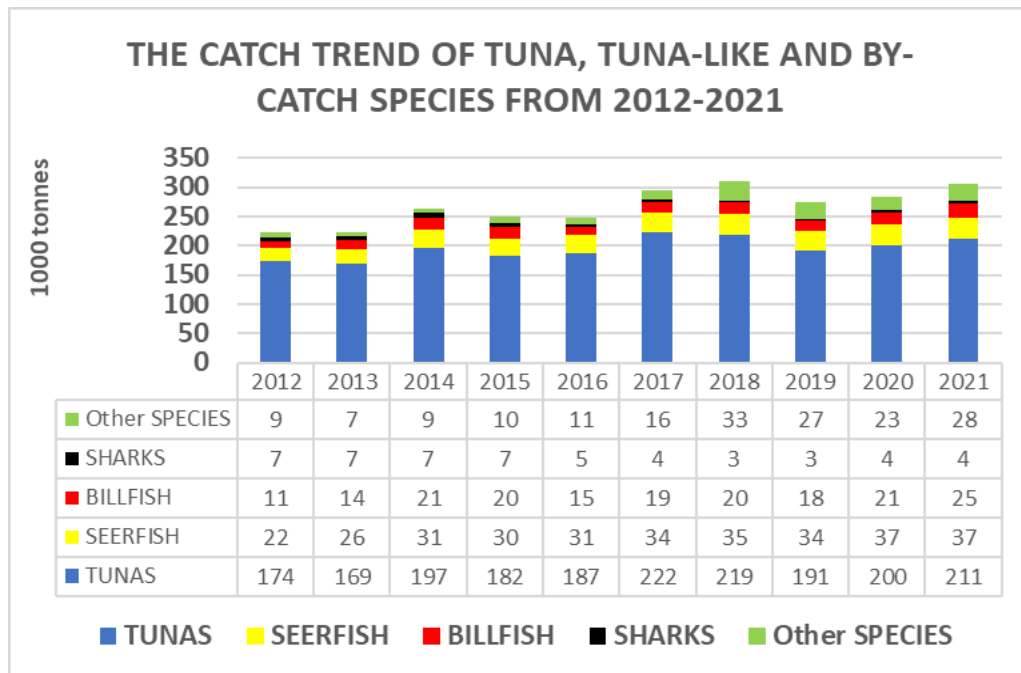|	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Other SPECIES	9	7	9	10	11	16	33	27	23	28
SHARKS	7	7	7	7	5	4	3	3	4	4
BILLFISH	11	14	21	20	15	19	20	18	21	25
SEERFISH	22	26	31	30	31	34	35	34	37	37
TUNAS	174	169	197	182	187	222	219	191	200	211

Figure 12: The catch trend of different species of large pelagic from 2012 to 2021.

The ten-year average estimate of catch, including tuna with 195 thousand tonnes (73%), seerfish with 32 thousand tonnes (12%), billfish with 18 thousand tonnes (7%), sharks with 5 thousand tonnes (2%), and other species with 17 thousand tonnes (6%) in total, demonstrates its importance as an economic resource. (See Fig. 13)
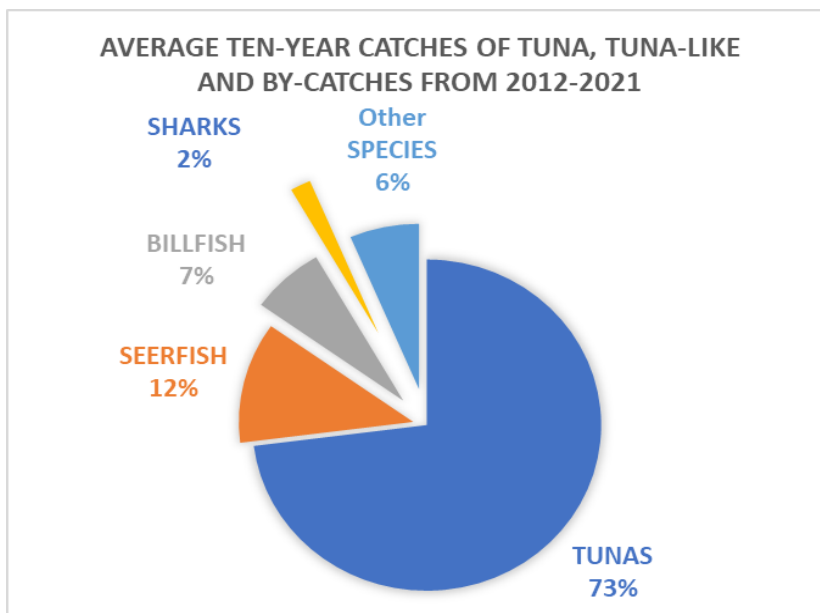

Figure 13: The average 10-year catches of different species of large pelagic from 2012 to 2021.

The majority of the tuna and tuna-like catch originates from the coastal fisheries (62%), while 38% comes from High Seas fisheries. (See Fig. 14)
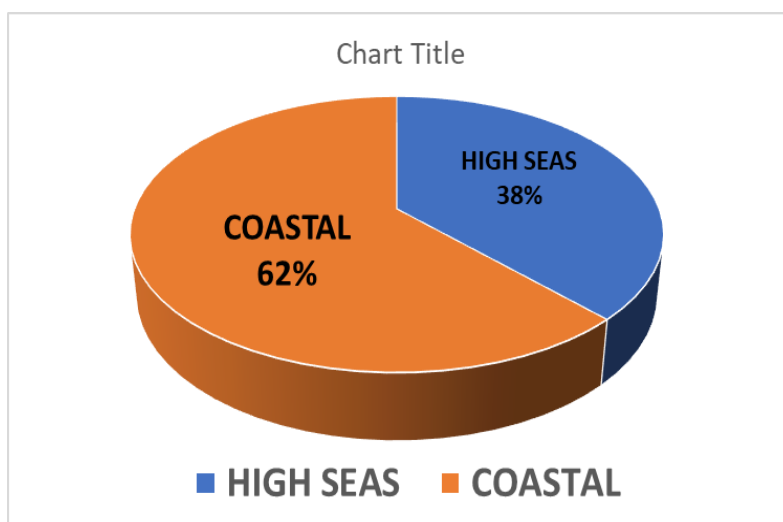

Figure 14: Average tuna and tuna-like species catch by coastal and High Seas fisheries from 2012 to 2021.

10. Size data collection:

a. Importance of Size Data Collection

Collection of size data for tuna and tuna-like species is crucial in understanding their population dynamics, growth rates, and the impacts of fishing on their populations, and, for creating effective tuna management strategies. The data collected will serve as one of the primary sources of scientific information supporting the management of tuna populations. Size data collection for tuna and tuna-like species can provide crucial insights into the conservation and sustainability of these populations, as well as the information necessary for effective resource management.

Size sampling shall be run under strict and well described random sampling schemes which are necessary to provide unbiased figures of the sizes taken. Sampling coverage shall be set to at least one fish measured by ton caught, by species and type of fishery, with samples being representative of all the periods and areas fished.

b. Current method for size data collection on tuna and tuna-like species in Iran

In order to improve the assessment of tuna and tuna-like species in the Persian Gulf and Oman Sea, port sampling has been conducted under random sampling scheme in four coastal provinces, and field samplers collected size data at 17 sample landing centers. At least one fish per tonne has been measured by species and type of fishery.

In our study, we utilized the direct measurement method. This method provides unbiased and accurate figures of the size taken, which is essential for estimating population size and growth rates over time. Although it can be time-consuming, it is more accurate than using estimations from catch data.

The size data is collected through measuring Fork Length (FL). Understanding the size distribution of these tuna populations across different fishing gears is crucial for effective fisheries management and conservation efforts. The data is collected using various fishing gears, including gillnet, hook-and-line, and longline.

To ensure accurate estimates, especially for larger fish and during spawn seasons, rigorous statistical analysis and adequate sample sizes are necessary for effective size data collection and the development of stock assessment models for tuna species.
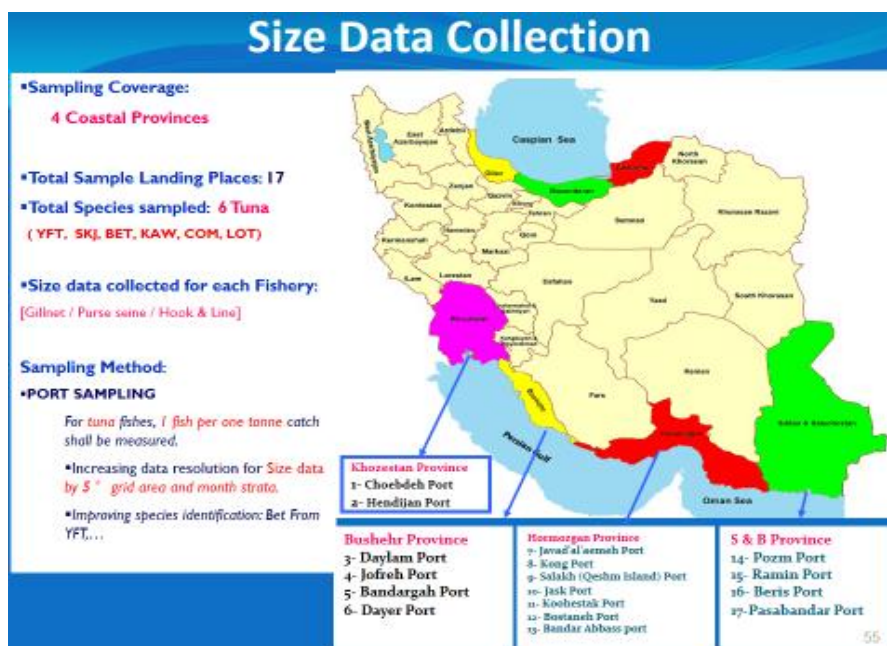
11. Conservation and management Measures Implemented in Iran

Conservation and management measures for sustainable exploitation of tuna and tuna-like stocks include a range of strategies aimed at reducing overfishing, protecting spawning grounds, and ensuring the long-term viability of these important fish populations. Billfish population in the Indian Ocean has been a topic of concern due to its declining status. Overfishing and habitat degradation have significantly affected their numbers, leading to a decease on stock levels. To address these concerns and ensure sustainable management of billfish stocks, various conservation and management measures can be implemented in the Indian Ocean region. One key approach is the establishment of catch limits and quotas for commercial fisheries targeting billfish. These limits aim to prevent excessive fishing pressure on these species and allow for their replenishment.

In order to maintain optimal management of fishing, Iran has implemented a plan to reduce the fishing effort of a selected group of vessels, with the objective of promoting sustainable exploitation of tuna stocks.

Additional conservation and management measures implemented by Iran are: setting regulations on fishing gear and methods, declaring closed seasons and areas, and regulating the process of issuing fishing licenses. These actions are aimed at ensuring the sustainable management of tuna populations and the long-term viability of the fishing industry.

Therefore, it is essential to regulate the use of fishing gear to minimize bycatch and improve the selectivity of fishing methods. In this way, Iran is currently making efforts to shift its focus from gillnet fishing to longline fishing. By making this change, Iran is aiming to promote sustainable and selective fishing practices, which limit the bycatch of non-target species including billfishes and protect the broader marine environment. To support and reinforce this strategy, Iran has collaborated with the United Nations Industrial Development Organization (UNIDO) since 2017. Collaboration with UNIDO is a positive step towards promoting sustainable economic growth in the fishing industry. By implementing best practices for longline fishing and improving the quality of its tuna products, Iran can improve quality of its tuna products, making them more appealing to consumers in export markets.

Over the past year, we have organized several training sessions focused on the identification of tunas, **billfishes**, and shark species for our fishermen and field samplers, with a particular reference on tuna species. Through these sessions, we have gathered field samplers with the intent to identify various species tuna and tuna-like species. This has helped us to improve the accuracy of our catch data and ensure that we are complying with regulations on sustainable fishing practices. By continuing to invest in training and technology, we hope to further improve our ability to manage these valuable resources for generations to come.

While these conservation and management measures are steps in the right direction, it is essential to continually assess their effectiveness through regular monitoring and scientific research. Adequate enforcement of regulations is also crucial to ensure compliance with sustainable fishing practices.

The Iran fisheries organization has established a system for monitoring and enforcing the fishing regulations in the country. This includes regular monitoring of landings and processing facilities. Efforts are undertaken to enhance the processes of controlling and customizing tuna fishing through port controls, monitoring of catch unloading, regulations governing fishing gears and tackles, and other measures implemented in the fishing grounds. Iran has taken additional measures to promote a monitoring system by equipping some distant-water fishing dhows with a Vessel Monitoring System.

The penalties for violating fishing regulations are severe. In this regard, actions are being taken to address fishing violations committed by vessels in the tuna fishing sector, and a commission is in place to deal with such violations. This commission is also implementing deterrent policy measures, and if necessary, it refers the violations to judicial authorities.

12. The key actions are currently underway

- Localizing and adapting the Indian Ocean Tuna Commission (IOTC) requirements and approvals to align with the Iran's specific implementation conditions and policies.

- Promoting greater participation and involvement of fishing cooperatives, RFOs and stakeholders in the management processes of tuna fish.
- The Iran National Tuna Commission (INTC) is being established with the involvement of all interested parties including relevant government departments and stakeholders.
- Conducting workshop on the sustainable management of tuna stocks exploitation.
- Coordinated efforts have been undertaken to implement the plan for marking fishing gears based on Resolution 19/04.

- Efforts are being undertaken to coordinate the implementation of the pilot project of pole-and-line fishing in Iran in partnership with one of the country's universities.

- The integrated fishing management system is a comprehensive database of fishermen that is web-based. Some parts of the system are currently available for use, but others are still in development. The programmers are working to complete these remaining features. Some of the capabilities of the system that will be made available include an electronic fishing license issuance system and a comprehensive database of all active fishing vessels. The system will also have a feature for *data collection processing and reporting system.* Additionally, the system will interface with *fishermen's insurance system*, *Ports and Maritime Organization system*, *Port State Control System* for departure and arrival of fishing vessels, and several other features. Once the system is fully implemented, it will be possible to receive real-time information on fisheries management activities.

13. Challenges in the management of the tuna and tuna-like fishing sector

- Multi-species multi-gear issue
- Non-standardized fishing tackles (Unauthorized or Illegally modified fishing gear)
- Bycatch of non-target species and illegal fishing practices
- The socio-economic factors that contribute to overfishing
- Impact of climate change on tuna populations
- Marine pollution and environmental issues

14. Collaborative Approaches to Management

Collaborative approaches to management, such as co-management and community-based management, involve the sharing of responsibility and decision-making between stakeholders, including fishing communities, research institutions, government agencies, fishers, and other community members. These approaches have been successful in achieving sustainable fisheries management, as they ensure that local knowledge and practices are incorporated into management plans and that all stakeholders have a vested interest in the sustainability of the fishery.

Regarding this issue, Iran's fisheries management policy has placed significant emphasis on promoting the active participation of fishermen, fishing cooperatives, and other players in the tuna processing industry in efforts to manage and protect tuna and tuna-like stocks. By involving these key stakeholders in the decision-making process, Iran has been able to benefit from their local knowledge and expertise.

A notable initiative aimed at leveraging the abilities and strength of the tuna fishing community is the formation and activation of the "**Hemmat Fishing Group**", which is a network of public-private partnerships focused on tuna fishing. This initiative is expected to play an important role, particularly in the sustainable management and protection of tuna and tuna-like fisheries in Iranian waters.

15. Strengthening Conservation and Management of tuna and billfish Species: Strategies and Recommendations.

Tuna and tuna-like species are an important resource for many coastal countries, and appropriate management measures are necessary to ensure their long-term sustainability. Effective management measures for tunas require a combination of scientific research, collaborative decision-making, and effective enforcement mechanisms to ensure sustainable use of this important resource. Some recommendations for management measures for tuna and billfishes include:

1. To maintain necessary workshops by IOTC and related entities, relating to *stock assessment, species identification*, and training courses specific for *observers & field samplers* on data collection and statistics with special reference to IOTC resolutions & recommendations, in order to ensure the continued development of these critical skills.

2. Increase public awareness: Educate the public about the importance of sustainable fishing practices and the need to protect tuna and billfish populations. This can include outreach to fishers, consumers, and other stakeholders, as well as public education campaigns.

3. Promoting selective fishing gear (longline and pole-and-line) that targets only specific species and reduces bycatch.

4. Supporting economic and social development programs to help fishers transition to more sustainable practices.

5. Effective management, control, and adjustment of fishing effort in the tuna fleet to optimize performance.

6. Improving export opportunities by implementing a plan to sustain the quality of harvested tuna.