In the name of God

Towards Sustainable Management of Billfish Fisheries in Iran: A Large Pelagic Fishery Assessment

22st Session of the IOTC Working Party on Billfish (WPB22), Seychelles
04–07 Sept 2024

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Abstract

The fishery for tuna and tuna-like species is a major component of large pelagic fisheries in Iran and is one of the most important activities in the Persian Gulf, Oman Sea, and the high seas. In 2023, the country produced nearly 1.4 million tonnes of aquatic products, with marine capture fisheries accounting for approximately 778 thousand tonnes. Additionally, aquaculture activities contributed 640 thousand tonnes to the national output. The production of large pelagic fishes amounted to around 332 thousand tonnes, representing approximately 43% of the country's total catch in 2023.

The estimated total quantity of tuna and tuna-like species is approximately 274 thousand tonnes. Billfish contributed about 31 thousand tonnes, constituting 9.3% of the overall large pelagic catch. Four species of billfish have been identified in local commercial landings: two species of marlins—black marlin (13,410 tonnes) and striped marlin (1,074 tonnes)—and two non-marlin species—sailfish (14,545 tonnes) and swordfish (1,503 tonnes). Additionally, other billfish species contribute 430 tonnes. In terms of catch composition, sailfish dominate, comprising 47% of the billfish catch, followed by black marlin at 43%, with unidentified billfish species accounting for the smallest portion at 1.4%. Although billfish species are not typically the primary targets, they are considered bycatch. However, in compliance with Iran's domestic regulations regarding tuna and tuna-like species, all data pertaining to the billfish catch will be systematically collected and reported.

Approximately 15,000 fishing vessels, encompassing fishing boats, dhows, and ships, are actively engaged in fishing activities within the Iranian coastal waters of the Persian Gulf, the Oman Sea, and the high seas. Four primary fishing methods are employed to target large pelagic species: gillnetting, purse seining, longlining, and trolling. It is important to note that gillnetting is the predominant fishing gear utilized in the IOTC area of competence. The majority of the production is derived from gillnet vessels operating within the Exclusive Economic Zone (EEZ) and the high seas.

Longlining is employed on a limited scale by certain traditional dhows within the coastal fishing grounds of Iranian waters in the Oman Sea to target yellowfin tuna, while small boats engaged in coastal fisheries use trolling to catch billfish and other large pelagic species.

To effectively manage the exploitation of large pelagic stocks domestically, the principal strategy centers on implementing policies aimed at reducing and regulating fishing effort within this sector. This approach aligns with the objectives of the Indian Ocean Tuna Commission, which endeavors to balance the harvest rates of these stocks with the preservation of sustainable fishing practices.

Each year, Iran undertakes dedicated efforts to adapt and implement the recommendations of the Indian Ocean Tuna Commission (IOTC). The primary goal is to identify suitable locations for these measures that encourage cooperation and active participation from the fishing community. Enhancing education and training workshops that emphasize the importance of sustainable fishing practices for large pelagic species is crucial. These workshops are essential for the effective management and sustainable exploitation of tuna, tuna-like species, and billfish stocks within the country.

This paper aims to present an overview of the catch trends for large pelagic species, including billfish, in the country from 2012 to 2023. Additionally, it assesses the effectiveness of the conservation and management measures implemented to ensure the long-term sustainability of these valuable marine species in the region.

1. Introduction

Billfish are widely distributed predators inhabiting the tropical, subtropical, and temperate waters of the world's oceans. In the Indian Ocean, six species of billfish reside, including the black marlin (*Istiompax indica*), Indo-Pacific sailfish (*Istiophorus platypterus*), striped marlin (*Kajikia audax*), blue marlin (*Makaira nigricans*), shortbill spearfish (*Tetrapturus angustirostris*), and swordfish (*Xiphias gladius*). These magnificent creatures are highly sought after by various fishing sectors due to their importance in food security, socioeconomic benefits, and cultural significance.

However, increased fishing pressure, pollution, coastal development, bycatch, 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. Unfortunately, these billfish species are currently facing significant environmental pressures and overexploitation, posing a serious threat to the sustainability of their fisheries.

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

Total fishery and aquaculture production

Iran's fisheries production is bifurcated into two main sectors: aquaculture and marine capture fisheries. Each sector entails distinct social and technical considerations tailored to their specific operational needs. The fishing communities, which make up a significant portion of the population in the coastal regions of the Persian Gulf, Oman Sea and Caspian Sea, have consistently been a focal point of attention and sensitivity in fisheries management plans.

In 2023, Iran's total fish production amounted to 1.4 million tonnes. Of this, 741 thousand tonnes (representing 52% of the total) were derived from the Persian Gulf, Oman Sea, and High Seas; around 37 thousand metric tonnes (3% of the total) were sourced from the Caspian Sea; and 640 thousand metric tonnes (45% of the total) were produced through aquaculture (*Fig. 1*).

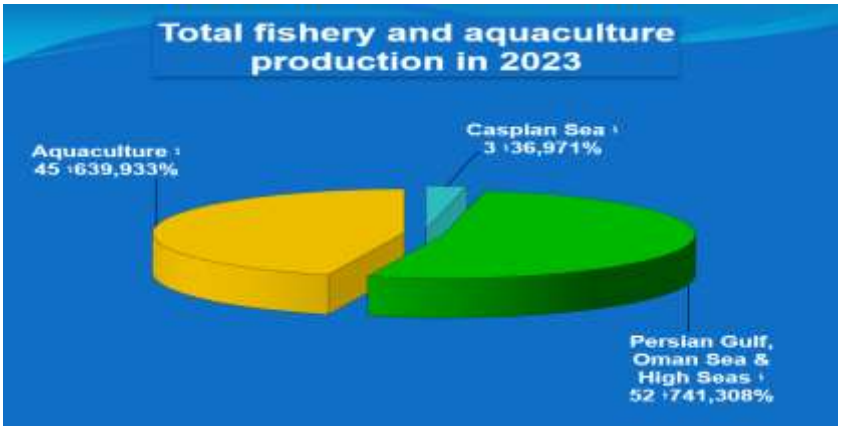


Figure 1: Total marine capture fisheries and aquaculture production of Iran (2023)

Figure 2 presents the historical data of Iran's marine capture fisheries and aquaculture production from 1995 to 2023. The pie chart illustrates the average catch over this 29-year period. Approximately 59% of the total catch comes from the Persian Gulf, the Oman Sea, and the High Seas. Aquaculture production accounts for around 34%, while the Caspian Sea contributes 7%. The Persian Gulf, the Oman Sea, and the High Seas have consistently been the largest contributors to Iran's overall fisheries production during the analyzed period, as indicated by the largest segment in the pie chart (59%). The bar chart further reinforces this dominance, showing a steady and often significant increase in production from this region over the years. The graph indicates an overall upward trend in Iran's fisheries and aquaculture production over the 29-year period, as evidenced by the increasing height of the orange bars in the bar chart. While initially a smaller contributor compared to the other two sources, aquaculture has gradually increased its share in the overall production. (See Figure 2)

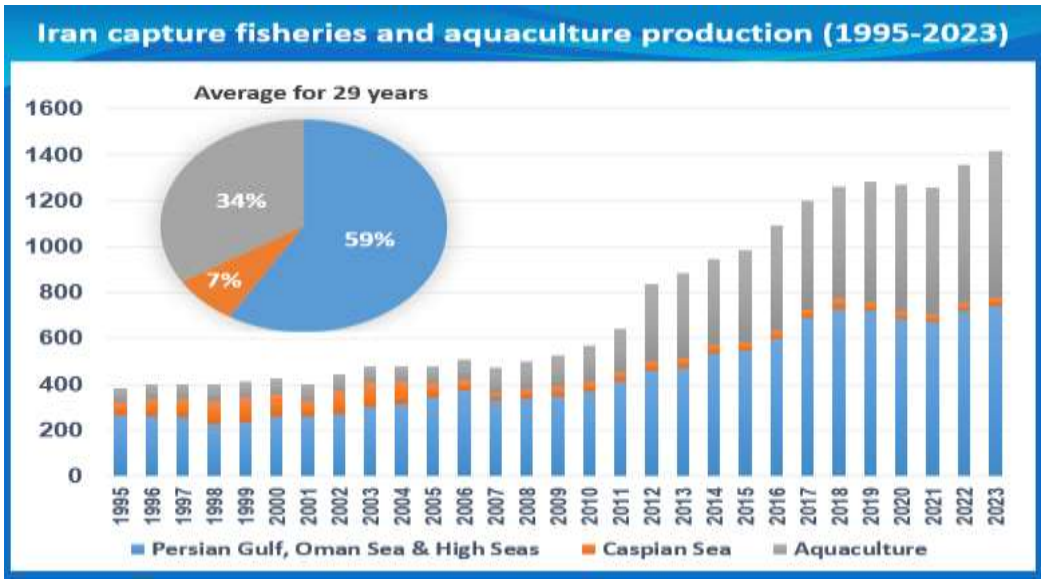


Figure 2: Total marine capture fisheries and aquaculture production of Iran (1995-2023)

2. Marine capture fishery (Iranian southern Fisheries)

In 2023, the total capture fisheries production in Iranian southern fisheries was approximately 741 thousand tonnes. However, capture fisheries in the Persian Gulf, Oman Sea, and High Seas have exhibited a declining trend since 2018. The following chart (Fig. 3) illustrates the total catch harvested from these regions from 2001 to 2023. The data reveal a substantial increase, culminating in a peak of 731 thousand tonnes in 2018. Subsequently, a notable decrease of approximately 58 thousand tonnes occurred by 2021. While a slight recovery was observed in 2022, the overall trend remains concerning.

The COVID-19 pandemic significantly exacerbated the situation, particularly during 2020 and 2021, by disrupting data collection efforts and hindering assessments for both billfish and other species. These challenges have compounded the difficulties in implementing effective conservation and management strategies for shared fish stocks in the region.

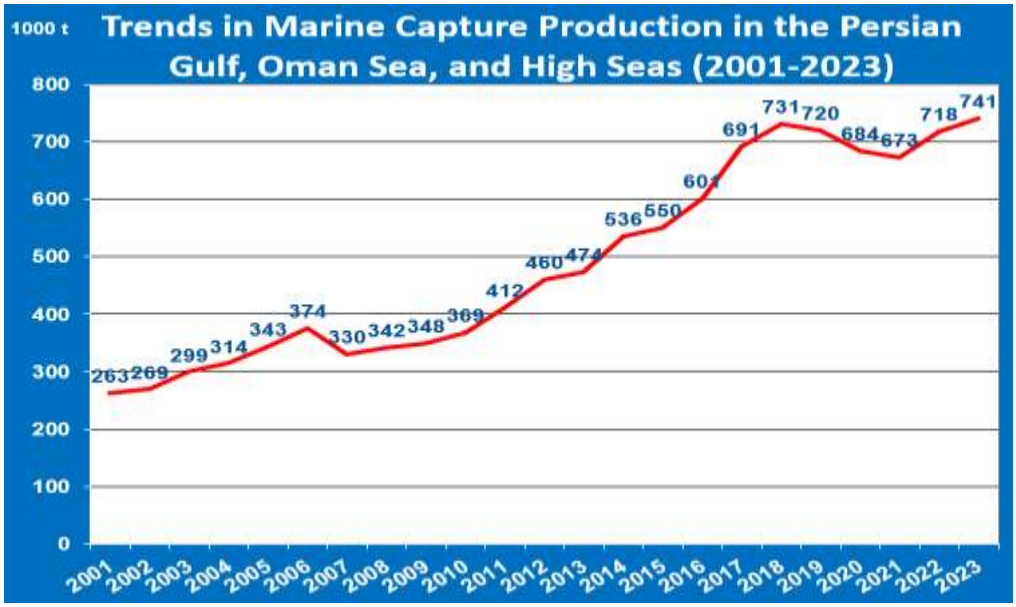


Figure 3: Trends in catch data for Iranian southern Fisheries (2001-2023)

The following pie chart (Fig. 4) illustrates the average catch composition by species group over 23 years. Large pelagic species dominate the catch, accounting for 240 thousand tonnes (49%). Demersal species follow, comprising 174 thousand tonnes (36%) of the total catch. Small pelagic species represent 12% of the catch, equaling 60 thousand tonnes. Shrimp contribute a smaller portion of 8 thousand tonnes (2%), while myctophids make up the smallest component at only 1%.

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.

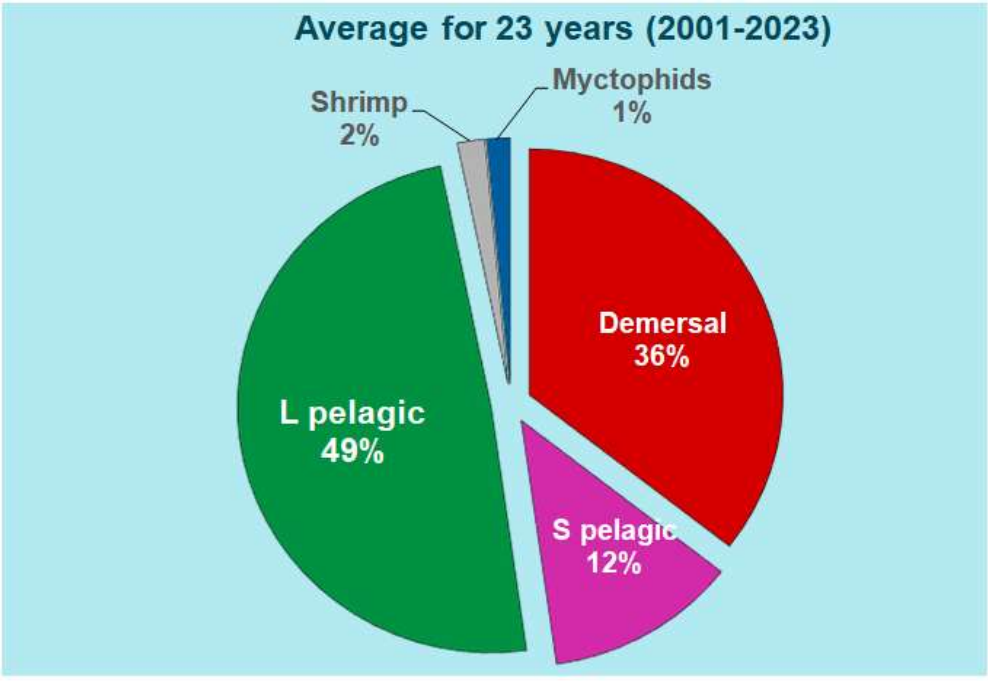


Figure 4: Catch by species group (2023)

The illustrated following 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 2023, providing valuable insights into the performance of the fishing industry in these regions. The chart shows an overall increasing trend in catches 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.

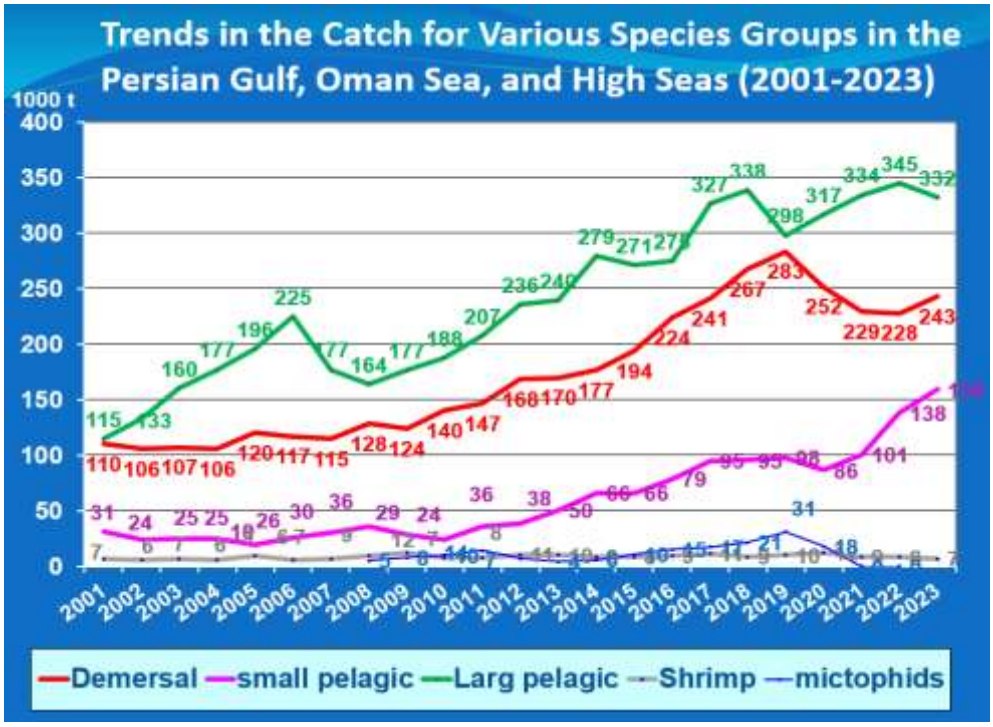


Figure 5: Trends in Catch for Different Species Groups (2001-2023)

3. 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 around 15,488, of which around 8,588 fishing vessels are engaged in tuna fishing activities. Of all fishing vessels, 11,884 are boats, 3,482 are dhows, and 122 are industrial fishing ships. The number of fishermen directly engaged in fishing activities is about 144,125 individuals.

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

In 2023, there were approximately 8,588 fishing vessels engaged in catching large pelagic species in the IOTC area of competence. This included 266 gillnet fishing dhows over 100 GT, 473 gillnet dhows between 51 and 100 GT, 604 gillnet dhows between 3 and 50 GT, and 4,908 gillnet fishing boats under 3 GT. Additionally, 2,337 trolling boats under 3 GT with outboard engines were also involved in day-long coastal fishing operations.

Around 475 gillnet fishing dhows were active as longliners in 2023. These vessels were not included in the overall count of fishing vessels, as they are seasonal and temporary, operating only during certain fishing seasons.

Table 1 shows the number of fishing vessels by gear type and vessel capacity.

Total No. of fishing vessels engaged in tuna and tuna-like fishing activities (2023)

GEAR GROUP	CAPACITY (GT) t	NO. OF Fishing Vessels
Purse seine	500 to 1000 t	0
	> 1000 t	0
Total Purse seine Fishing Vessels		0
Coastal Artisanal Longline (Seasonal & Temporal)	< 3 t	416
	51 to 100 t	59
	100 to 200	0
	> 1000 t	0
Total Coastal Artisanal Longliners		475
Gillnet	< 3 t	4,908
	3 to 20 t	250
	21 to 50 t	354
	51 to 100 t	473
	> 100 t	266
Total Gillnet Fishing Vessels		6,251
Trolling	< 3 t	2,337
Total No. of Fishing Vessels		8,588

Table 1 Number of fishing vessels by gear type and vessel capacity.

The following bar chart displays the number of fishing vessels in the IOTC area, categorized by vessel type and size in 2023. Gillnet-boat vessels, especially those under 3 tonnes, dominate the fleet. Other significant categories include gillnet-dhow vessels of varying sizes. Trolling vessels, particularly those under 3 tonnes, are present in much smaller numbers. The data does not include any trolling-dhow vessels.

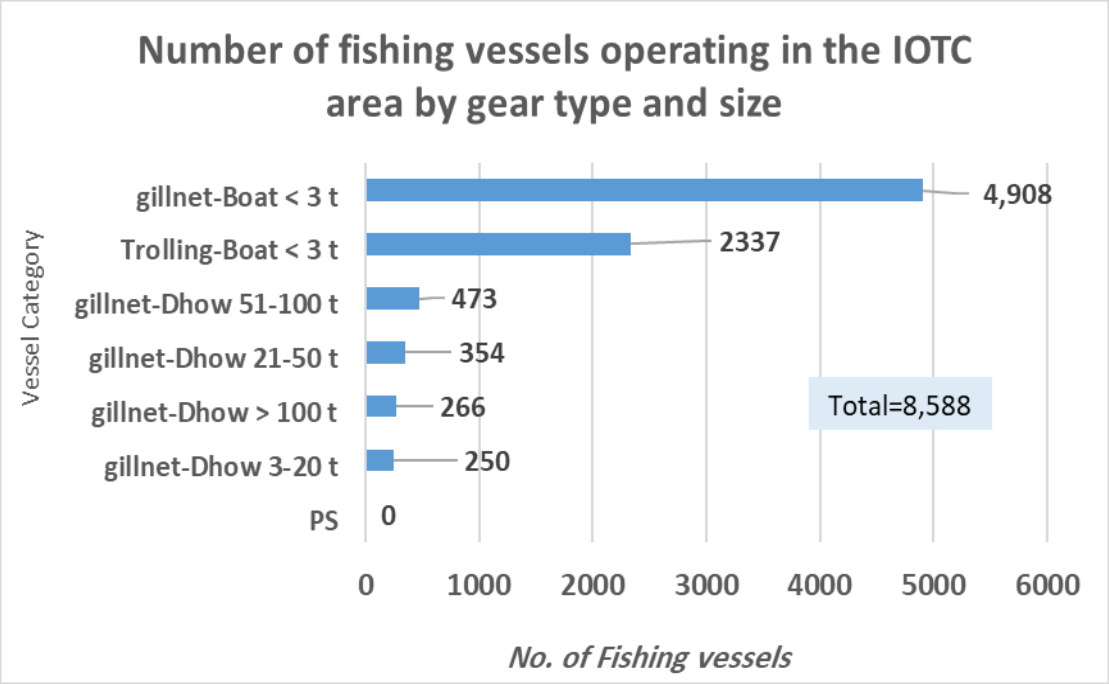


Figure 6: Number of fishing vessels operation in the IOTC area by gear type and size (2023)

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

For this study, catch and effort data were collected from 67 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.

5. 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 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 dhows), and *trolling*, from 2012 to 2023.

Table 2. Annual fishing effort for large pelagic by fishing fleet and Grear Group

GEAR GROUP	CAPACITY GT	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Purse seine	500 to 1000 t	0	0	0	0	0	0	0	0	0	0	0	0
	>1000 t	981	727	1,080	1,005	1,164	1,085	715	811	401	376	0	0
Total Purse seiners		981	727	1080	1005	1164	1085	715	811	401	376	0	0
Coastal Artisanal Longline	< 3 t	0	0	0	0	18,000	19,440	24,300	20,000	34,000	45,000	49,200	49,920
	51 to 100 t	0	0	0	0	3,200	6,600	14,025	11,040	9,520	16,800	29,520	6,490
	100 to 200 t	0	0	0	0	560	560	1,190	1,200	0	0	0	0
	>1000 t	0	0	0	0	0	0	0	0	0	0	0	0
Total Coastal Artisanal Longliners		0	0	0	0	21,760	26,600	39,515	32,240	43,520	61,800	78,720	56,410
Gillnet	< 3 t	557,434	538,550	476,632	552,367	487,646	438,046	516,149	496,736	764,432	516,149	568,892	632,951
	3 to 20 t	43,303	40,985	44,679	44,374	41,682	43,035	44,779	37,392	43,369	44,779	46,606	46,430
	21 to 50 t	195,643	184,070	137,860	72,121	74,870	58,114	51,045	47,178	44,594	51,045	63,268	73,225
	51 to 100 t	91,293	91,790	84,658	33,749	30,337	54,873	52,410	40,029	36,904	52,410	100,245	100,224
	>100 t	57,662	60,400	53,020	51,260	50,530	59,746	69,535	75,343	72,941	69,535	52,129	56,248
Total Gillnet Fishing Vessels		945,335	915,795	796,849	753,871	685,064	653,815	733,918	696,677	962,241	733,918	831,140	909,078
Trolling	< 3 t	125,446	123,450	226,770	254,934	229,190	196,440	224,708	258,713	133,500	127,260	135,740	183,070
Total Trolling fishing Boats		125,446	123,450	226,770	254,934	229,190	196,440	224,708	258,713	133,500	127,260	135,740	183,070
Total Fishing Vessels for all fisheries		1,071,762	1,039,972	1,024,699	1,009,810	937,178	877,940	998,856	988,441	1,139,662	923,354	1,045,600	1,148,558

Figure 7 illustrates the trend of fishing effort for tuna and tuna-like species over the last twelve years, from 2012 to 2023. The diagram suggests that the majority of the fishing effort, approximately 79%, was carried out by fishing boats. Fishing dhows, on the other hand, accounted for around 21% of the effort. While purse seine vessels were the least prevalent and responsible for less than 1% of the effort.

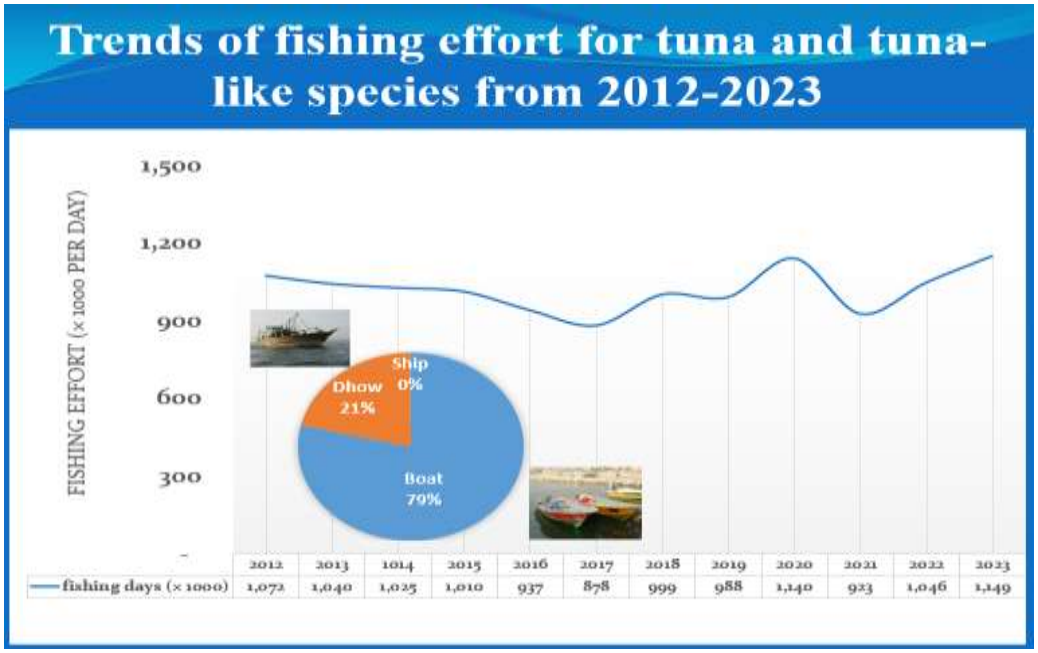


Figure 7: Trends of fishing effort for tuna and tuna-like species from 2012-2023

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 are captured by Iranian pelagic gillnetters operating in the region. Tuna is the main target species for these gillnetters; however, fishermen also consider billfish an important bycatch species.

In 2023, the billfish catch was around 30,962 tonnes, which is approximately 9.3% of the large pelagic species and 4% of the total country catch.

The following diagram (Figure 8) illustrates the average catch of various billfish species over a 12-year period from 2012 to 2023. The total annual billfish catch averaged 20,758 tonnes. Sailfish was the dominant species, contributing 52% (10,888 tonnes) to the total catch. Black marlin accounted for 31% (6,525 tonnes), followed by swordfish at 6% (1,159 tonnes) and striped marlin at 4% (828 tonnes). The remaining 7% (1,358 tonnes) comprised other billfish species.

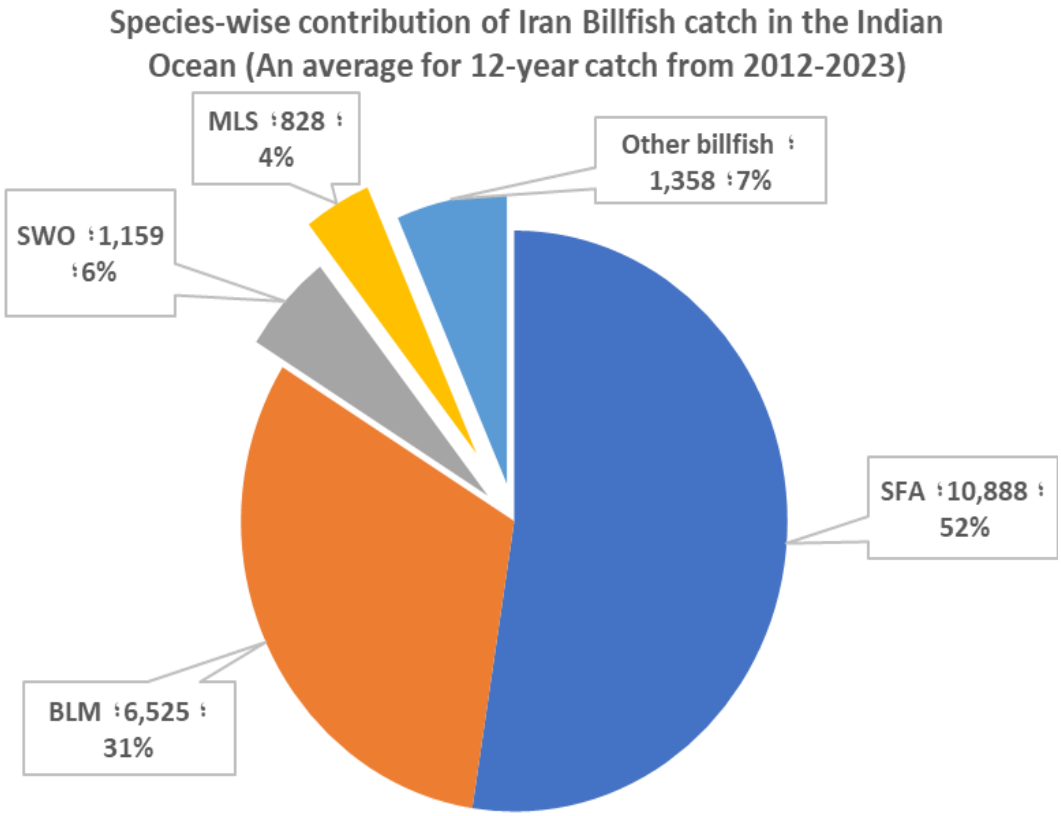


Figure 8: An average 12-year Catch for billfish Species (2001-2023)

The following line chart presents a clear overview of billfish catch quantities from 2012 to 2023. Sailfish (SFA) dominated the catch during this period, with a 12-year average of 10,888 tonnes, constituting 52% of the total billfish catch. Black marlin (BLM) ranked second, accounting for 6,525 tonnes or 31% of the total. Together, SFA and BLM comprised 83% of the overall billfish catch. Swordfish (SWO), striped marlin (MLS), and other billfish species collectively represented the remaining 17%. (see Fig. 9)

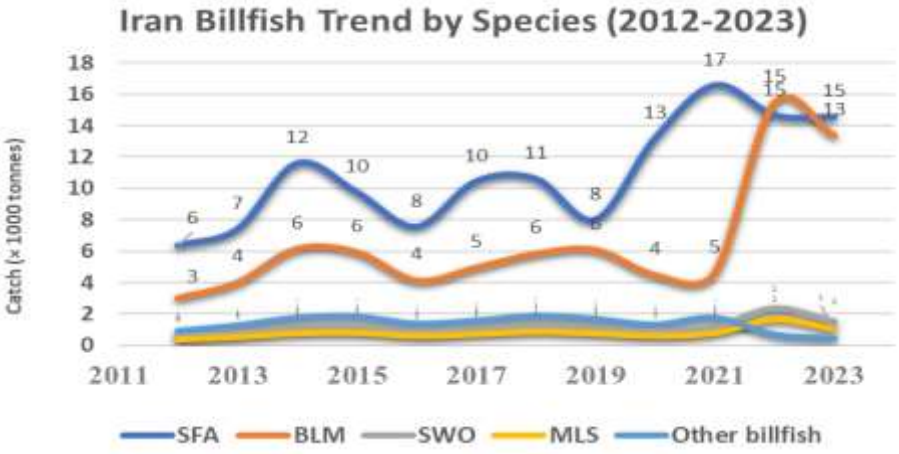


Figure 9: Nominal catch of billfish from 2012-2023

9. Seasonal variation of billfish

Figure 10 shows the seasonality of the catch component of billfish from 2012 to 2023. 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).

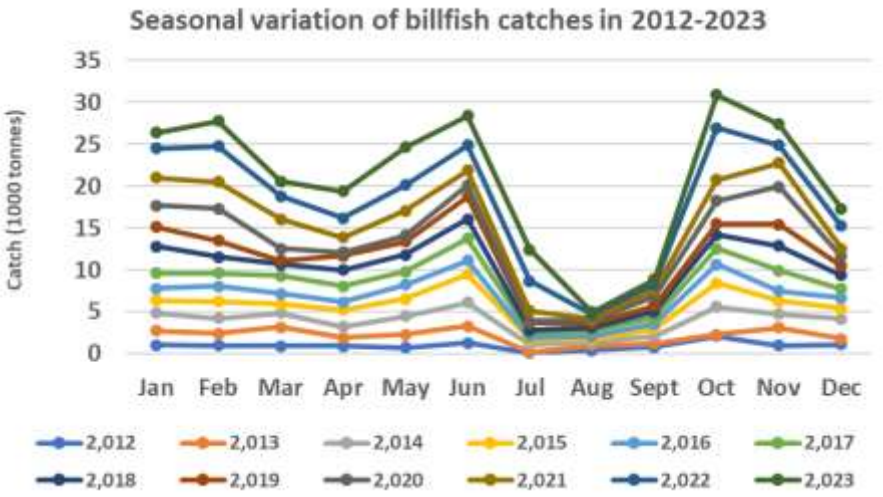


Figure 10: Seasonal variation of billfish catches from 2012 to 2023.

The following chart displays the large pelagic catch by different fishing gear from 2012 to 2023. 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 (4%). Furthermore, the harvesting activity by traditional longline accounting for 2% of the total catch and purse seine (PS) was approximately equivalent to 1% of the total catch (see Fig. 11).

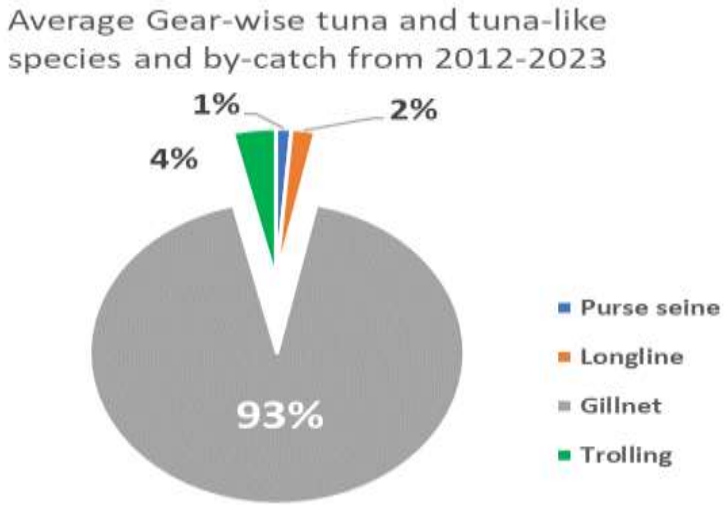


Figure 11: Average Gear-wise tuna and tuna-like species and by-catch from 2012 to 2023.

Figure 12 presents a comparative analysis of fishing gear used for billfish species and associated bycatch from 2012 to 2023. The data reveals a significant dominance of gillnets in the fishery, accounting for 96% of the total catch. In contrast, trolling, a more selective fishing method, contributed only 4% to the overall catch.

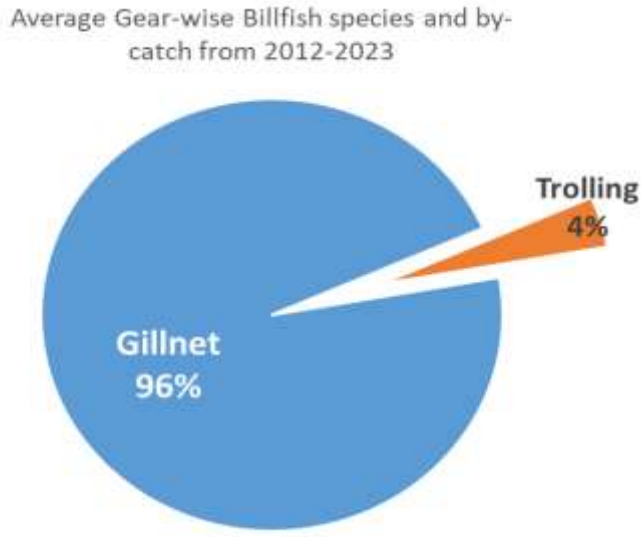
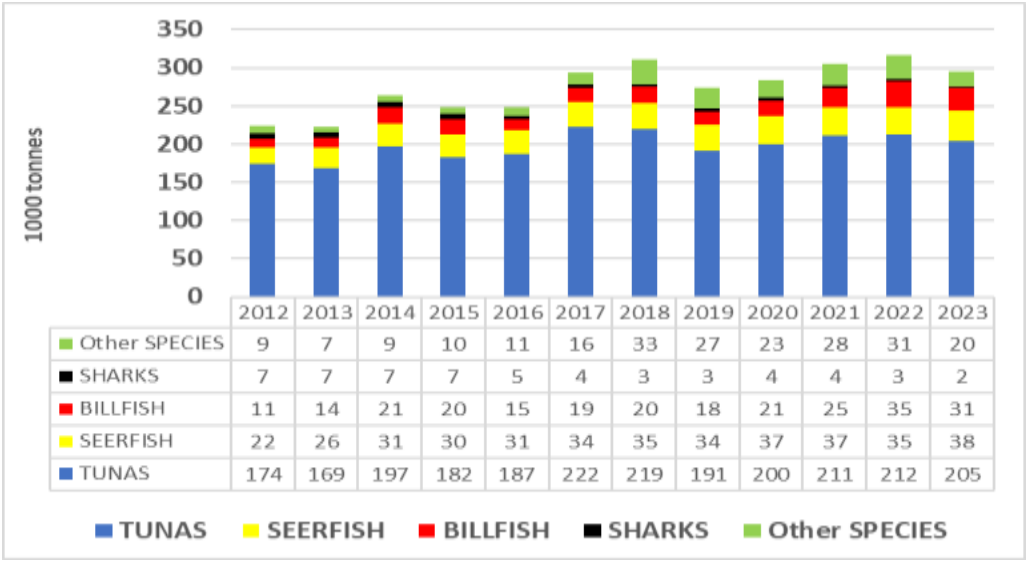


Figure 12: Average Gear-wise Billfish species and by-catch from 2012 to 2023.

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 2023. Tunas consistently dominated the catch, while sharks exhibited a decreasing trend. The catch of seerfish and billfish remained relatively stable. Fluctuations in the catch of 'Other Species' suggest varying influences from factors such as market demand, environmental conditions, and fishing practices.



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Other SPECIES	9	7	9	10	11	16	33	27	23	28	31	20
SHARKS	7	7	7	7	5	4	3	3	4	4	3	2
BILLFISH	11	14	21	20	15	19	20	18	21	25	35	31
SEERFISH	22	26	31	30	31	34	35	34	37	37	35	38
TUNAS	174	169	197	182	187	222	219	191	200	211	212	205

Figure 13: The catch trend of different species of large pelagic from 2012 to 2023.

The ten-year average estimate of catch, including tuna with 197 thousand tonnes (72%), seerfish with 33 thousand tonnes (12%), billfish with 21 thousand tonnes (7%), sharks with 5 thousand tonnes (2%), and other species with 19 thousand tonnes (7%) in total, demonstrates its importance as an economic resource. (See Fig. 14)

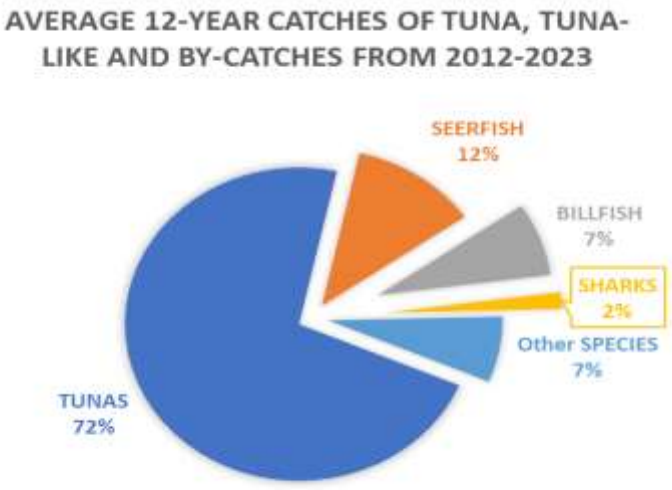


Figure 14: The average 10-year catches of different species of large pelagic from 2012 to 2023.

The majority of the tuna and tuna-like catch originates from the coastal fisheries (61%), while 39% comes from High Seas fisheries. (See Fig. 15)

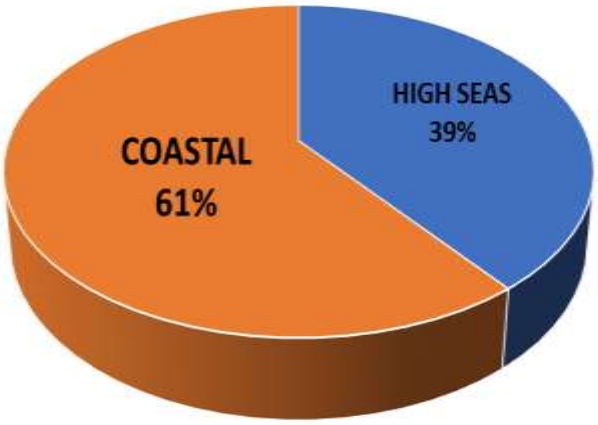


Figure 15: Average tuna and tuna-like species catch by coastal and High Seas fisheries from 2012 to 2023.

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 tonnes 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 19 sample landing centers. At least one fish per tonne has been measured by species and type of fishery.

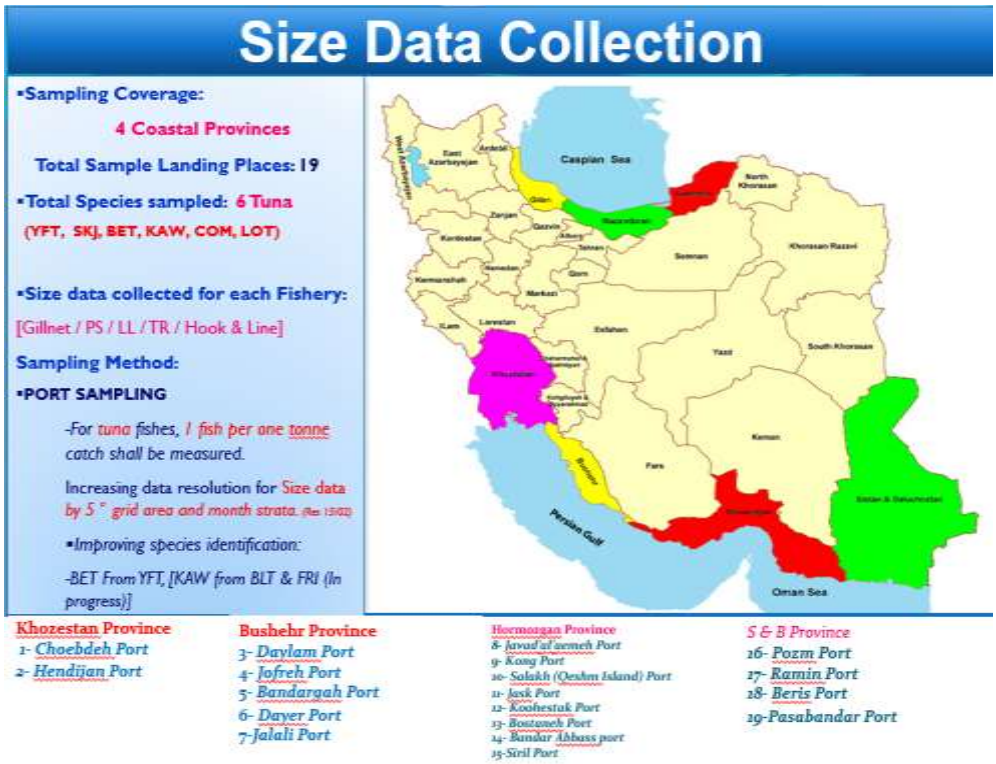
In our study, we utilized the direct measurement method. This method provides unbiased and accurate figures of the size taken, which is essential for estimating population size and growth rates over time. Although it can be time-consuming, it is more accurate than using estimations from catch data.

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.

In 2023, although the 'one fish per tonne' benchmark has not been implemented for all species, the collected size data are very close to the corresponding benchmark, demonstrating an improvement compared to previous years.

Despite the implementation challenges and the lack of sufficient funding and personnel for gathering tuna size data, we exceeded the 'one fish per tonne' benchmark for several tuna species. Specifically, the collected size data for Yellowfin Tuna (YFT) shows a 29% increase, Bigeye Tuna (BET) saw a 27% increase, and Narrow-barred Spanish mackerel (COM) saw a 65% increase, which are significant figures.



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.

To maintain optimal fisheries management, Iran has formulated a plan to reduce fishing effort by a number of fishing vessels, with the ultimate goal of enhancing the sustainable exploitation of tuna stocks.

Iran has introduced supplementary conservation and management measures, including regulations governing fishing gear and techniques, promoting selective methods like longlining and trolling, establishment of closed seasons, and oversight of fishing license issuance. These initiatives are designed to promote sustainable management of tuna populations and ensure the enduring sustainability of the fishing sector.

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. In support and reinforcement of this strategy, Iran has been collaborating with the United Nations Industrial Development Organization (UNIDO) since 2017 on a joint project titled "Enhancing the Added Value of yellowfin tuna." This project is currently underway. Through the adoption of optimal practices in longline fishing and the enhancement of tuna product quality, Iran anticipates enhancing the attractiveness of its tuna offerings in global 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 of 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.

- Fostering increased participation and engagement of fishing cooperatives, Regional Fisheries Organizations (RFOs), and stakeholders in the management processes of tuna fisheries.
- The Iran National Tuna Commission (INTC) has been established and engages with all relevant government agencies and stakeholders in its sessions, utilizing their consultation, collaboration, and expertise.
- Organizing a workshop on sustainable exploitation management of tuna stocks.
- Efforts are underway to coordinate the implementation of the pilot project for pole-and-line fishing in Iran, in collaboration with a local university.

- 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

- The issue of multi-species and multi-gear fishing, and the tendency of fishermen to relatively increase fishing effort.
- 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.

In addition to the establishment of the 'Hamat Fishing Group,' another notable initiative aimed at promoting sustainable tuna fisheries management is the symposium titled 'Responsible Tuna Fisheries Management: A Symposium Focusing on Enhancing the Added Value of Tuna Fish.' This symposium was held last year and brought together experts, policymakers, and industry stakeholders to discuss strategies for enhancing the value of tuna products while ensuring responsible fishing practices. The symposium highlighted the importance of collaboration among all sectors of the tuna industry to achieve sustainable tuna fisheries management.

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: Undertake initiatives to educate the public about the significance of sustainable fishing practices and the imperative to safeguard billfish populations. This should involve targeted outreach to fishermen, consumers, and other relevant stakeholders, in addition to implementing comprehensive public education campaigns.

3. Advocating the use of selective fishing techniques, such as longlining and pole-and-line methods, which target specific fish species and minimize the incidental catch of non-target species (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. Enhancing export opportunities through the implementation of a plan to maintain the quality of harvested tuna.

The end