

Estimation Iran's Sharks Catch Historical Data 1950-2023

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I- Abstract

Historical data is one of the scientific addresses which are given a briefed overview about data condition of any fish stocks in the past. It usually used as a base for prediction of future data or trends. On the other hands, historical data are applicable for evaluation of catch in the past and future. While Sharks are valuable species with significance importance for marine biologist and ecologist in any ecosystems, but historically their data have not registered in many countries.

There is only limited information about Sharks catch in Iran. They are the group of species that normally Iranian fishermen do not have enough interest to catch them. In fact, about 80% of Iranians do not eat Sharks because of religious believes. The Iran Fisheries Organization, has never issued any licenses for Sharks catch, with the exception of the years, when Shark fishing was promoted by the FAO. In addition, Sharks catch has been banded by the Department of Environment as a national authority. Different types of Sharks are living in different depth of the sea and there is possibility, they incidentally are caught by different type of fishing gears. According to available reports, about 53 species of Sharks belong to 10 families are landing in the Iranian fishing harbors while some of them are very rare. Some of the Sharks are caught in first 30m depth of the Persian Gulf and Oman Sea, while some of them are caught in the Indian Ocean at the open Sea as bycatch. Iran total catch and total Sharks catch have recorded officially since 1992. But there are only scattered and limited recorded or estimated data and information in few articles and publications about Iran's Sharks catch between 1970-1991 and no information before 1970. While there are few reports which have printed by the international organizations such as FAO and CITES, about Iran total catch since 1950, but they are not included Sharks data.

Surely, Correlation between total catch and Sharks catch and their ratio are good indexes for calculation the years without Sharks data. So, we calculated these two indexes in different period of time. According to available data, there is a positive correlation between total catch and Sharks catch equal to 0.519 at the level of 0.01 during 1970-2023. Also, this data shows a weak and negative correlation between total catch and Sharks catch equal to -0.241 at the level of 0.01 during 1992-2023. In addition, the correlation is calculated equal to 0.305 during 1970-1991 and equal to 0.854 during 1970-1979. For better understanding about relevance between two variations, the ratio of Shark's catch is calculated in compare with total catch during 1970-2023, 1992-2023, 1970-1991 and 1970-1979. They were 4.2%, 7.6%, 2.1% and 11.7% respectively.

This surveys shows the Sharks catch condition in period of 1970-1979, is very different from after 1979 and surely close to period of time in 1950-1970, when there is no data. So, in order to back calculation, we decided to extend 11.7% ratio (Average in 1970-1979) to the years during 1950-1970. In fact, this study, has been made an attempt to study the correlation and ratio between total catch and Sharks catch in the years with data (1970-2023) and expand it to the years without data (1950-1970).

II- Introduction:

Historical data is one of the scientific addresses which are given a brief overview about data condition of related stocks in the past. It usually is used as a base for prediction of future data or trends. Historical data can also be used in connecting with fish for evaluation of catch in the past. While Sharks are valuable species with significance importance for marine biologist and ecologist in any ecosystems, but historically their catch data have not recorded in many countries. A number of examples have been produced for use of historical documents for the analysis of the long-term population dynamics of fish species and ecosystem changes (Øiestad, 1994; Holm *et al.*, 2001; Jackson *et al.*, 2001; MacKenzie *et al.*, 2002). Despite the difficulties of interpreting results and often uncertain fishing effort, some methods may provide additional importance information from the available fisheries data. In some cases, historical analyses may provide long-term data series.

Catch data recording and fisheries statistics publication has been started in Iran, since 1992, while the recording system does not completely cover all species, landing areas and different markets. During this period of time, some commercial species stocks were seriously affected by negative factors. There are evidences about severe changes in catch composition and contribution of each species in total catch. Considering to the effects of overfishing and environmental factors, it is very difficult to evaluate individual contribution of Sharks in catch, where we do not have any access to valid data and catch composition in the past.

Sharks are valuable species that most of their stocks are under pressure and overexploited all over the world. Many species of sharks located in endangered level and have entered into IUCN list. So, access to any evolution of the Shark catch history helps us to better understanding of their stocks in the past and future. On this way, absence, deficiency or lack of data are the main problems and only some countries have recorded Sharks catch historically, while many countries do not have any information about them. So, data mining and survey on the past data with appropriate methods are considerable subject for any data collection system. As we know different types of Sharks are living in different depth of the sea and there is possibility they are caught as a by-catch by different type of fishing gears. According to observation program, most of the Sharks are caught in first 30 m depth.

Sharks are the group of species that Iranians have not enough interest to consume them. In fact, because of some reasons especially religious believes about 80% of the Iranians do not eat Sharks. Also, Iran fisheries Organization has never issued any licenses for Sharks catch and officially their catch is banded by Environment Organization as a national competent authority. Sharks Catches are used as raw material in some fish meal factories. Dried and salted meat are presumably exported to Pakistan in eastern part of Iran and Oman Sea. Dried fins are exported without any type of control to other countries, mainly to the United Arab Emirates.⁹

The first studies on stock assessment of demersal and pelagic fish were carried out between 1976–1979 through a regional project that was done by FAO. It covered all southern and northern Persian Gulf and Oman Sea waters by use of four research vessels. The total biomass was estimated at more than 120000 tons of which Sharks represented about 4% (Sivasubramaniam, 1981)¹¹. According to Iran Fisheries Research Organization Swept Area project, the biomass of *carcharhinus dussumieri* estimated 201 tons in 1997. Other study estimated the biomass of this

fish about 234 tons (N. Nyamymandi & *etal*, 2014)⁵. Some years later the biomass of the fish estimated 430 tons (Nyamymandi, 2002). Based on these reports the most dominated length frequencies of Sharks have been 52-56 and 67-63 cm. (Iran Fisheries Organization data information). Regarding to catch composition data, Sharks have a decreasing trend from 4.2% in 2004 to 2.9% in 2009 that shows a decline with an annual average 1.3% during 2004-2009. These results suggesting that Sharks resources are overexploited and the current effort is far higher than the effort required harvesting optimum yields. (Khorshidian, Nyamymandi, 1997)⁵

Available information indicated that around 53 species of Sharks belong to 10 families are landing in Iranian fishing harbors. Base on Iran Fisheries Observer reports, 19 species of these Sharks are common among Persian Gulf, Oman Sea and Indian Ocean, 5 species only belong to Iranian territorial waters and 29 species only belong to Indian Ocean. *Carcharhinidae*, *Hemiscylliidae* and *Sphyrnidae* are most dominated families where 24 species of them belong to *Carcharhinidae* family⁷. According to a study (Bargahi, 2021) which has done during 2010-2020 in 20 fishing harbors, 38 Sharks species identified, where most of them were small between 50-100 Cm length frequency. The abundance of these Sharks was respectively, *Rhizoprionodon acutus* 21%, *Carcharhinus falciformis* 18%, *Carchahinus sorrah* 15%, *Rhizoprionodon oligolinx* 12% *Carchahinus dussumieri* 10% and *Carrcharhinus limbatus* 8% and some other species 18%.

Hammerheads and oceanic whitetip are caught as bycatch in gillnet (bottom and drift gillnets), bottom trawl and trolling fisheries in the Persian Gulf and the Oman Sea. A driftnet fishery for tunas has been also operating in high seas areas of the Western Indian Ocean, with a high percentage of Sharks in the catches. Many boats also use a combination of fishing gears. Fish resources are mainly Shared stocks with the other coastal states, as both Persian Gulf and Oman Sea are narrow seas (there are no high seas areas). Target fisheries for Sharks have been banned in Iran since 2004. *Carcharhinus falciformis* represent about the 9 percent of the total catch of Sharks, followed by *Carcharhinus longimanus* 0.7 percent, *Sphyrna zygaena* 0.4 percent and the family *Pristidae*, accounting for less than 0.1 percent. Besides fisheries, marine resources in the Persian Gulf and Oman Sea are under pressure from other anthropogenic and natural processes, such as oil pollution and bloom in jellyfish that affected negatively fisheries in the region (Daryanabard and Dawson, 2008)⁹.

III- Material and Methods:

This study has tried to estimate total Shark's catch by Iranian fishermen, since 1950, while the recorded Shark's catches only are available since 1992. Also there are some information that shows Sharks catch during 1970-1991. On the other hand, the recorded Sharks catch in total, are collected through the Iran Fisheries Organization official statistic year books during 1992-2023. But we collected some information for Sharks catch through the papers, reports and documents during 1970-1991. So, I have tried to find different period of time trends, where they give a view for calculation of Sharks catch for the years without data during 1950-1970.

According to available data, we calculated the ratio of Sharks catch in compare to total catch and correlation between Sharks catch and total catch in the level of 0.01 in different period of time during 1970-2023. Then we used the best period of time trend to calculation Sharks catch for the years without data. For this, the proportion of Sharks in compare with total catch is calculated

based on % as a below. The ratio of Sharks catch in compare with total catch was 2.1% during 1992-2023, 4.3% during 1970-2023 and 11.7% during 1970-1979.

$$\sum_{2023=32}^{1992=1} \left[\frac{\text{Sharks catch}_{1992} \times 100}{\text{Total catch}_{1992}} \right] + \left[\frac{\text{Sharks catch}_{1993} \times 100}{\text{Total catch}_{1993}} \right] + \left[\frac{\text{Sharks catch}_{1994} \times 100}{\text{Total catch}_{1994}} \right] + \dots + \left[\frac{\text{Sharks catch}_{2022} \times 100}{\text{Total catch}_{2022}} \right] + \left[\frac{\text{Sharks catch}_{2023} \times 100}{\text{Total catch}_{2023}} \right] // 32 = \text{Average Sharks Catch Ratio (ASCR)}$$

In fact, by calculation of Shark's ratio in compare with total catch, the ratio 1970-1979 are selected to extend for the years without data. The selected rate was 11.7%. Then total Shark's catch was calculated for the years without data during 1950-1969. The total catch including Sharks catch are extracted from Iran Fisheries Organization statistic year book during 1992-2023. Some data are extracted from different papers, thesis and reports for period of time during 1970-1991. Also, Iran total catch during 1950– 1991 has extracted from FAO database as a main source of data.

IV- Results and Discussion

According to the current study objective and in order to assessment of absent data for Sharks catch during 1950- 1969, selection of an appropriate method which leads us to valuable data for missing years, was the most important step. So, suitable methods are surveyed according to available data and period of study condition. In order to survey on Iran Sharks total catch and data mining for period of gap during 1950-1969, it was important to know, how should be face with absent data and how is possible to remove the gap with valid data. Academically through this kind of conditions there are some methods for more investigation and decision making as a below:

- 1- Deleting the variables that have empty data and missing value and forget about it, if it is not necessary,
- 2- Replacing empty years' data with adding a steady amount for each year,
- 3- Replacing empty years' data with Average, Mode or Median of available data with missing years' data,
- 4- Replacing empty years' data by use of variables correlation rate,
- 5- Replacing empty years' data according similarity in variables, ratio or proportion.

According to Iran Sharks catch data, a set of data (complex data) with different variables and related information did not find and two variables including total catch and Shark catch have had accessible. Also, the study was not going to prepare a model for data forecasting for future based on past or current trend. Vice versa it was trying to find past absent years' data base on current information. In conclusion first method is not an acceptable way to access our goal, because the study does not want to delete Shark's gaps year. Replacing absent data with adding a steady amount of catch for each year was suggested by the second method, while adding a steady amount (steady weight) for each year dose not led the study to correct conclusion for the completing gaps. Third method leads to use some information such as average of available data for the years without data. The fourth methods suggest to use correlation between variables. The fifth method suggest us, replacing empty years' data according similarity in variables or imputing based on data set and complex of data with different variables.

Surely, Correlation between total catch and Sharks catch and these two variables ratio are good indexes for use in calculation the years without Sharks data. So, these two indexes are calculated

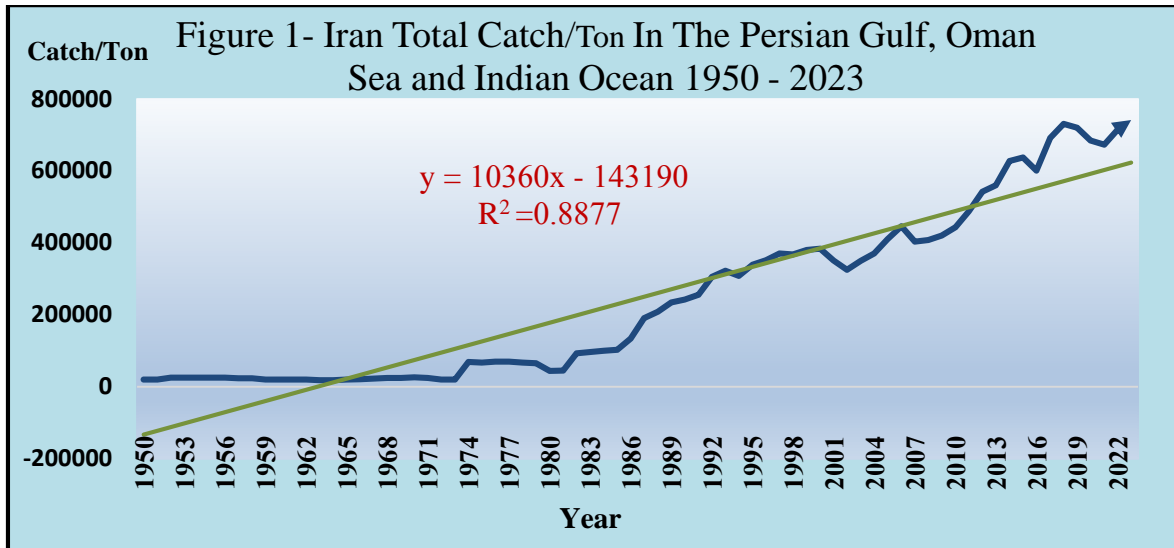
in different period of times. According to available data, there is a positive correlation between total catch and Sharks catch equal to 0.519 at the level of 0.01 during 1970-2023. Also, this data shows a weak and negative correlation between total catch and Sharks catch equal to -0.241 at the level of 0.01 during 1992-2023. That means although the amount of Iran total catch has increased during 1992-2023 but the amount of Sharks catch has decreased. In addition, the calculated correlation for period of 1970-1991 was equal to 0.305 and for period 1970-1979 was calculated 0.854. In order to better understanding about relevance between two variations, the ratio of Shark's catch is calculated in compare with total catch during 1970-2023, 1992-2023, 1970-1991 and 1970-1979. They were 4.2%, 7.6%, 2.1% and 11.7% respectively. (Table 1)

Table 1-Correlation and Ratio of Sharks catch and Total catch in different period of time between 1970-2023

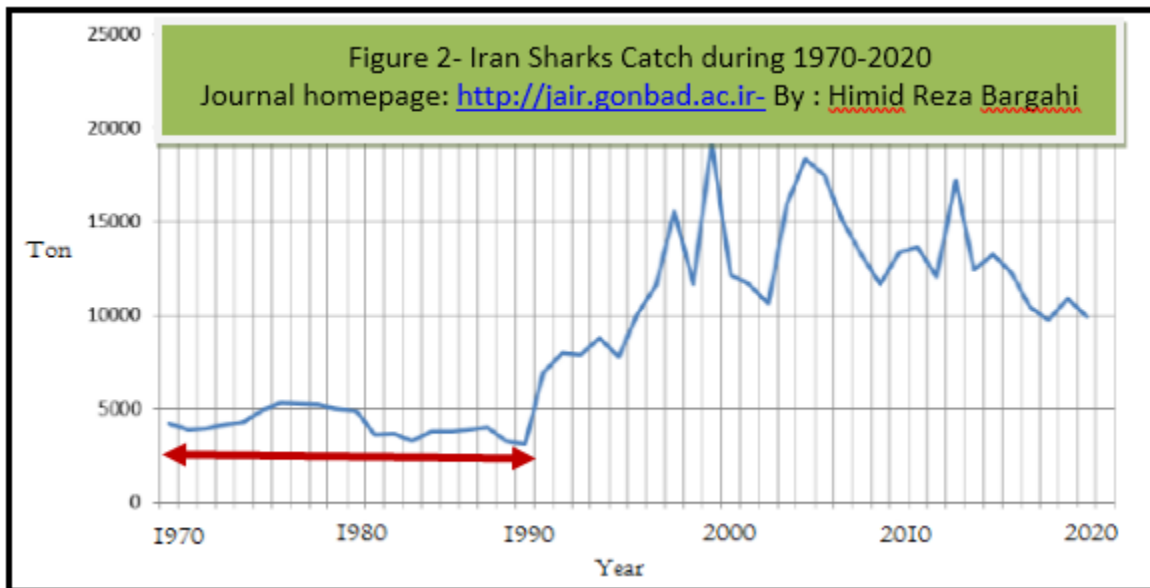
Index	Years	1970-2023	1992-2023	1970-1991	1970-1979
	Correlations between Total catch and Sharks catch		0.519	-0.241	0.305
Raito of Sharks catch and total catch		4.2%	7.6%	2.1%	11.7%

This surveys, shows that the Sharks catch condition in period of 1970-1979 is very different from after 1979. It looks more close to the condition during 1950-1970 than the other period of times. So, it looks more appropriate for the years when there are no data. In order to back calculation, we decided to extend 11.7% ratio (Average ratio in 1970-1970) to years 1950-1970. In fact, this study, has been made an attempt to study the correlation and ratio between total catch and Sharks catch in the years with data (1970-2023) and expand it to the years without data (1950-1970).

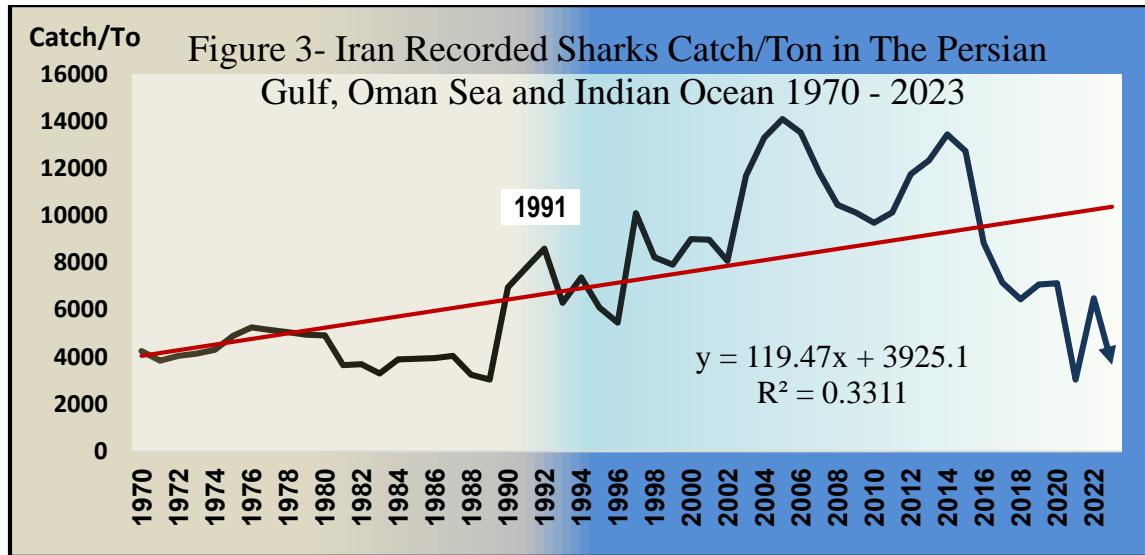
Although Iran official catch data are recorded since 1991 by Iran fisheries organization, but there is estimated data about total catch of Iran by FAO, since 1950. Based on the data, total catch of Iran has been 20017 tons in 1950 and the amount of catch stayed in a stable level up to 1973. But after maintenance and strengthening of Iran fishing fleet, the amount of catch has increased more than three times up to 1974 and reached to 69062 tons. The increasingly trend had continued slowly and the amount of catch reached to 133381 tons up to 1986, but after that Iran fisheries organization started to receive the results of its investments in fishing industries and catch growth rate found more speed, than before. So, increasing in catch, was passed from 241 thousand tons in 1990 and reached to 339 thousand tons in 1995, 383 thousand tons in 2000, 410 thousand tons in 2005, 443 thousand tons in 2010, 637 thousand tons in 2015 and 644 thousand tons in 2020, because of access to new fish stocks especially access to open sea in the Indian Ocean and Tuna species. (Figure 1)



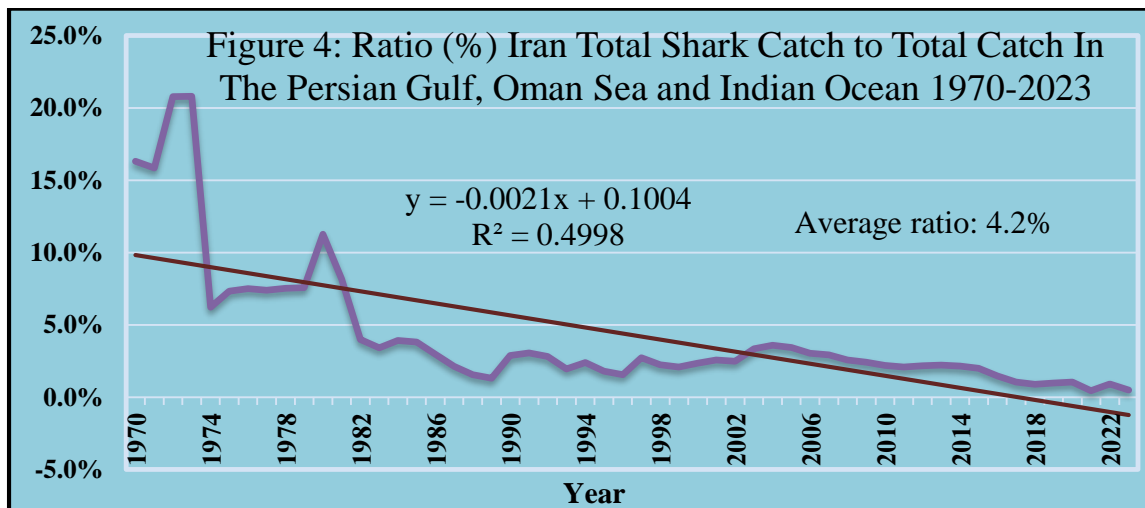
Although Sharks have been caught for many years by Iranian fishermen as a by-catch, but there is low level of records about it and Iran Sharks catch has been recorded only since 1992. Base on available information the recorded data are, based on Shark's total catch but not by species. In fact, there is low level of information for each individual species of Sharks. Also, they are some papers with sporadic information like figures that give us a view about Sharks data for period of time during 1970-1991 (Figure 2).



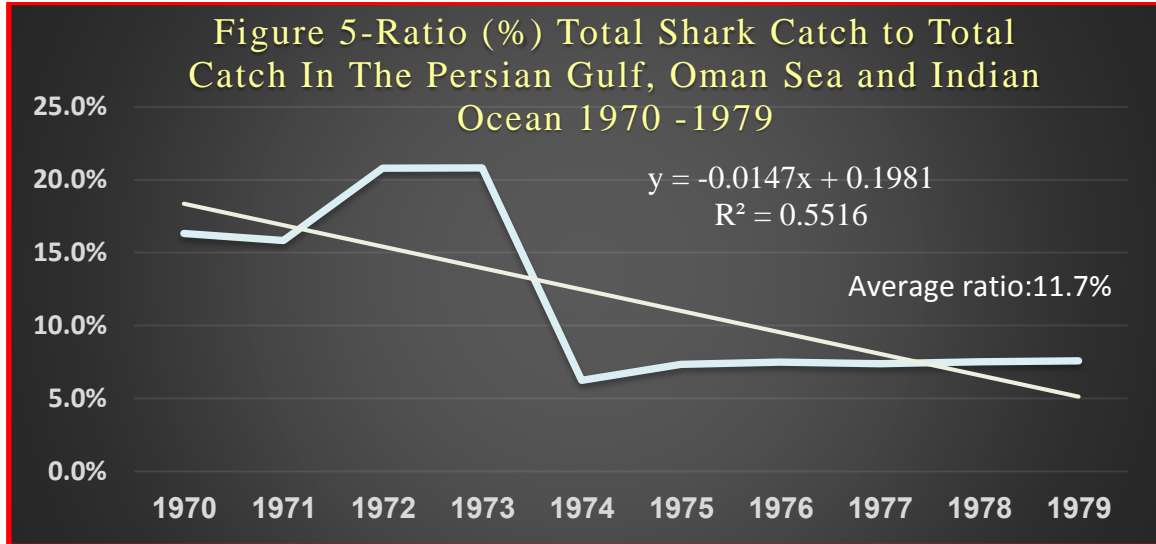
The data related to period of time in 1970-1991 are added to the recorded data during 1992-2023. So, Iran Sharks catch are prepared during 1970-2023 where it is acceptable as a recorded Sharks catch. (Figure 3)



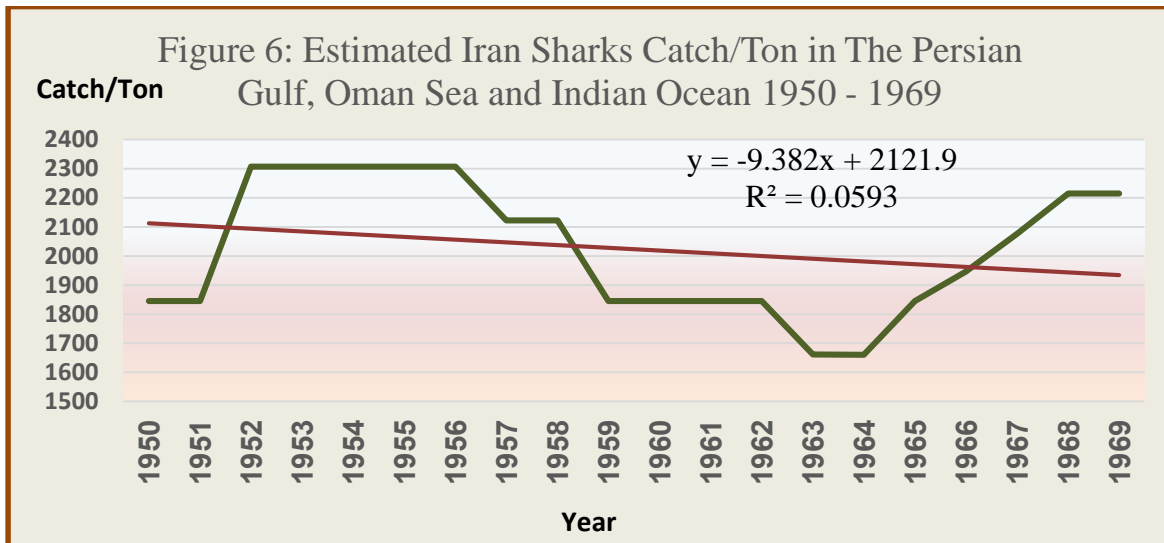
According to available data, the proportion of total Sharks catch in compare to total catch have had a ratio equal to 2.1% in average. In fact, about 2.1 kg of Sharks are caught incidentally as by-catch per 100 kg of total catch by the Iranian fishermen during 1992-2023. While the correlation between total catch and Sharks catch have been equal to -0.241 at the level of 0.01 during these years. So, it shows the Sharks catch condition is totally different from the other years. Also, the ratio of Sharks catch calculated equal to 4.2% in average during 1970-2023, while there is a positive correlation between total catch and Sharks catch equal to 0.519 at the level of 0.01 during the years. That means 4.2 kg of Sharks are caught as by-catch incidentally per 100 kg of total catch by Iranian fishermen during 1970-2023. (Figure 4)



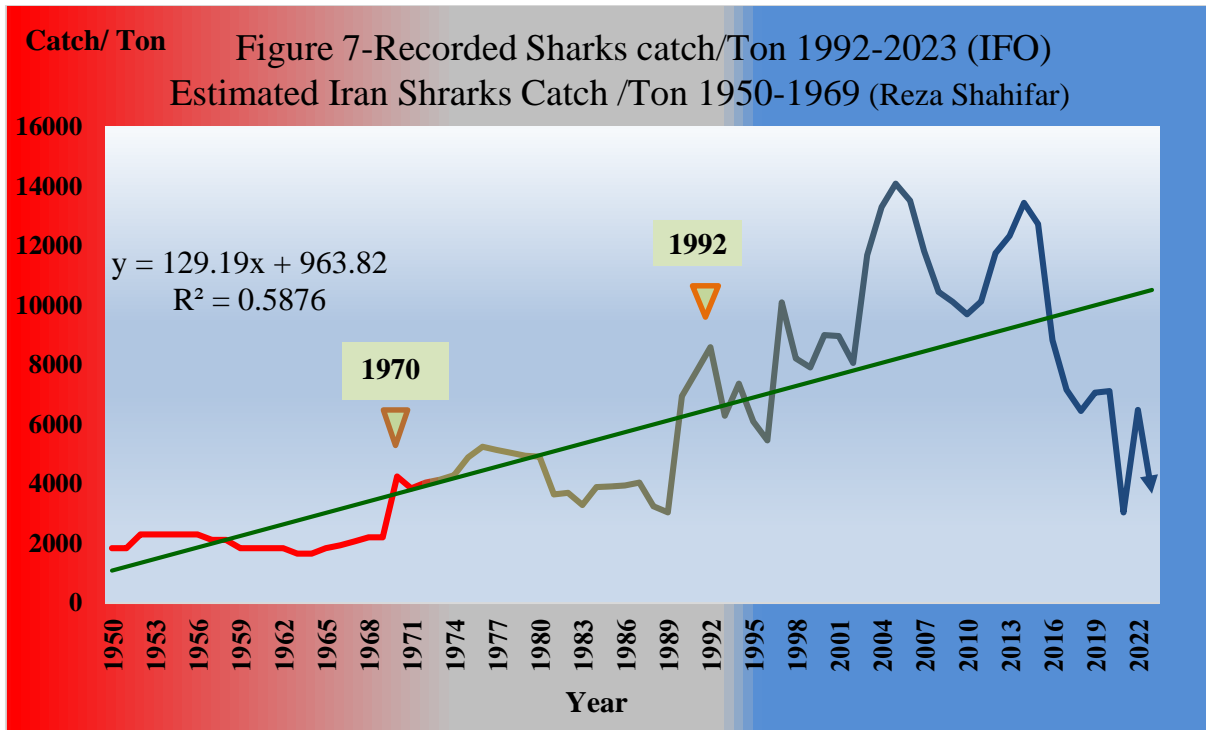
As is mentioned before, the ratio of Sharks catch to total catch has been 11.7% during 1970-1979. Also, there is a positive correlation between total catch and Sharks catch equal to 0.854 during 1970-1979, which it looks similar to the years without data during 1950-1969. So, we decided to extend 11.7% ratio to back calculation of sharks catch during the years 1950-1969. While it is not possible to use it for estimation Sharks catch by species because of lack of Sharks data by species (Figure 5)



Then the 11.7% ratio is extended for the years without data during 1950-1969 and the Sharks catch are estimated for the years. (Figure 6)



After estimation of Sharks catch for the period of years during 1950-1969, the data for the period of recorded Shark catch was added to 1970-2023. In fact, the Sharks catch structure including from three different parts. First, the estimated total Sharks catch during 1950-1969, second, total Sharks catch which its date are extracted from papers and recorded documents during 1970-1991 and third part, which are published as official data from 1992-2023. Finally, we combined all three period of time data as a historical total Sharks catch for 1950-2023. (Figure 7)



V- Conclusion:

In order to access to Iran Sharks, catch historical data, the use of correlation between total catch and Sharks catch and the ratio of Sharks catch in compare to total catch were selected as valuable indexes for calculation of Sharks catch during the years without data in 1950-1969. So, these two indexes are calculated in different period of times and the best similarity among them are selected for use the years without Sharks data. Although, there is low level and negative correlation between Sharks catch and total catch equal to -0.241 at the level of 0.01, the amount of the ratio of total Sharks catch in compare to total catch have been calculated 2.1% in average during 1992-2023. So, this period of time condition, does not a suitable period of time for extending their results for the years without data. Based on current study the best period of time with more similarity with the years before 1970 is 1970-1979. In fact, it is reasonable we extend the calculated ratio of Sharks catch to the total catch for period of time during 1970- 1979 to the year 1950-1969. According to this study, a correlation between Sharks catch and total catch was 0.854 in the level of 0.01 and the ratio of the Sharks catch to total catch was 11.7%, So, scientifically it is more acceptable to use its ratio for the years before that during 1950-1969.

For further study, there is possibility to do more research about Shark species in catch combination. Surely, there are many changes in Shark's species quality and quantity during 1950- 2023. For example, Whale shark was a common species that are caught by Iranian fishermen for use of their oil. The oil has used, for shipbuilding industry, but everything is change now and there is no more use for the Sharks oil. Also, there are many small pelagic Sharks, such as milk Sharks in current catch composition. Also, after joining Iran fisheries vessels for fishing in the Indian Ocean, many Sharks are caught at the open sea as a by-catch. While, there are a lot of uncertainty about the data and information related to Sharks species during 1950-2023.

VI- References:

- 1- CITES, 2016, Poster on the status of the implementation of CITES listed Sharks in Iran.
- 2- Dr. G.H.Vossoughi, 2000, Identification and distribution of cartilaginous fishes of the Persian Gulf
- 3- Dr. T.Valinasab, N, Sedgi Maruf, 2013, List of the Persian Gulf, Oman Sea & Caspian Sea fish.
- 4- Iran Fisheries Organization year books, 1998-2023.
- 5- N. Niamaimandi, Dr.T, Valinassab, Gh-A, Zarshenas, 2014, Stock assessment of sharks in the northern part of the Persian Gulf, Iranian Fisheries Research Organization, Science publishing online group.
- 6- R. Nori Dafrazi, R.Abbaspour Naderi, 2010, Marine species of Persian Gulf, Oman Sea & Caspian Sea.
- 7a- Estimation Iran sharks catch historical data 1950-2016.By: Reza Shahifar, Saeed Eslami. IOTC-2017-WPEB13-13.
- 7b- Reza Shahifar, IRAN Fisheries Data Mining by focus On Sharks Species during 1950-2015, IOTC and CITES Joint Meeting, November 2016, Seychelles, IOTC).
- 8-[WWW.FAO.Org](http://www.fao.org) Datasheet.
- 9-Country and regional prioritization for supporting implementation of CITES provisions for Sharks, 2018. FAO Fisheries and aquaculture circular No.1156 (En), ISSN 2070-6065, Iran (Islamic Republic of), Pages 83-90.
- 10- Marcelo Vasconcellos Fishery Resources Officer FAO Fisheries Department Rome, Italy
Monica Barone Consultant FAO Fisheries Department Rome, Italy and Kim Friedman Senior Fishery Resources Officer FAO Fisheries Department Rome, Italy
- 11- Technical workshop on the status, limitations and opportunities for improving the monitoring of Shark fisheries and trade Rom, 36Nov 2008, FAO fisheries and aquaculture report. No. 897 FIMF/R897 (En) ISSN 2070-6987.
- 12-Five decade decline in Sharksof Iran, Bargahi, H.R, 2021, Volume 8, Issue 5 (2nd Conference on Iranian indigenous Fish Conservation, February 2021 2020), Journal homepage:
<http://jair.gonbad.ac.ir>
- 13- Nardin Roshan Moniri, Nazanin Roshan Moniri, Dirk Zeller, Dalal Al-Abdulrazzak, Kyrstn Zylich, Fisheries catch reconstruction for Iran, 1950-20101, Sea Around Us Project, Fisheries Centre, University of British Columbia, 2202 Main Mall, Vancouver, BC, V6T 1Z4, Canada.