Estimation Iran sharks catch historical data 1950-2016
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I- Abstract:

Historical data of fish stocks is one of the scientific addresses which are shown the condition of related fish stocks. Historical data are Past-periods data that are used usually as a base for prediction of future data or trends. In addition it gives a briefed overview about data condition at the past. In fact catch historical data are applicable for evaluation of catch in the past and future.

While sharks are valuable species in any ecosystems with significance importance for marine biologist and ecologist, but their historical data have not registered by species in Iran and there is only limited information about their total catch. Sharks are a group of species that have not enough interest for consume of them in Iran. Because of some reasons especially religious believes about 90% of Iranians do not eat Sharks. Also Iran fisheries Organization has never issued any licenses for sharks catch and sharks fisheries are banded. But, as we know different types of Sharks are living in different depth of sea and there is possibility for their incidental catch with different type of fishing gears. According to available Iran observer reports, most of the sharks are caught in first 30 m depth of the Persian Gulf and Oman Sea as by-catch. Base on available information around 53 species of sharks belong to 10 families, are landing in Iranian fishing harbors where some of them are very rare.

This study has tried to introduce an estimation about total sharks catch by Iranian fishermen since 1950, while the recorded sharks catches only are available since 1992 and there is limited information about sharks catch by species. Base on available information, Iran total catch including sharks, are recorded separately during 1992-2016, while it is estimated as total catch by some international organization such as FAO and CITES during 1950-1991 and there is no data for sharks during the years.

In order to estimation missed year data there are some different methods and there is possibility to find a correlation between sharks catch and total catch during 1992-2016. In order to access this estimation, the proportions of shark's catch are compared with total during 1992-2016. According to result, there is a limited and significant correlation between total catch and sharks catch 0.552 at the level of 0.01. In fact this correlation is very weak and regression equation shows us R^2=0.304, but there was no way except using this correlation with other factors such as average or mean of sharks proportion in catch composition.

Without any doubt the rate of sharks in catch composition, gives us a view of sharks catch condition during the recorded years (1992-2016 for 25 years). So there is possibility to calculate a correlation between sharks catch and total catch during 1992-2016 and extend this to previous years during 1950-1991. The key point is, sharks catch have allocated a distinguished and almost stable quantity and proportion of Iran total catch during the recorded years which it calculated 2.6% in average. So with considering to other methods I extended this rate for sharks catch calculation during 1950-1991. Finally calculated shark catch from 1950-1991 and recorded shark catch during 1992-2016 add together and introduce as Iran sharks historical data during 1950-2016.

II- Introduction:

Historical catch data are one of the scientific addresses which are shown the condition of any fish stocks. Historical data are Past-periods data that are used usually as a base for forecasting future data or trends. In addition it gives a briefed overview about data condition at the past. In fact historical data of catch are applicable for evaluation of catch in the past and future. Historical records of fisheries also can be used in analyzing population dynamics of commercial species and assessing the environmental effects on them.

A number of encouraging examples of use of historical documents for the analysis of the long-term population dynamics of fish species and ecosystem changes have been produced (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, historical methods may provide additional importance information to the data available from statistics published by fisheries. In some cases historical analyses may provide long-term data series, whereas fisheries statistics has started more than during two decades in Iran. During this period of time, some commercial species were seriously affected by some negative factors and there are evidences about severe changes in catch composition and contribution of each species on total catch. Superimposing 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 them 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 species catch history helps us to better understanding of their stocks in the past and future. On this way absence, deficiency or lack of data is a main problem and only some countries recorded and documented sharks catch data historically, while many countries do not have any information about that. So, survey on past data with appropriate methods are one of the issues that are considerable for any data collection system.

Sharks are a group of species that have not enough interest for consume of them in Iran. In fact because of some reasons especially religious believes about 90% of Iranians do not eat Sharks. The other point is Iran fisheries Organization has never issued any licenses for sharks catch and sharks catch are banded. So, these are valid evidences for low level of sharks catch in Iran as a target species. As we know different types of Sharks are living in different depth of sea and there is possibility they are caught as a by-catch by different type of fishing gears. According to catch observation, most of the sharks are caught in first 30 m depth.

Base on FAO study, MSY of sharks estimated 7000 tons only in Persian Gulf while the amount of sharks catch in Iran (Persian Gulf and Oman Sea) reported 11000 ton. According to Iran Fisheries Research Organization swept area project, the biomass of *carcharhinus dussumieri* estimated 201 ton in 1997. Other study estimated the biomass of this fish about 234 ton (Khorshidian, Nyamymandi, 1997). Some years later the biomass of the fish estimated 430 ton (Nyamymandi, 2002). Base on these reports the most dominated length frequencies of the sharks have been 52-56 and 67-63 cm. (Iran Fisheries Organization data information).

Available information indicated that around 53 species of sharks belong to 10 families are landing in Iranian fishing harbors. Base on observer repots, 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 Sphyrinidae are most dominated families where 24 species of them belong to Carcharhinidae family. (Reza Shahifar, IRAN Fisheries Data Mining by focus On Sharks Species during 1950-2015, IOTC and CITES Joint Meeting, November 2016, Seychelles, IOTC).

III- Material and Methods:

This study has tried to introduce estimation about total shark's catch by Iranian fishermen since 1950, while the recorded shark's catches only are available since 1992. On the other hand the recorded Iran sharks catch (in total), are collected during 1992-2016 through the papers and official statistic year books. According to this information we have tried to find a trend where it gives us a view of sharks catch condition during this period of time (25 years).

The key point is, sharks catch have allocated almost a stable quantity and proportion of Iran total catch during the recorded years (1992, Max 4.7% & 2016, Min 1.5%, in Average 2.6%). While the amount of catch has recorded since 1950 (published in international level such as FAO, IUCN …) but there is no valid information about sharks catch during 1950-1991. So there is possibility to calculate a correlation between sharks catch and total catch during 1992-2016. In order to access this estimation, the proportions of shark's catch are compared with total during 1992-2016. It was a weak correlation between total catch and sharks catch while the other methods did not introduce valid results. So, this average proportion (2.6%) was extended to previous years during 1950-1991. On this way the proportion of sharks in total catch is calculated base on % as a below:

$$\sum_{2016=25}^{1992=1} \left(\frac{\text{Sharks catch}_{1991} \times 100}{\text{Total catch}_{1991}} \right) + \left(\frac{\text{Sharks catch}_{1992} \times 100)}{\text{Total catch}_{1992}} \right) + \left(\frac{\text{Sharks catch}_{1993} \times 100}{\text{Total catch}_{1993}} \right) + \dots +$$

$$\left(\frac{\text{Sharks catch}_{2015} \times 100}{\text{Total catch}_{2015}} \right) + \left(\frac{\text{Sharks catch}_{2016} \times 100}{\text{Total catch}_{2016}} \right) \Bigg/ 25 = \text{Sharks Proportion Mean \%}_{1991-2016} =$$

$\text{MSP\%}_{1991-2016} = 2.6\%$

$\text{MSP\%} \times \text{Total Catch}_{1950} = \text{Sharks catch}_{1950}$
$\text{MSP\%} \times \text{Total Catch}_{1951} = \text{Sharks catch}_{1951}$
$\text{MSP\%} \times \text{Total Catch}_{1952} = \text{Sharks catch}_{1952}$
$\text{MSP\%} \times \text{Total Catch}_{\dots} = \text{Sharks catch}_{\dots}$
$\text{MSP\%} \times \text{Total Catch}_{1994} = \text{Sharks catch}_{1989}$
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$\text{MSP\%} \times \text{Total Catch}_{1996} = \text{Sharks catch}_{1991}$

In fact by calculation of shark's proportion in total catch during 1992-2016 (equal to 2.6% in average) and extending of it for 1950-1991, the amount of sharks catch are calculated for these years. The total catches including sharks during 1992-2016 are extracted from Iran Fisheries Organization annually records catch and a thesis, while the source of total catch during 1950–1991 is FAO database.

IV- Discussions:

According to this study objective and in order to assessment of gap and missing data for sharks catch during 1950- 1991, selection of an appropriate method which leads us to valuable data for missing years, was the most important step. So, I analyzed available methods according available data and current condition. In order to survey on Iran shark catch data and mining it for the period of gap during 1950-1991, I need to know how should be face with missing data and how is possible to complete gaps with valid data. Academically through this kind of condition 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 forgot about it, if it 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 or imputing,

According to Iran sharks catch data, we did not find a set of data (complex data) with different variables and related information, because we had only access to two variables (total catch and Shark catch). Also we were not going to prepare a model for data forecasting for future base on current trend vice versa we were trying to find past missed years data base on current information. In conclusion first method is not an acceptable way to access our goal, because we do not want to delete sharks gaps year. The second method suggests us, replacing missing data with adding a steady amount of catch for each year, while adding a steady amount for each year dose not lead us to correct conclusion for the gaps. Third method leads to use some information such as average from available data for missing data. The forth methods suggest us to use correlation between variables. So we must to carry out statistical correlation test. The fifth method suggest us, replacing empty years data according similarity in variables or imputing base on data set and complex of data with different variables.

According to result there is a limited and significant correlation between total catch and sharks catch 0.552 at the level of 0.01. In fact this correlation is very weak and regression equation shows us R^2=0.304 that is not enough strong. Table 1 shows correlation between total catch and Shark catch during 1992-2016.

		Total Catch (Ton)	Sharks Catch (Ton)
Total Catch (Ton)	Pearson Correlation	1	.552**
	Sig. (2-tailed)		.004
	N	25	25
Sharks Catch (Ton)	Pearson Correlation	.552**	1
	Sig. (2-tailed)	.004	
	N	25	25

Table 1- correlation between total catch and Shark catch during 1992-2016
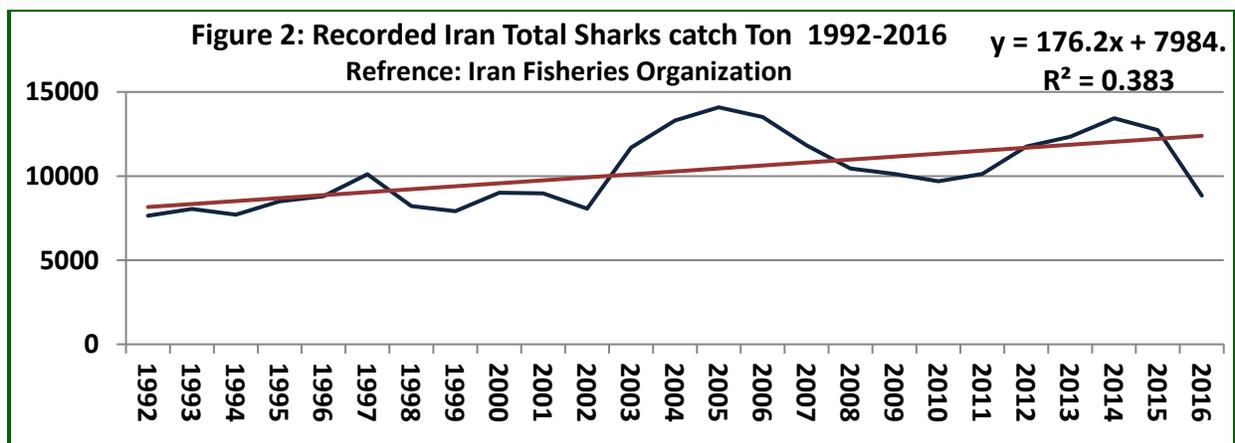
**. Correlation is significant at the 0.01 level (2-tailed).

So, considering to, low level of correlation among two variables and a stable proportion average of sharks catch in compare with total catch during 1991-2016, I used available proportion for the previous years as we mentioned in section material and methods. The key point is, sharks catch have allocated a distinguished and almost stable quantity and proportion of Iran total catch during the recorded years.
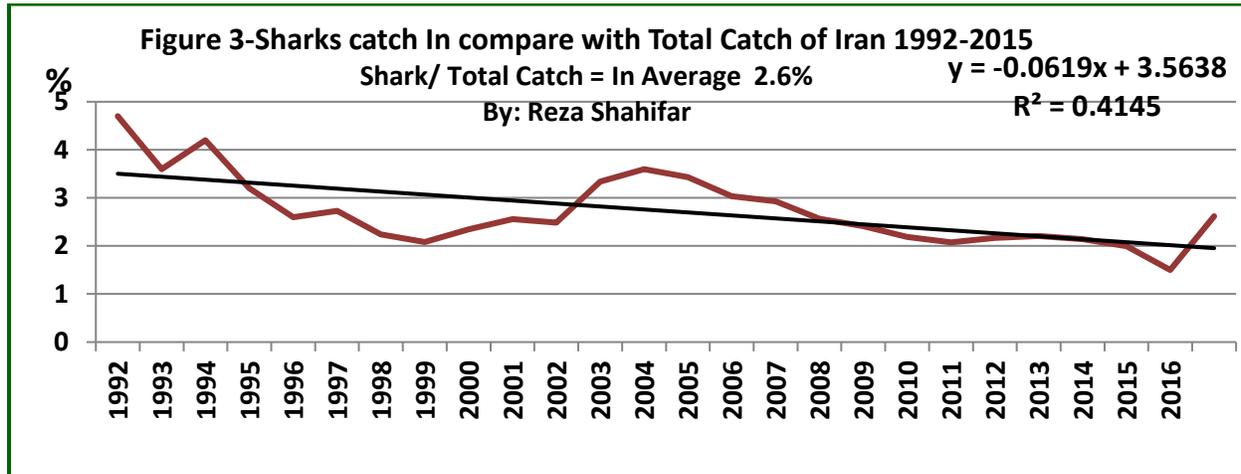
Although Iran official catch data are recorded since 1991 by Iran fisheries organization, but there is estimated data about total catch of Iran by FAO, since 1950. Based on this data, total catch of Iranian fishermen have been 20017 tons in 1950 and the amount of catch stayed in a stable level up to 1973. But after maintenance in fisheries and strengthening of fishing fleet the amount of catch increased more than three times in 1974 and reached to 69062 tons. The increasingly trend had continued up to 1986 slowly and the amount of catch reached to 133381 tons, but after that Iran fisheries organization started to received the results of its investments in fishing industries and catch growth rate found more speed than before. So, increasingly trend of catch are passed 200 thousand tons in 1988, 300 thousand tons in 1992, 400 thousand tons in 2005, 500 thousand tons in 2012 and 600 thousand tons in 2014 because of access to new fish stocks. (Figure 1)

Figur 1: Iran Marine Fisheries Catch/Ton 1950-2016
Refrence: FAO and Iran Fisheries Organization
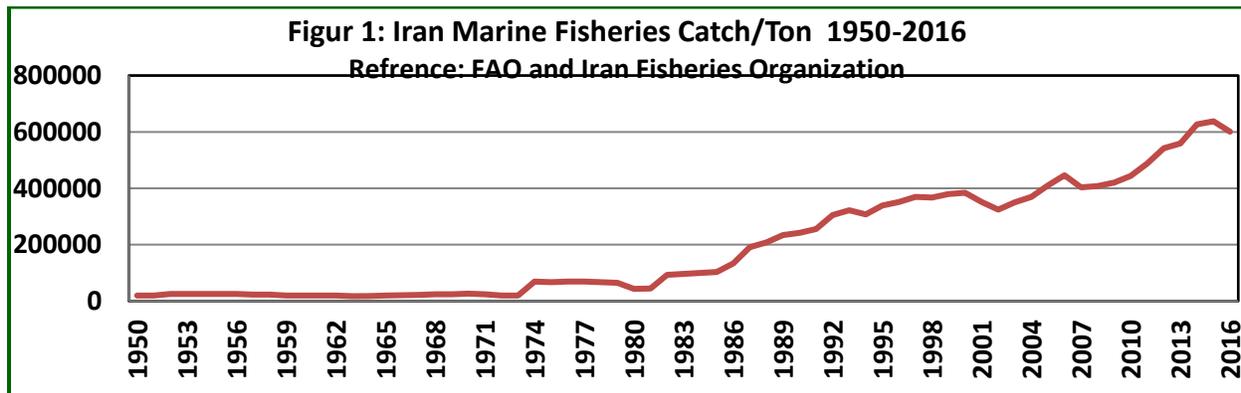
Although sharks have been caught for many years by Iranian fishermen as a by-catch but there is low level of records about it and Iran sharks catch has registered only since 1992. Base on available information the registered data are base on sharks total catch not by species. In fact there is low level of information for each individual species of sharks. So, this study presents estimation about shark's total catch. (Figure 2)

Figure 2: Recorded Iran Total Sharks catch Ton 1992-2016
Refrence: Iran Fisheries Organization
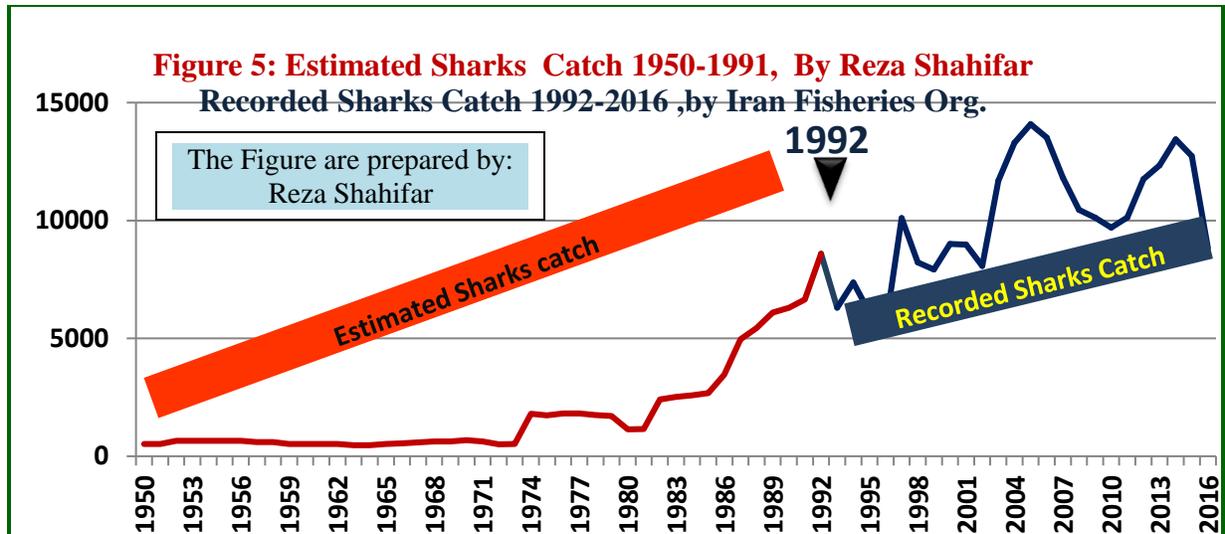
$y = 176.2x + 7984.$
$R^2 = 0.383$

According to total catch data and total sharks catch, the proportion of sharks catch in compare with total catch have had a stable proportion and has been 2.6% in average. In fact around 2.6 kg of sharks have been caught in each 100 kg of total catch by Iranian fishermen during 1992-2016. So with reference to the correlation among total catch and sharks catch there is possibility to use this proportion of the sharks catch for the years 1950-1991. (Figure 3)

Figure 3-Sharks catch In compare with Total Catch of Iran 1992-2015
Shark/ Total Catch = In Average 2.6%
$y = -0.0619x + 3.5638$
$R^2 = 0.4145$
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Considering to 2.6% average proportion of sharks catch in compare with total catch we extended this proportion to the past, when we have not any shark's data for the period of time, during 1950-1991. While it is not possible to use it for estimation sharks catch by species because of lack of data (Figure 4)

Figure 4: Estimated Iran Sharks Catch/Ton 1950-1991
$y = 112.8x - 766.1$
$R^2 = 0.620$
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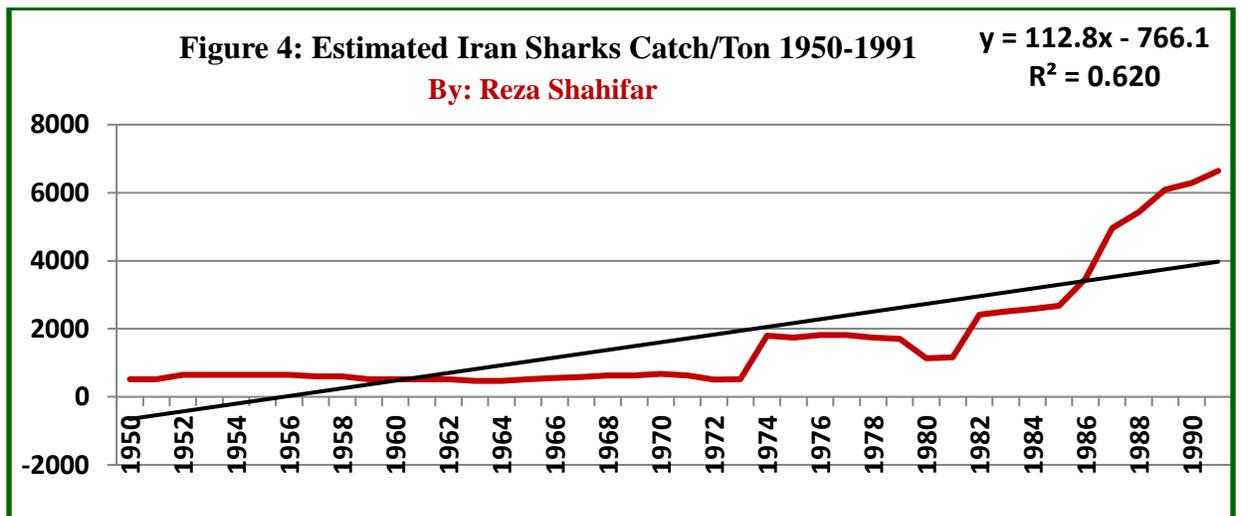
After estimation of amount of sharks catch for the period of years during 1950-1991, we add the information to the period of recorded shark catch during 1992-2016. Finally we combined and put together two period of time information as a historical total sharks catch for 1950-2016. (Figure, 5)

Figure 5: Estimated Sharks Catch 1950-1991, By Reza Shahifar
Recorded Sharks Catch 1992-2016 ,by Iran Fisheries Org.

V- Conclusion:

Although, there is low level of correlation between sharks catch and total catch in Iran fish catch, but because of low level of information about that I used average of sharks proportion in compare with total catch during 1992-2016 for the past gaps during 1950-1991. Nevertheless, this estimation there is some uncertainty about accuracy of the calculation, but it gives us a rough view of sharks catch during the missed year's data. In fact the result of used method is very close to reality of sharks catch in the past where our experiences are witness of this profess. Also we do not have enough information about sharks catch in species. However in order to access more detail in Iran sharks data, we need more study and research about previous year's data and data mining, through new researches and studies with more detail.

However the used method in current paper is prepared a rough estimation of sharks catch historical data since 1950. According to this, the minimum sharks were caught in 1963 and 1964 with 468 tons, while the maximum catch was happened in 2005 with 14086 ton sharks catch. Current trend shows although the amount of sharks catch has been stable in compare with total catch but the amount of shark's catch have been decreased since 2013 because of severity of regulation in Iran and stock collapse all over the world.

VI- References:

1- CITES, 2016, Poster on the statuse 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 fish of the Persian Gulf, Oman Sea & Caspian Sea.
4- Iran Fisheries Organization year books, 1998-2016.
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.
7- WWW.FAO.Org Datasheet.