Global Veterinaria 10 (5): 565-570, 2013
ISSN 1992-6197

DOI: 10.5829/idosi.gv.2013.10.5.7370

Evaluation of Sturgeon Catching Processes During 2004 to 2009 in South East of Caspian Sea (Golestan Province, Iran)

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Abstract: Sturgeons are the most valuable fish in the world due to their delicious and expensive Caviar. This study was done to evaluate the process of catching and sturgeons stocks over 2004 to 2009 in Golestan province (Iran). In this study, the data obtained about fisheries of Golestan province were used about sturgeon catching ranges during 2004 to 2009. Now there are five catching facilities in Golestan Province namely Faridpak, Torkman, KhajehNafas, Chalasht (Ashoor) and Mianghaleh facilities and processing centers that are responsible for the extraction and processing caviar. Results have indicated that the Sturgeon catching ranges declined sharply over the mentioned years and are being a downward trend and significant differences can be seen from the total amount of sturgeon catching during those years ($P<0.05$). So that the most catching happened in 2004 with 3777 numbers and with 109185 kg and the least amount of catching was in 2009 with 396 numbers with 16588 kg. The results have shown that the maximum catching rate was about 2958 sturgeon with 98391 kg during 2004 to 2009 in Faridpak facility and the least amount of catching was in Chalasht facility with 1010 fish and 29595 kg weight. The results showed that the frequency of catching among the five species of sturgeon caught in Golestan Province, *Acipenser persicus* has the first place in Golestan province and in southeastern of the Caspian Sea with 74.85 % of the total amount of catching. The results of this study showed that the rate of sturgeon stocks in the Caspian Sea is declining sharply.

Key words: Catching · Sturgeon · Southeast · Caspian Sea · 2004-2009

INTRODUCTION

Caspian Sea sturgeons include Persian sturgeon (*Acipenser persicus*), Russian sturgeon (*Acipenser gueldenstaedtii*), Star Sturgeon or Stellate Sturgeon (*Acipenser stellatus*), Ship Sturgeon (*Acipenser nudiventris*) and Great Sturgeon (*Huso huso*) and Volga rivers sturgeon, *Acipenser ruthenus*. Sturgeon not only in terms of the quality of the food but also from the perspective of international trade has attracted great attention to him and has the significant economic value. The best living place for these fish is in all waters of the Caspian Sea and in addition to domestic consumption, a large amount of caviar is exporting to international markets annually as well. As regards, the generation of these valuable fish is highly on the verge of extinction and the amount of catching them in the Caspian Sea has fallen in the recent years. Considering that the most valuable fisheries aquatic of the Caspian Sea is sturgeon, caviar as a strategic product plays an important role in the regional geopolitics economy. So any investment for maintaining and developing of reserves reconstruction and utilization of these valuable resources is considered as an important step in preventing their extinction. So that in this respect we can mention that skills in catching and the use of physiology principles of artificial propagation in order to increase the reserves efficiency, systematic utilization of immature female spawners caught from the sea to extract caviar and developing them in an artificial conditions. The strategic importance of caviar led to the special attention to this economical valuable product. Caspian Sea is considered as the main origin of

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Acipensers of the world and Iranian caviar has a unique place due to the specific ecological conditions prevailing on the southern Caspian Sea. Among the five species of sturgeon in this sea, *Acipenser persicus* species focus on a special care as the native of Iran's coasts. According to the indescribable value of caviar, any plan is essential for reducing the harmful elements that threaten the life cycle of sturgeon in the Caspian Sea. And thereby we can save the generation of this ancient fish from extinction [1]. According to the importance of sturgeon, in this research the process of catching fish about Persian sturgeon, Russian sturgeon, Stellate Sturgeon, Ship Sturgeon and Great Sturgeon were studied during 2004 to 2009 in Golestan province that as one of the three northern provinces of Iran is involved in the sturgeon catching. And with examining the process of catching and fish reserves in the southern Caspian Sea basin can get the attention of the related managers and planners more in the condition of these fish reserves and choose an appropriate management plans about protecting their reserves.

MATERIALS AND METHODS

This study was performed based on the information obtained from the active fisheries of Golestan province of catching *A. gueldenstaedtii*, *A. stellatus*, *A. nudiventris*, *A. persicus* and *Huso huso* during 2004 to 2009. Captured sturgeons after catching are transferred to catching centers in Golestan Province. Now there are five catching facilities in Golestan Province (Figure 1) along the shoreline of the Caspian Sea, which the range of each fishery is exactly specified [2].

- Engineer Faridpak's center of catch and processing
- Torkman's center of catch and processing
- Khajeh Nafas's center of catch and processing
- Chalasht (Ashoor) center of catch and processing
- Mianghaleh center of catch and processing

The above facilities after biometric and registering the information are responsible for operations like extracting and processing caviar. At the end all the information obtained from these five stations were analyzed after the catching season, each year and over 6 years that SPSS 13 is used for analyzing all the information and Excel 2003 is used for drawing charts. For examining the total amount of catching sturgeon in each year as well as fisheries, Kay-Score (Chi-Tow) is used and to determine the weight and length of all sturgeons caught between different years as well as the fisheries, Kruskal-Wallis test is used. To investigate the relationship between the total amounts with different examined years, Pearson correlation coefficient was used.

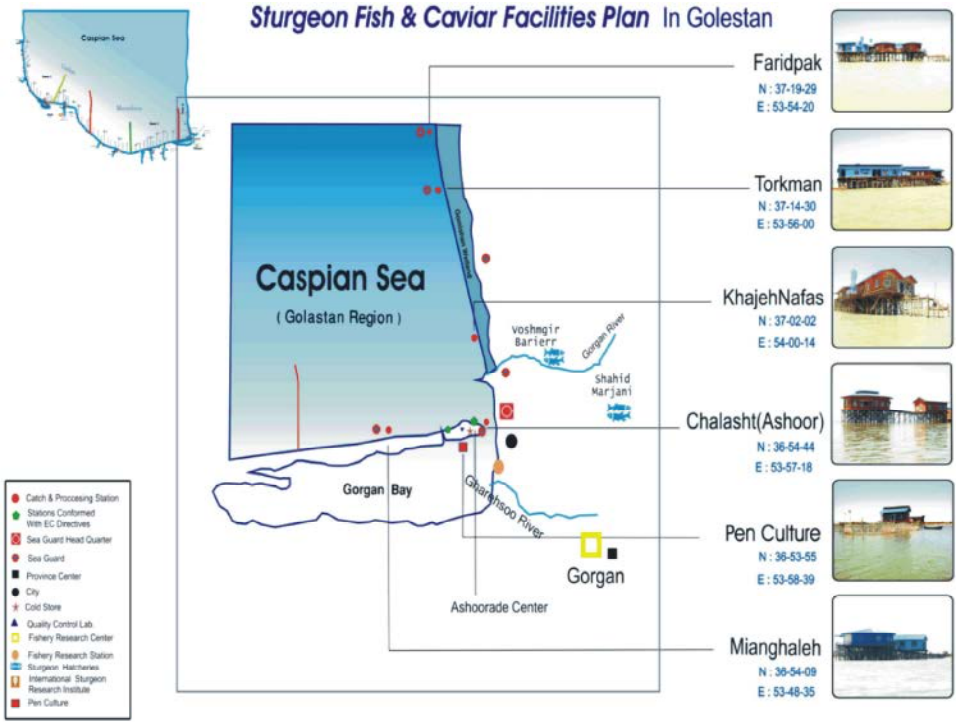

Fig. 1: Geographic location of catching facilities in Golestan Province

RESULTS

Catching results of *A. gueldenstaedtii, A. stellatus, A. nudiventris, A. persicus* and *Huso huso* during 2004 to 2009 are shown in Table 1. The results showed that the highest rate of sturgeon catching was in 2004 with 3777 sturgeon and equivalent to 109,185 kg and the lowest catching was in 2009 with 396 sturgeon and equivalent to 16,588 kg. Finally during the years of study a total amount of 10,571 *A. gueldenstaedtii, A. stellatus, A. nudiventris, A. persicus* and *Huso huso* were caught that the total amount was equivalent to 341,301 kg.

And based on the results, it is found that the average catching of *A. gueldenstaedtii, A. stellatus, A. nudiventris, A. persicus* and *Huso huso* has had many changes during the 2004 to 2009 in Golestan Province so that the total amount of catching of all five species has been declining year by year. The total amount of catching and the captured numbers in 2009 has greatly reduced than in 2004 (Figures 2 and 3). The results have shown that during those years in most of the time the maximum number of sturgeon captured was related to Persian sturgeon (*A. persicus*) and the minimum number was related to *A. nudiventris*.

The results of Sturgeon catching in catching facilities of Golestan Province showed that the maximum rate of catching over the 2004 to 2009 in Faridpak facility was 2958 numbers of sturgeons equal to 98,391 kg and the least amount of fish catching was in Chalasht facility with 1010 numbers equal to 29,595 kg (Table 2).

Also, results showed that the average catching of *A. gueldenstaedtii, A. stellatus, A. nudiventris, A. persicus* and *Huso huso* have had many changes in facilities of Golestan province during 2004 to 2009 so that the total amount of catching of all five species has been declining year by year. And the total amount of catching and the captured numbers in 2009 has greatly reduced than in 2004 (Figure 4).

Table 1: Overall statistics for sturgeon catching during 2004 to 2009 in Golestan Province

	A. persicus		*A. stellatus*		*Huso huso*		*A. nudiventris*		*A. gueldenstaedtii*			
Year	N	W	N	W	N	W	N	W	N	W	Total number of catching	Total amount of catching (kg)
2004	2820	80013	562	5353	151	17600	57	1984	187	4235	3777	109185
2005	2082	56990	245	2357	156	17327	53	1913	164	3350	2700	81937
2006	1359	40028	122	1269	148	18020	33	1183	92	2111	1754	62611
2007	860	24763	75	875	125	13162	48	1531	85	1765	1193	42096
2008	517	15035	85	851	95	11562	24	800	30	632	751	28884
2009	245	6806	43	494	59	8016	20	591	29	681	396	16588
Total	7883	223635	1132	11198	734	85691	235	8001	587	12765	10751	341301

N: number, W: weight (kg)

Table 2: Overall statistics for sturgeon catching in different facilities during 2004 to 2009 in Golestan Province

	A. persicus		*A. stellatus*		*Huso huso*		*A. nudiventris*		*A. gueldenstaedtii*			
Facility	N	W	N	W	N	W	N	W	N	W	Total number of catching	Total amount of catching (kg)
Torkman	1941	58166	418	4291	208	25241	59	2212	120	2843	2746	92753
Chalasht	774	18974	64	550	70	8119	19	490	83	1462	1010	29595
KhajehNafas	747	19839	147	1298	97	10944	26	871	69	1485	1086	34437
Faridpak	2310	67586	273	2901	165	19739	51	1733	159	3474	2958	98391
Mianghaleh	2111	59070	230	2159	194	21648	80	2696	156	3501	2771	89074
Total	7883	223635	1132	11198	734	85691	235	8001	587	12765	10751	341301

N: number, W: weight (kg)

Table 3: The average body length and body weight of sturgeon caught during 2004 to 2009 in Golestan province

Fish	Average weight (kg)	Minimum weight	Maximum weight	Average length (cm)	Minimum length	Maximum length
A. gueldenstaedtii	21.75±7.49	10	69	154.75±16	110	231
A. stellatus	9.89±6.94	1	38	143.06±16.02	57	230
A. nudiventris	34.05±13.05	11	69	179.86±24.8	115	239
Huso huso	116.74±59.84	36	518	237.97±38.26	135	428
A. persicus	28.37±8.64	3	86	175.5±18	115	303

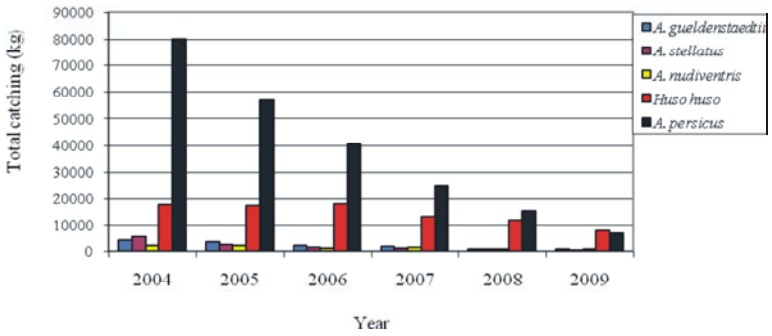

Fig. 2: The amount of sturgeon catching during 2004 to 2009 in Golestan Province

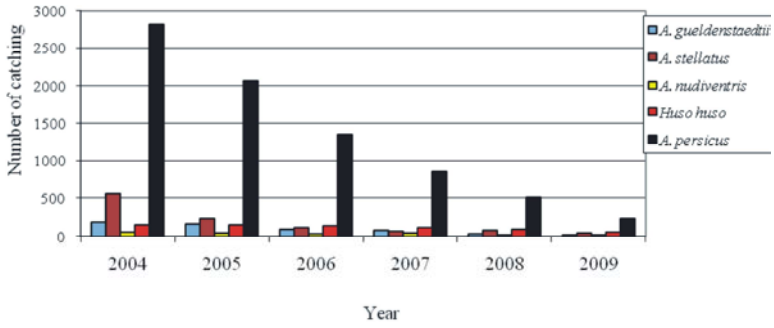

Fig. 3: The number of sturgeon catching during 2004 to 2009 in Golestan Province

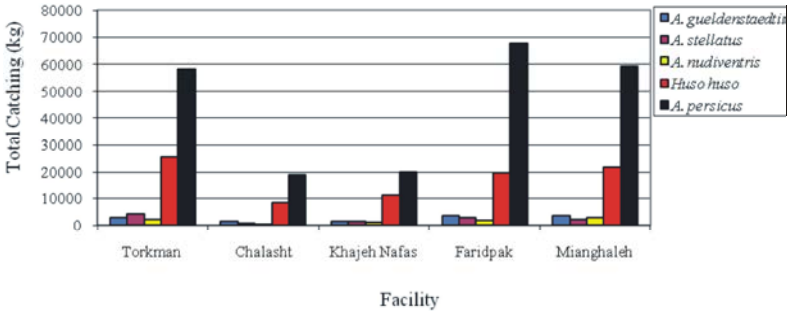

Fig. 4: The amount of sturgeon catching during 2004 to 2009 in facilities of Golestan Province

Results of the average body length and body weight of sturgeon captured during the study are shown in Table 3. According to results the highest weight and the average length of captured sturgeon is related to *Huso huso*.

DISCUSSION

The results of this study showed that catching *A. gueldenstaedtii* has dropped sharply during the examined years so that the maximum rate of catching is related to 2004 with 1874 numbers equal to 4235 kg and the lowest catching is related to 2009 with 29 numbers equal to 681 kg. Also according the results of this study, it is found that the maximum amount of catching *A. gueldenstaedtii* between five facilities of Golestan province during 2004 to 2009 was in Mianghaleh facility with 156 numbers and 3510 kg and the lowest rate of catching was in Khajeh Nafas facility with 56 numbers and 1485 kg. Thus in terms of the importance of active facilities of Golestan province in catching *A. gueldenstaedtii*, it can be considered as follows: KhajehNafas < Chalasht < Torkman < Faridpak < Mianghaleh. The results also have shown that among the five species of sturgeon caught in Golestan Province in terms of the frequency of catching *A. gueldenstaedtii*, it has ranked third with a 3.74 % of the total amount of catching sturgeon in Golestan province in the southeast of the Caspian Sea.

The results of this study showed that catching *A. stellatus* has declined sharply during the studied years, so that the highest rate of catching was in 2004 with

562 numbers equal to 5353 kg and the lowest rate was in 2009 with 43 numbers equal to 494 kg. Also in terms of the results of this study it has been found that the maximum amount of catching *A. stellatus* was in Torkman facility with 418 numbers and weight of 4291 kg and that the minimum amount of catching was in Chalasht facility with 64 numbers and weight of 550 kg. Thus it can be considered in terms of the importance of facilities in catching *A. stellatus* in Golestan province as follows: Chalasht < KhajehNafas < Mianghaleh < Faridpak < Torkman. Results also showed that *A. stellatus* has ranked fourth with 3.28 % of the total catching of sturgeon in Golestan province in the southeast of the Caspian Sea.

The results of this study showed that catching *A. nudiventris* has declined sharply during the studied years, so that the highest rate of catching was in 2005 with 40 numbers equal to 1606 kg and the lowest rate was in 2009 with 12 numbers equal to 418 kg. Also in terms of the results of this study it has been found that the maximum amount of catching *A. nudiventris* was in Mianghaleh facility with 80 numbers and weight of 2696 kg and that the minimum amount of catching was in Chalasht facility with 19 numbers and weight of 490 kg. Thus it can be considered in terms of the importance of facilities in catching *A. nudiventris* in Golestan province as follows: Chalasht < KhajehNafas < Faridpak < Torkman < Mianghaleh. The results also have shown that in terms of the frequency of catching *A. nudiventris* among the five species of sturgeon caught in Golestan Province, *A. nudiventris* has ranked fifth with a 2.34 % of the total amount of catching sturgeon in Golestan province. Results also showed that *A. nudiventris* has ranked fifth with 2.34 % of the total catching of sturgeon in Golestan province in the southeast of the Caspian Sea.

The results of this study showed that catching *Huso huso* has declined sharply during the studied years, So that the highest rate of catching was in 2004 with 151 numbers equal to 17600 kg and the lowest rate was in 2009 with 59 numbers equal to 816 kg. Also in terms of the results of this study it has been found that the maximum amount of catching *Huso huso* was in Torkman facility with 208 numbers and weight of 25241 kg and the minimum amount of catching was in Chalasht facility with 70 numbers and weight of 8119 kg. Thus it can be considered in terms of the importance of facilities in catching *Huso huso* in Golestan province as follows: Chalasht < KhajehNafas < Faridpak < Mianghaleh < Torkman. The results also have shown that in terms of the frequency of catching *Huso huso* among the five species of sturgeon caught in Golestan Province, *Huso huso* has ranked second with a 6.95 % percent of the total amount of catching sturgeon in Golestan province in the southeast of the Caspian Sea.

The results of this study showed that catching *A. persicus* has declined sharply during the studied years, So that the highest rate of catching was in 2004 with 2820 numbers equal to 80013 kg and the lowest rate was in 2009 with 245 numbers equal to 6806 kg. Also in terms of the results of this study it has been found that the maximum amount of catching *A. persicus* was in Faridpak facility with 2310 numbers and weight of 67586 kg and the minimum amount of catching was in Chalasht facility with 774 numbers and weight of 18974 kg. Thus it can be considered in terms of the importance of facilities in catching *A. persicus* in Golestan province as follows: Chalasht < KhajehNafas < Torkman < Mianghaleh < Faridpak. The results also have shown that in terms of the frequency of catching *A. persicus* among the five species of sturgeon caught in Golestan Province, *A. persicus* has ranked first with a 74.58 % of the total amount of catching sturgeon in Golestan province in the southeast of the Caspian Sea.

The results also shows that 10,571 numbers weighing 341,301 kg of sturgeon has been caught in Golestan Province over 6 years that the maximum weight and length of Sturgeon was for *Huso huso*, *A. nudiventris*, *A. persicus*,

A. gueldenstaedtii and *A. stellatus* respectively. Meanwhile in terms of rank and frequency of catching different fish in Golestan province, *A. persicus, Huso huso, A. gueldenstaedtii*, *A. stellatus* and *A. nudiventris* respectively have the ranks of catching in Golestan province.

Another study that was done about Caspian Sea sturgeon has specified that now the most abundant species of sturgeon in Caspian Sea is *A. persicus*. So that Tavakoli *et al.*, examining the species composition of catching sturgeon of Caspian Sea have announced that Sturgeon abundance in stock assessment *A. persicus*, *A. gueldenstaedtii*, *A. stellatus, Huso huso* and *A. nudiventris*, respectively [3]. This is because of Iran's attention in reconstruction and artificial propagation of these fish in the country. There are three sturgeon stocks' propagation and restoration centre in Iran and in three Northern provinces of the country which are Shahid Marjani centre in Gorgan (Golestan Province), Shahid Rajaee centre in Sari (Mazandaran Province) and Shahid Beheshti centre in Rasht (Gilan Province). Catching operations and artificial propagation of this fish is done in

the southern Caspian Sea Basin and in these three centers at the beginning of annual migration season of sturgeon toward the coasts and rivers of the southern Caspian Sea Basin. And eventually millions numbers of sturgeon fry are released into the rivers of the south part of Caspian Sea annually. That *A. persicus* has had the highest rate of production and releasing among the five species during recent years.

Generally according to these results it is specified that the process of catching sturgeon has taken a downward trend over recent years in the Golestan Province. And it shows the reduction of these precious fish stocks in the southern areas of the Caspian Sea. This can be due to various reasons such as over catching, illegal catching, contamination of the Caspian Sea, the lack of suitable areas for reproduction and breeding sturgeons. The people who offer this study say that the proper and appropriate struggle against non-permissible catching and revision in the Article 22 of the Law on Protection of Marine Resources, by using severe penalties on unallowable fishermen and efficient managerial decisions about preventing and reducing the entering of pollutants to Caspian Sea for protection the ??generation of these valuable fish, preservation and restoration of the breeding and spawning valuable sturgeon. And of Islamic Republic of Iran should pay greater attention to the people who live in south of the Caspian Sea especially in coastal areas and to Torkman underserved areas in order to prevent illegal catching and establish industrial factories in the shoreline. The Iran government should provide jobs and attract unemployed youth in order to protect the aquatic resources. The fisheries should support and encourage young jobseekers to build workshops for aquaculture. These are recommendations and management strategies that can revive generation and can prevent these precious fishes from extinction. It seems that according to these results fisheries managers and practitioners as well as Golestan province should provide appropriate management strategies and pay enough attention to maintaining and restoring these valuable resources. Otherwise we will witness the loss of the valuable resources of the Caspian Sea in the near future.

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