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Iranian Fisheries Status: An Update (2004-2014)

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Abstract

Iran's appropriate geographical location (i.e., large brackish water source in the north, Caspian Sea, salt water source in the south, Persian Gulf and Gulf of Oman) and a wide range of brackish, freshwater and marine species (i.e., trout, carp, sturgeon, sea bass, sea bream, turbot, mackerel, sardine, tuna, sea cucumber, marine shrimp, crayfish) provides Iran to be a great fish producer country. The total fishery production was 947,352 tons in 2014. In this year, 575,512 tons (60.74% of total fishery production) of fish production were obtained from the capture fisheries and 371,840 tons (39.26% of total fishery production) of production was obtained from the aquaculture production. Fisheries in the Persian Gulf and Gulf of Oman are the most important fishery (93% of total fishery) in Iran. There has been a fast increase in the aquaculture production in Iran. For example, total aquaculture production for 2004 and 2014 was 124,560 and 349,365 tons, respectively. Therefore, the percentage of aquaculture in total fish production has been rising every year. The ratio of aquaculture production to total fish production was 26.26% in 2004, 32.65% in 2008 and 39.26% in 2014. Rainbow trout and carps are the main cultured freshwater fish species. In recent years, fisheries production export of Iran has been increased from US$ 85 million in 2004 to US$ 300 million in 2014. In conclusion, despite Iran's long coastline, fishery has not been developed completely and has the potential to be developed more by enhancing aquaculture and fish cage culture.

Keywords: Aquaculture; Export; Statistics; Fisheries; Iran

Introduction

Iran is surrounded by three seas: the Caspian Sea at the north, the Persian Gulf and Gulf of Oman at the south. It has a long coastline exceeding 5,800 km, about 890 km in the north (Caspian Sea coast) and 4,900 km in the south (Persian Gulf and Gulf of Oman coast including coastline around the islands) [1]. In addition, Iran has a great variety of marine and freshwater resources. Table 1 shows important marine and freshwater resources, and their surface area in Iran. There are differences between biological contents and climatic conditions among Iran's sea. These difference water conditions result in diversity of fish species and provides many resources for fisheries activity in Iran. The fisheries are one of the most important agriculture industries in Iran (REF). Providing human nutrition and raw material for industrial sectors, creating employment possibilities and generating high potential for export earnings.

Since 1996, fisheries production statistics have been collected every year by Iran Fisheries Organization. Marine fisheries is divided into two sectors north water (Caspian Sea) and south water fisheries (Persian Gulf and Gulf of Oman coast), while for inland aquaculture, Iran is divided into thirty-one provinces.

There has been a recent increase in the fishery production of Iran. Total harvest increased from 474,500 tons in 2004 to 838,892 tons in 2012 (Table 2). In 2014, total fisheries production of Iran peaked at 947,352 tons, with 575,512 tons (60.74%) of the total production were obtained from capture fisheries [2,3]. In 2014, Iran was 20th place in world aquaculture production, 28th place in world fish capture production, and 27th in overall production [4]. After Egypt (1,481,882 tons), Iran (947,354 tons) is the biggest fish producer in the Middle East and western Asia. Turkey (536,516 tons), Oman (211,319 tons) and Yemen (190,000 tons) are other big producers [4]. The percentage contribution of aquaculture production to total harvest increased from 26.26% in 2004 to 39.26% in 2014.

Although the bulk (about 93%) of capture production (535,865 tons) was obtained from the south, 48% of the aquaculture production came from three provinces; Mazandaran (71,784 tons) and Guilan (46,802 tons) provinces in the north and Khuzestan (60,172 tons) in the southwest [2,3].

Seas and Lakes	Dam Lakes	Rivers
Caspian sea (370,987)	Aras (145)	Helmand (1,150)
Gulf of Oman (903,000)	Shahyun (65)	Hari (1,100)
Persian Gulf (251,000)	Amir Kabir	Aras (1,072)
Urmia (5,200)	Latyan	Karun (950)
Hamoun (3,820)	Sivand (11)	Karkheh (900)
Bakhtegan (3,500)	Mulla Sadra	Sefid Rud (670)
Namak (647)	Upper Gotvand	Zayanderud (400)
Maharloo (600)	Golpayegan	Zarrineh (302)

Table 1: Important marine and freshwater resources of Iran and their surface area.

Years	Aquaculture				Capture fisheries				Aquaculture + Capture fisheries
	Fresh water	Sea	Fresh water + sea	% Ratio of aquaculture in total production	Fresh water	Sea	Fresh water + sea	% Ratio of capture fisheries in total production	Total production
2004	115657	8903	124560	26.26	35775	314165	349940	73.74	474500
2005	130603	3577	134180	25.68	44887	343492	388379	74.32	522559
2006	148974	5700	154678	26.88	46435	374447	420882	73.12	575560
2007	191169	2508	193677	34.44	39174	329571	368745	65.56	562422
2008	179275	4372	183647	32.65	36967	341980	378947	67.35	562594
2009	202225	5128	207353	34.58	44279	348122	392401	65.42	599754
2010	245015	6359	251374	37.88	43805	368505	412310	62.12	663684
2011	277325	8026	285351	38.82	37831	411897	449729	61.18	735079
2012	328725	10152	338877	40.4	40314	459701	500015	59.6	838892
2013	358178	12698	370876	41.91	40423	473658	514081	58.09	884957
2014	349365	22475	371840	39.26	39647	535865	575512	60.74	947352

Table 2: Aquaculture and capture fisheries productions (tons/year) obtained from seas and freshwaters in Iran between 2004 and 2014 [2,3].

A review on the aquaculture development in Iran until 2008 was primarily published by Kalbassi et al. [5]. They mainly reported carp, rainbow trout, sturgeon and marine shrimp aquaculture status in Iran. In addition, in another study, a review on the status of fisheries in Iran was primarily published by Karimpour et al. [6]. They presented and discussed the fishery, aquaculture, importance aquaculture species and aquaculture industry in Iran between 1997 and 2008. On the other hand, no studies have been published on the status of fisheries in Iran in recent years. This review presents and discusses the notable expansion of fisheries and aquaculture in Iran between 2004 and 2014 [7].

Fishery production

Marine fishery: Over 60% of marine fishery products is from Persian Gulf and Gulf of Oman. The most abundant species were *Eleutheronema tetradactylum* (fourfinger threadfin), *Otolithes ruber* (tigertooth croaker), *Pampus argenteus* (silver pomfret), *Scomberomorus commerson* (narrow-barred Spanish mackerel), *Scomberomorus guttatus* (Indo-Pacific king mackerel), *Pomadasys kaakan* (javelin grunter), *Epinephelus coioides* (orange-spotted grouper), *Thunnus tonggol* (longtail tuna), *Dussumieria* (rainbow sardines), *Coryphaena hippurus* (mahi-mahi), *Acanthopagrus latus* (yellowfin seabream) and *Cynoglossus arel* (largescale tonguesole) [2,3] (Figure 1). There is no notable difference in abundant of each species caught from the Persian Gulf and Gulf of Oman.

Regard into marine crustaceans; three shrimp species are caught in the south of Iran. *Penaeus indicus* (Indian white shrimp), *Penaeus merguiensis* (banana shrimp) and *Penaeus semisulcatus* (green tiger shrimp). Annual harvest in 2013 and 2014 was 8,789 and 8,567 tons shrimp were from Persian Gulf and Gulf of Oman, respectively [3].

Iran's marine fishery has increased steady in the last decade. It raised to 535,865 tons in 2014 from 314,165 tons in 2004. Although there are no statistics to show exact portion of fish species in Iran's marine fishery, about 50% of harvest is large pelagic species. In addition, catching of tuna and tuna-like (*Auxis rochei, Auxis thazard, Euthynnus affinis, Katsuwonus palamis, Rastrelliger kanagurta, Scomber japonicas, Scomberomorus commerson, Scomberomorus guttatus, Thunnus albacares* and *Thunnus tonggol*) species is a major component in large pelagic fisheries in Iran [2,3].

After large pelagic fish species, demersal fish species with 32-35% constitute the highest rate in the catch caught from the seas. *P. kaakan*, *O. ruber*, *C. arel* and *P. argenteus* are the most important demersal fish species [2,3].

Inland fishery: Iran has two major inland basins in the north and south and several smaller basins in center and east. Taking into account the newly described species of cyprinids and loaches, freshwater and brackish water fish of Iran exceed 200 species. Inland waters contain 163 of these species including mainly cyprinids with 87 species, balitorids with 22 species and gobiids with 10 species [8].

The main inland fishing area is the Caspian Sea the largest inland body water in the world with salinity around 12 ppt. In 2014, the total fish catch from the Caspian Sea was 39,647 tons. The most important commercial fish species in the Caspian Sea are divided into three groups; bony fish, Caspian Sea sprat and sturgeon fish species.

The most important commercial bony fish of the Caspian Sea are *Rutilus frisii kutum* (Caspian kutum), *Liza aurata* (Golden grey mullet), *Liza saliens* (Leaping grey mullet), *Sander lucioperca* (Pikeperch), *Cyprinus carpio* (European carp), *Rutilus rutilus* (Roach), species of genus *Alosa* (Caspian shads), *Abramis brama* (bream), *Chalcalburnus chalcoides* (Caspian shamaya) and *Vimba vimba* (Caspian vimba). Three species of Caspian Sea sprat live in the Caspian

Sea: *Clupeonella engrauliformis* (Anchovy kilka), *Clupeonella grimmi* (Big eyed kilka) and *Clupeonella cultriventris* (Common kilka). The Caspian Sea is inhabitant of five species of Sturgeon fish: *Huso huso* (Great sturgeon), *Acipenser gueldenstaedtii* (Russian sturgeon), Acipenser persicus (Persian sturgeon), Acipenser stellatus (Stellate sturgeon) and *Acipenser nudiventris* (Spiny sturgeon) [6]. Annual average catch of these three fish groups between 2004-2014 is given in Figure 2.

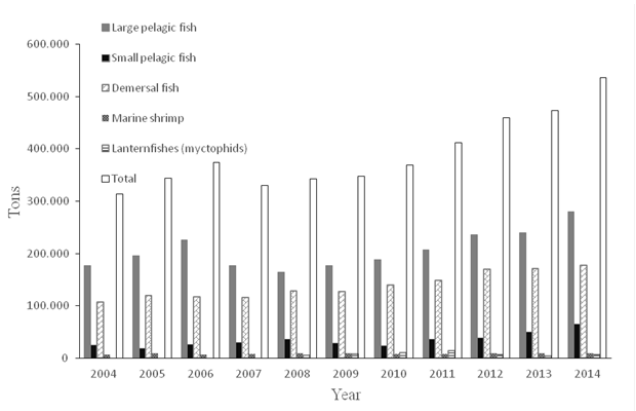

Figure 1: The most abundance caught fish types in the marine water of Iran between 2004-2014 [2,3].

Caspian kutum, grey mullet and European carp are the most important caught fish species of fishermen in the Caspian Sea. Grey mullet is the most abundant species and contributes in 70% of the total bony fish fishery in the Caspian Sea.

Sturgeon fishery: There are 27 sturgeon species living in the seas and rivers of the Northern hemisphere [9]. The maximum sturgeon catch in the world was 32,078 tons in 1977 [10]. Iran is the biggest exporter caviar and sturgeon fish meat in the world. However, sturgeon fisheries reduced in the last two decades. For example, sturgeon fisheries from Iranian waters dropped to 41 tons in 2014 from 500 tons in 2004 [2,3]. Bronzi et al. [10] suggested that variety of reasons contributed to the sturgeon fishery decline:

- River fragmentation and channelization with subsequent changes in hydrology and hydrodynamics.
- Overharvest by legal and illegal fisheries.
- Increasing pollution, from agricultural practices, urban growth and industrial developments.

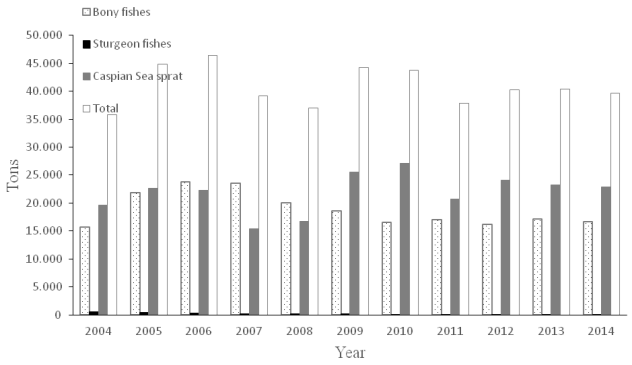

Figure 2: The amount of captured bony fish, Caspian Sea sprat and sturgeon fish species from the Caspian Sea between 2004-2014 [2,3].

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Common carp	65400	73396	77463	97262	87748	100430	121608	132177	154565	167883	170341
Rainbow trout	30000	34760	46275	58761	62630	73642	91519	106409	131000	143917	126515
Sturgeon	-	-	-	-	-	363	251	312	456	564	650
Marine shrimp	8903	3577	5700	2508	4372	5128	6359	8026	10152	12698	22475
Narrow-clawed crayfish	27	268	270	258	275	287	298	338	341	263	70
Harvesting from natural water resources	20230	22179	24970	34888	28622	27503	31339	38089	42363	45551	51666
Marine fish in cage	-	-	-	-	-	-	-	-	-	-	123
Total	124560	134180	154678	193677	183647	207353	251374	285351	338877	370876	371840

Ornamental fish	30	31	35	54	79	93	107	132	148	186	204

Table 3: Name and quantity (tons) of important aquacultured and ornamental fish (million) products between 2004 and 2014 [2,3].

Aquaculture production

In recent years, there has been a fast increase in the aquaculture production of Iran. It contributed approximately 40% of fisheries production of Iran in 2014 (Table 3).

Aquaculture production in Iran increased about 11.5% per year from 2004 (124,560 tons, 26% of fisheries production) to 2014 (349,365 tons, 40%). This rapid increase was higher than the global average of 8% per year and resulted from production of carp species and rainbow trout (carp culture increased from 54,801 tons in 2002 to 170,341 tons in 2014). This increment was more rapid for rainbow trout. Rainbow trout culture in Iran enhanced from 16,026 tons in 2002 to maximum amount of 143,917 tons in 2013. After Chile, Iran was the biggest rainbow trout producers in the world.

Most aquaculture production in Iran is comprised of freshwater species except for marine shrimp production (about 6% of the total). However, there is also a very small cage culture industry in the south of Iran.

Iranian Fisheries Organization (IFO) divided aquacultured species into six groups 1) cyprinid species, 2) trout species, 3) sturgeon species, 4) marine shrimp species, 5) crayfish (besides it is not cultured) and 6) marine fish species. The most important aquaculture species are listed in Table 4.

No	Group of species	Species
1	Cyprinid	*Cyprinus carpio, Hypophthalmichthys molitrix, Hypophthalmichthys nobilis, Ctenopharyngodon idella*
2	Trout	*Oncorhynchus mykiss*
3	Sturgeon	*Huso huso, Acipenser baerii, Acipenser persicus, Acipenser ruthenus, Acipenser stellatus*
4	Marine shrimp	*Litopenaeus vannamei, Penaeus merguensis, Penaeus monodon, Fenneropenaeus indicus, Penaeus semisulcatus*
5	Crayfish	*Astacus leptodactylus*
6	Marine fish	*Lates calcarifer, Acanthopagrus latus, Sparidentex hasta, Sparus aurata*

Table 4: Important aquaculture species in Iran.

Cobia (*Rachycentron canadum*), silver pomfret (*Pampus argenteus*), fourfinger threadfin (*Eleutheronema tetradactylum*), Asian sea bass (*Lates calcarifer*), sobaity seabream (*Sparidentex hasta*), grouper (*Epinephelus coioides*) and rabbit fish (*Siganus canaliculatus*) (11-12) are produced in experimental or pilot scales.

One of the important freshwater crustacean species in Iran is the narrow clawed crayfish (*Astacus leptodactylus*). It is the only freshwater crayfish species in Iran. The commercial value of exported *A. leptodactylus* between 2000 and 2009 varied from 1.5-2.5 million US$ annually [13]. Iranian crayfish production reached to maximum 341 tons at 2012.

Future species: The candidate species for mariculture development include groupers (*Serranidae*), cobia (*Rachycentron canadum*), silver pomferet (*Pampus argenteus*) and fourfinger threadfin (*Eleutheronema tetradactylum*) [5]. Also recently, the Caspian salmon, *Salmo trutta caspius*, has attracted interest for aquaculture in cages and raceways in Iran, with emphasis on using triploid populations to omit problems associated with sexual maturation, which can reduce commercial benefits of salmonid culture, especially beyond the maturation phase [5-14].

There are more than 130 species of seaweed found in the Iranian marine waters. *Gracilaria spp.*, *Sargassum spp.* and *Eucheuma spp.* are some of the commercial seaweed species. Over the past four years several trials have been carried out on the farming of Gracilaria in ponds and the open sea and a pilot project has been initiated to develop commercial seaweed farming. Persian Gulf pearls are well-known on the international markets, however, due to over fishing, oyster stocks have been reduced dramatically. Iranian Fisheries Research Organization (IFRO) has conducted various research projects for seed production and in 2004 successfully produced seed. Access to seed production technology could lead, in the future, to pearl culture activity [5].

In addition, a recent development occurred in Iran in the culture of two sea cucumber species (*Holothuria lecospliota* and *Holothuria scabra*) and black-lip pearl oyster (*Pinctada margaritifera*).

Fish processing industry: IFO has divided fish processing industry into four sections:

- Fish canning factory.
- Fish meal factory.
- Freezer and refrigerator units in shoreline.
- Fish processing unit.

At present, there are 134 fish canning factories, 46 fish meal factories, 122 freezer and refrigerator units in shoreline and 143 fish processing units. Number and production capacity of fishery processing industry of Iran between 2004 and 2014 are presented in Table 5.

In the last decade, Iranian fishery processing industry increased in all sections except fish meal production. Although the number of fish meal factory increased the fish meal production decreased in recent years. The reason of this decrease is due to the fluctuations in Caspian Sea sprat catch. For example, fish meal production reached to the maximum in 2005 and 2006 when the Caspian Sea sprat catch reached to the maximum.

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Fish canning factory	113	118	127	134	134	134	134	134	134	134	134
	458.95	491	543	569	569	569	569	569	569	569	569
Fish meal factory	38	44	44	36	36	36	46	46	46	46	46
	960	1100	1100	910	921	921	921	921	921	921	921
Freezer and refrigerator unit	133	126	109	112	113	113	114	114	120	120	122
	86.9	101	91	96	116	126	126	126	151	151	159
Fish processing unit	116	119	125	125	129	132	135	135	142	142	143
	1891	1940	2038	2038	2067	2135	2179	2179	2255	2255	2266

Table 5: Number (up lines) and production capacity (down lines) of fishery processing industry in Iran between 2004 and 2014 [2,3].

Exports

Strong infrastructure (such as access to open waters) and high volume product (marine shrimp, marine fish, carp species and rainbow trout) of Iran have caused a continuous increase in fisheries exports. Iran's exports worth and amount displayed a steady increase in the last decade. The value of aquatic products export in 2014 was more than 300 million US$. The worth of export between 2004 and 2014 is presented in Figure 3.

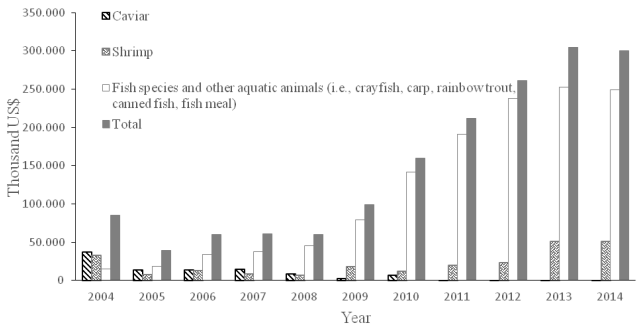

Figure 3: Worth (thousand US$) of aquatic products export of Iran between 2004 and 2014 [2,3].

Caviar is one of the most valuable export products of Iran. In 2014, the price of caviar increased 94.1% in comparison to that of 2013. The price of one kg Iranian caviar reached to 1,652 US$ in 2014. In 2015, Iran exported 1,029 kg caviar to Japan, Germany, England, Italy, Belgium, the South Korea, Norway and United Arab Emirates.

Other important product is shrimp. Iran exports shrimp to 40 courtiers in the world. The worth of shrimp exported from Iran in 2014 was more than 56 million US$. Countries in the Southeast Asia, Iraq, Kuwait, Lebanon and United Arab Emirates are the major export markets for Iranian shrimp. Iran also exports shrimps to some European countries such as Spain, Italy, Norway and Turkey. Fisheries export amount (ton) between 2004 and 2014 is presented in Table 6.

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Caviar	38.4	9.1	9.98	6.6	2.3	0.4	4	0.3	0.4	1.2	0.8
Shrimp	7681	1918.7	2986	2289.1	1346.2	3801.1	2602	4141	4904	11585	11610
Fish and other aquatic animals	12610	14856	27312	31102	23028	29633	41894	52673	59096	60219	60182
Total	20329	16784	30308	33398	24376	33435	44500	56814	64000	71805	71793

Table 6: Amount of fisheries export (ton) from Iran between 2004 and 2014 [2,3].

Fish consumption in Iran

In Iran, fish consumption per person was 4.5 kg in 1997. However, fish consumption in Iran has increased from 5.2 kg in 2002 to 9.2 kg in 2014. Global per capita fish consumption has risen to above 20 kg. Although fish consumption is increasing from year to year, on the other hand, fish consumption in Iran is still behind the world average. Fish consumption per capita between 2004 and 2014 in Iran is presented in Table 7.

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Fish consumption	6.7	7.03	7.7	7.35	7.32	7.51	8.5	9.1	10.2	8.5	9.2

Table 7: Fish consumption (kg per capita) between 2004 and 2014 in Iran [2,3].

Fisheries and aquaculture facilities

Fish farm numbers and fish farm areas: Fish farm numbers and their areas raised very fast in recent years. For example, fish farm number increased from 4,859 in 2002 to 18,795 in 2014. Fish farm area for cyprinids increased from 25,890.6 hectares in 2004 to 50,853 hectares in 2014 (approximately 96% increment). This increment was 0.4% for rainbow trout farms. Fish farm area for rainbow trout increased from 104.6 hectares in 2004 to 225 hectares in 2014. Number and area of fish farms between 2004 and 2014 are presented in Table 8.

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Cyprinid	6084	6319	6863	7261	7923	8362	10527	11968	14295	14615	16254
	25891	28332	29836.7	33793	31892	34504	40261	43722	46587	48697	50853
Rainbow trout	662	698	750	1200	1085	1180	1387	1607	1907	1923	1595
	104.6	132	111.4	162.6	157	169	230	236.5	258	230	225
Harvesting from natural water resources	220	240	356	307	283	351	332	296	367	412	428
	450000	848500	570183	545287	455709	499117	496579	485259	555515	562227	746096
Shrimp	310	298	189	208	219	145	214	209	320	313	518
	4272	3641	2625.7	1207	2481	2148	2873	3220	4427	4779	7053
Total	7276	7555	8158	8976	9510	10038	12460	14080	16889	17285	18795
	480267	880605	602756	580449	490239	535938	539943	532437	606787	615933	804227

Table 8: Number (up) and area (hectare) of fish farms (down) in Iran between 2004 and 2014 [2,3].

The number of employees in the fisheries sector: Number of employees in the fisheries sector increased as fisheries industry enlarged after 2004. For example, the number of employees in the fisheries sector increased from 144,584 persons in 2002 to 208,472 persons in 2014. Number of employees in the different parts of fisheries sector between 2004 and 2014 are presented in Figure 4. The number of fishermen in the north and south waters did not increase during last decade. In contrast, the number of fish farmers increased dramatically from 16,894 in 2004 to 68,287 in 2014 (approximately 24% increment).

Number of fishing fleets: The number of fishing fleets (boat, doha dhow, fishing ship) does not show any significant differences between 2004 and 2014. Number of fishing fleets between 2004 and 2014 is presented in Table 9.

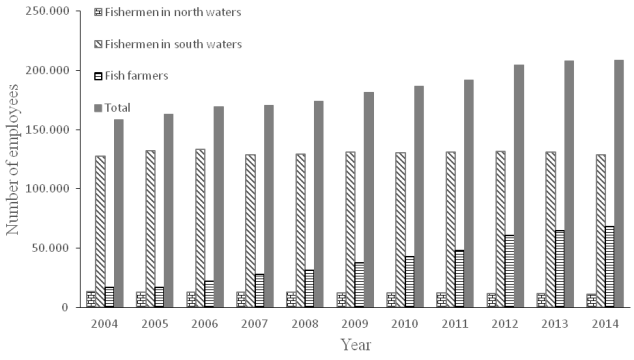

Figure 4: Number of employees in the different parts of fisheries sectors in Iran between 2004 and 2014 [2,3].

		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Caspian Sea	Boat	582	713	1007	980	980	890	827	811	804	865	825
	Doha Dhow	152	145	146	135	115	81	73	73	73	73	73
	fishing Ship	-	-	-	-	-	-	-	-	-	-	-
	Total	734	858	1,153	1,115	1,095	971	900	884	877	938	898
Persian Gulf and Gulf of Oman	Boat	7,496	7,563	7,663	7,847	7,970	7,932	7,855	7,689	7,520	7,423	7,385
	Doha Dhow	3,210	3,250	3,257	2,999	3,033	3,066	3,087	3,090	3,135	3,151	3,165
	Fishing Ship	77	78	47	45	44	47	51	54	54	51	50
	Total	10,783	10,891	10,967	10,891	11,047	11,045	10,993	10,833	10,709	10,625	10,600

Table 9: Number of fishing fleets in Iran between 2004 and 2014 [2,3].

Discussion and Conclusion

Iran has a great potential for fisheries and aquaculture production in its both freshwater and marine resources. It seems that potential for mariculture will also significantly enlarge with the completion of the cage aquaculture projects in the north and south of Iran. In addition, Although Iran has the potential to produce 900,000 tons fish in cages according to the Development Strategy Department of IFO the total production from cage aquaculture will increase up to 400,000 tons in 2025. The cage culture potential for Caspian Sea, Persian Gulf and Gulf of Oman are 300,000, 150,000 and 450,000 tons respectively.

Statistics in Iran show that fishery productions between 2004 and 2014 have significantly been developed and freshwater aquaculture has achieved remarkable attention due to high demand for aquatic products because of the fact that fast growing rate of human population and increase in fish consumption of per person in Iran. Therefore, fishery sector is considered as one of the most important promising industries of Iran economy.

However, although the suitable aquatic production in Iran is about 947,352 tons this industry is still far away from the production aims of the Iranian government. There is no statistics available to see the contribution of fisheries in Gross Domestic Products (GDP) of Iran. Nevertheless, the agriculture sector is not an important part of the economy at present; the whole sector (fisheries, agriculture, poultry and animal husbandry) was estimated to contribute 13% of GDP in 2014 in the country.

The most important priorities of IFO to financially support are shrimp farming, fish culture in cages, lantern fish (myctophids) fishery and sturgeon fish farming. For example, Iranian Government has started to support fish farms financially especially for cage culture and sturgeon fish farming.

Conversely, there are difficulties in Iranian fisheries, such as shortage of experts, qualified technical stuff and lack of high technology in cage culture (i,e., importing cages, automatic feeding machinery, water quality monitoring, etc.). Despite to having high potential for doing mariculture in cages, fish cage culture has not developed well and needs future investments and supports. Furthermore, aquaculture in Iran is associated with other problems such as low stocking density large earthen ponds for shrimp farming, lack of technical knowledge among farmers, diseases especially white spot disease in shrimp culture, unsuitable feed quality especially for juvenile diets, improper feeding management, low water quality in some of aquaculture sites, low hatching and survival rate in larval production units, low quality seed production, improper brood stock production especially in shrimp aquaculture industry, financial problem, and low cultural species diversity [5]. Therefore, it can be concluded that although Iran has a good potential to improve fish production it is necessary to overcome above problems.

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