

The importance of fishery production as an income source in Turkey

Karataş E.^{1*} . Karataş A.²

Received: November 2016

Accepted: March 2017

Abstract

Fishery production is a very important income source in the world for many people. Many people earn their living in this field. Turkey has four seas and many fresh water resources so it is one of the most advantageous countries in the world in the context of fishery production. However, it cannot be said this sector has been given enough importance in Turkey. Whereas the fishing industry has become an important income source in the world. With its rich aquatic biodiversity, Turkey may rise to the top among other countries in this sector. In this study, the importance of fishery production as an income source in Turkey will be highlighted.

Keywords: Fishery Production, Turkey, Seas, Fresh Water, Income

1- Department of Environmental Cleaning Services, Ulukışla Vocational School, Ömer Halisdemir University, 51000, Niğde, Turkey.

2- Department of Local Governments, Niğde Vocational School of Social Sciences, Ömer Halisdemir University, 51000, Niğde, Turkey.

*Corresponding author's E-mail: ekaratas@ohu.edu.tr

Introduction

Aquaculture is the most important food ingredient since the human being's history. The nutrients need for growing population in the world makes it more inevitable to use water products more. Particularly countries that are aware of balanced nutrition are looking for ways to benefit from the seas and are investing in the future today. Fishing is an important source of future input into the economies of all countries as it is today (Ordu Ticaret Borsası, 2014).

Marine fisheries are very important to the economy and well-being of coastal communities, providing food security, job opportunities, income and livelihoods as well as traditional cultural identity. They produced 80 million tones fish in 2009 and directly employed 34 million people in fishing operations in 2008. Fish and fishery products are a vital and affordable source of high-quality protein, especially in the world's poorest nations – in 2008, fish supplied more than 3 billion people with at least 15 percent of their average animal protein intake. Therefore, maintaining the long-term prosperity and sustainability of marine fisheries is not only of political and social significance but also of economic and ecological importance (Ye and Cochrane, 2011: 3).

Most of the protein in the world's food supply is derived from either grain or animal sources, each of which provides roughly half the supply. Fish resources generally account for about 16% of the protein attributed to the animal group. Although not a dominant

source of the world's protein, fisheries resources are nevertheless important in several ways. Firstly, fish and crustaceans are important and high quality sources of amino acids, which are nutritionally important types of protein found only in small amounts in cereals and grains. This turns out to be important for global nutrition and particularly important to some food deficient, low-income countries. Secondly, fisheries are locally important sources of food, trade and income in many developed and developing coastal nations. Trade in fisheries products is an important source of foreign exchange for some countries and has been of growing importance as global markets for both food fish and fishmeal have grown. Finally, fisheries provide employment and income earning opportunities for considerable numbers of people, particularly in the less developed and employment-scarce coastal countries (Sanchirico and Willen, 2007: 109). Fisheries are an important means of livelihood for Turkey as it is in the whole world. In this study, Turkey will be examined in terms of marine or inland fisheries.

Seas and Fresh Water Potential of Turkey

It would be useful to give information about the seas of Turkey before describing water potential of Turkey. Information about the seas of Turkey is as follows (Şansal, 2016):

Black Sea: Black Sea (Karadeniz in Turkish) lies to the north of Turkey.

Black Sea is an inland sea covering an area of about 420 thousand square kilometers reaching at 2206 meters in its deepest point. Below 200 meters the oxygen level in the water is very low so marine life is very limited below this depth. Most known fish they catch in the Black Sea are; Black Sea turbot, gurnard, and small sharks. Its waters are warm in the summer, very cold in the winter. Its salinity is around 0.18% because of a constant inflow of fresh water from rivers surrounding it. The most important rivers flowing into the Black Sea are Danube from north east, Kızılırmak, Sakarya and Yesilirmak from Anatolia in the south. Black Sea is one of the youngest seas on the Earth, it's used to be a big fresh water lake some 8000 years ago. The name is probably derived from the color of its deep waters.

Sea of Marmara: Sea of Marmara (Marmara Denizi in Turkish) is an inland sea within the Marmara region connecting to the Black Sea with the Bosphorus Strait in the northeast. It lies between Thrace and Anatolia parts of Turkey, covering an area of over 11thousand square kilometers. It is approximately 280 km long from northeast to southwest and about 80 km wide at its greatest width. Its maximum depth reaches 1355 meters near the center. There are many marble sources on its islands which gave its name to the Sea; marble is Marmaros in Greek and Mermer in Turkish. The salinity level is little bit over that of the Black Sea, but much less than the oceans.

However, sea-bottom waters are much more saline almost as of the Mediterranean, but like in the Black Sea these two layers do not get combined.

Aegean Sea: Aegean Sea (Ege Denizi in Turkish) is a part of Mediterranean Sea lying between Turkey and Greece. There is Mediterranean Sea to the south, Greek Peninsula to the west, Anatolia and part of Thrace to the east. It's connected to the Sea of Marmara by Dardanelles Strait to the northeast. It covers an area of 214thousand square kilometers, stretching for about 660 kilometers from north to south, and reaching at a maximum depth of 3543 meters. Tides are very limited in the Aegean Sea. Aegean Sea gave its name to the Aegean region and shows a typical Mediterranean climate characteristics; summers are dry and winters are rainy but not much cold. The water temperature during summer months reaches 23-24 degrees Celsius, and usually northern part of the Sea is a little bit cooler than its southern part. In contrary, northern part is abundant about the fish than its southern part.

Mediterranean Sea: Mediterranean Sea (Akdeniz in Turkish) is surrounded by Asia to the east, Europe to the north and Africa to the south. It's connected to the Atlantic Ocean to the west with Gibraltar Strait. It's also connected to the Red Sea in the southeast with the Suez Canal in Egypt, a man-made canal built in 1869. And to the east it's connected to the Dardanelles Strait.

Aegean and Marmara Seas are often considered as a part of the Mediterranean Sea. The sea gave also its name to the Mediterranean region of Turkey. Mediterranean covers about 2,5million square kilometers, its shores were home to many ancient civilizations in the history. There aren't much tides in the Mediterranean because of its narrow connection with the Atlantic. The average depth is about 1500 meters and the deepest point reaches at 5267 meters. The coastline is approximately 46,000 kilometers long. As it is known, fisheries is done not only with seas but also with fresh water resources. Turkey's water potential is as follows (Demirbaş and Bakış, 2003: 406):

According to the principal rivers, the Black Sea region has the Sakarya, Kizilirmak Yesilirmak, Çoruh, İkizdere, Hursit Cayi and Firtina rivers. The Marmara basin has fewer rivers, which are Kocaçay (whose upper and middle reaches Simav and Susurluk respectively) Biga and Gonen. Küçük Menderes, Büyük Menderes and Gediz rivers take place in the Aegean basin.

In the Mediterranean basin the principal rivers Aksu, Köprüçay, Manavgat, Göksu, Ceyhan and Seyhan are found.

Two major rivers flow from Turkey into Caspian Sea basin, which are Aras and Kura rivers.

Water from Turkey flows into the Gulf of Basra via the famous Euphrates and Tigris rivers.

In terms of the number of natural lakes, the Eastern Anatolian region is the richest. It contains Turkey's largest lakes, Lake Van, and the lakes of Ercek, and Cildir. Also, the area of Taurus Mountains contains many lakes such as Beysehir, Egirdir, Burdur and Acigoller.

The lakes of Marmara region are Sapanca, Iznik, Ulubat, Manyas, Terkos, Kucukcekmece and Buyukcekmece.

Central Anatolia lakes are Tuzgolu, Aksehir and Eber which are also located in this region. As a result of the construction of dams during the past thirty years, several large dam lakes have come into existence.

These are Ataturk Dam Lake, Keban, Karakaya, Altinkaya, Adiguzel, Kilickaya, Karacaoren, Menzelet, Kapulukaya, Hirfanli, Sariyar and Demirkopru, all of which are artificial. Most of these rivers, including their tributaries, and lakes are suitable to install small hydropower plants. Turkey has totally constructed 519 dams, which are now in operation, by 2002. Of these 519 dams, 202 facilities have been constructed as large dams and 317 as small dams (Demirbaş and Bakış, 2003: 406).

As one can see, Turkey is a country that can be considered rich in salt and fresh water resources. For this reason, the fishery industry has to be more developed than it is today.

Fisheries Sector and Aquaculture in Turkey

Turkey is surrounded by four seas which are giving the country a rich and diverse coastline that supports many economic activities. With a total surface area of 26 million ha and rivers having a total length of 177,714 km, Turkey are a country suitable for fish production and is rich in water resources. Capture marine fishery have a big share in total production corresponding to about 70 % of the total production. Capture marine fisheries in Turkey employed some 31,350 people and amounted to 397,731 tons in 2015 from all the seas surrounding the country, the Mediterranean, Aegean, and Black seas, and the Sea of Marmara. The marine fleet consists of 15,680 vessels. The Black Sea is responsible for approximately three fourths of the annual catches. The main species in terms of volume are small Pelagics, anchovies, pilchards, sprats, and horse mackerel which amounted to 73 % of the catch in 2015 and which are caught primarily in the Black Sea. They are used almost exclusively in the production of fishmeal and fish oil, two of the main ingredients in fish feed. Fish for human consumption on the other hand comes from all the seas surrounding Turkey though the Black Sea catches are significantly higher than those from the other three. Inland capture fisheries amounted to about 34,176 tons in 2015. The most important species are inci kefali (Tarek) and carp and their share is half of whole

production. The other important species are sand smelt, Gibel carp and land snail (Eurofish, 2015).

Turkish fisheries sector continues to intensify and diversify by investing in development of new species and modifying its systems and practices. Fish hatcheries are used to cultivate and breed a large number of fish species in an enclosed environment. With the target of supplying high quality egg throughout the year and developing new species, Turkey hatcheries are equipped with advanced technologies. In addition to eggs supplied from various wild catch brood stocks with the techniques of natural and photo period all year long, genetic selections of species are also practiced. Fish go through various juvenile stages until reaching maturity. From eggs they hatch into larvae, which in turn carry a yolk-sack which is the source of continued nutrition. When the yolk-sack is depleted the tiny fish must be capable of feeding themselves. At this point they are known as fry and pass through various stages of development until grown to market-size. This development period is known at the juvenile stage and the smaller the fry the more sensitive; intensive care is required for satisfactory growth. One of the keys to the attractive taste of the Turkish products is the care at juvenile stage. Healthy, well-fed juveniles, result in a quality of flesh that has enabled a global acceptance of these products (Aegean Exporters Associations Official Website).

Technological advances, combined with the governmental strategy, scientific "know-how", and high quality of production has given the way for increase of the national aquaculture output in the past decades. The rapid growth of the aquaculture sector has made Turkey the leading producer in the Mediterranean. Currently, it produces large quantities of European Seabass, gilthead Seabream, and rainbow trout. Turkish production extends also to the Black Sea, where sea-raised trout and European Seabass are cultivated.

The total output of the Turkish aquaculture sector reached 240,334 tons in 2015. With 75,164 tons produced in 2015, Turkey is currently the largest producing and exporting country of Seabass in the world. At present, Turkey is the second largest producing country of Seabream in the World (Eurofish, 2015).

Compared to other countries, aquaculture activities are relatively new sector in Turkey. In Turkey, first economic fish farming started with rainbow trout and carp production in the 1970s. Significant increases occurred of the aquaculture production in Turkey with production of sea bream and sea bass of the years of 1985s, and farming of tuna in the 2000s. In recent years trout production has increased by producing trout by cage systems which are build in dams, lakes and ponds. Turkey's aquaculture production has increased rapidly year by year to 235.133 tons by 2014 from 79.031 tons

in 2000. Turkey's income from aquaculture has increased from 139.552.950 TL to 2.160.070.890 TL by the years of 2000 and 2014. In Turkey, the aquaculture's share in total fishery production is around 44% in the year of 2014. Most produced fish are rainbow trout (*Oncorhynchus mykiss*), sea bass (*Dicentrarchus labrax*) and sea bream (*Sparus aurata*) in Turkey. Rainbow trout is mainly consumed locally, while around 75% of sea bass and the sea bream are exported to EU countries. Almost all of the aquaculture products are sold as whole fresh fish. According to Republic of Turkey, State Planning Organization in 2023 the aquaculture production of Turkey is planned to be 500.000 tons and the commercial value is estimated to reach the level of 4.500.000.000 TL (Aydın, 2016).

One of the typical characteristics of aquaculture in Turkey is that it is mostly based on intensive and semi-intensive systems of carnivorous fish species in one of the main branches of the national aquaculture sector is freshwater rainbow trout farming which exists in almost each province of Turkey. In 2015, production of trout was 108,038 tones.

Seabass and Seabream culture are carried out in provinces located on the Aegean Sea coast. Turkish companies are involved in tuna culture which has started accelerating and become widespread among European countries after 2000. Whereas marine aquaculture production mostly depends on cage

farming, freshwater production is carried out either in land based units extracting water from rivers (the major type of production unit) or in cages set in lakes and hydro-electric or irrigation dams (Eurofish, 2015).

Currently, Turkey has a significant level of know-how in the form of qualified manpower which is relatively cheap. There are 17 fisheries faculties and five departments in the agriculture faculties providing undergraduate and graduate education in fisheries (including aquaculture) and aquatic sciences. Annually, over 300 students graduate from these institutions, however the numbers employed by the sector are still low and those who are employed are mainly in the marine aquaculture sector. In spite of modernization in farming systems, the labour requirement is still high, mainly due to the low cost of labour. However, since a comprehensive data collection system has not yet been established, the exact number of employees working in the Turkish aquaculture sector is not known. It is estimated that more than 12 000 employees work in the sector and related activities; the secondary support services, namely feed, equipment and consultancy are also developing rapidly and provide job opportunities (FAO Official Website).

What Fish Is In Season?

As you could not find all fish species in a specific season, each fish has a various catching season and becomes more tasteful in a specific time. Here is

a list showing when each fish is at its best and most abundant in Turkey (Republic of Turkey Ministry of Food, Agriculture and Livestock Official Website):

January: Mackerel, blue fish, bonito and horse mackerel species taste delicious. Grey mullet and anchovy are fatty in this season. Small bluefish, large bluefish, haddock, red mullet and gurnard species are caught abundantly. Gold fish, swordfish and common sea bream are caught rarely.

February: Season of turbot starts in February and continues till the end of May. Red mullet is seen abundantly. Mackerel, bluefish and bonito start to lose fat. Silverside and grey mullet taste delicious.

March: Grey mullet, sea bass and turbot are at their best in this season. Since mackerel becomes lean, it can be fried or consumed as salad. Silverside is found abundantly. Since bluefish and bonito lose fat, these species can only be fried or consumed as salad. Grilling is better for large bluefish. Red mullet tastes delicious.

April: This is the season for turbot. Moreover, you can find common sea bream, sea bass, swordfish and gurnard abundantly. However, swordfish does not taste very good. Silverside, grey mullet, haddock, red mullet and gold fish are caught abundantly. Meager is seen in this month.

May: Sea bass, gold fish, sole fish, red mullet, swordfish and scorpion fish are eaten tastefully. Mackerel, Atlantic bonito, bonito, anchovy and horse

mackerel have lost fat. Grey mullet is delicious.

June: Fish species are rarely caught in June. Since bottom fish have spawned, they swim scattered. For this reason, June is not fruitful for fishery. Red mullet, gold fish, common sea bream, sea bass and meager can also be found.

July: Pilchard starts to be seen in this season and continues to be tasteful till the middle of October. Horse mackerel and mackerel are suitable for frying and boiling. Red mullet and gold fish taste delicious, but grey mullet does not.

August: Baby bonito season starts. It is nearly as long as mackerel or just a little longer. This is the most delicious season for pilchard. On the other hand, swordfish is so delicious in August. However, grey mullet should not be preferred.

September: Pilchard and swordfish taste delicious. Bonito grows large and suitable for all kinds of cooking. Horse mackerel and gurnard are found abundantly.

October: This is the season for migratory fish species to migrate Marmara from Black Sea. For this reason, fish species are seen abundantly. Mackerel is seen early in the season. Bluefish gains its full taste and horse mackerel becomes fatty. Bonito is caught abundantly. Red mullet, gold fish, swordfish, sea bass, common sea bream, pilchard, meager, Atlantic bonito are also seen.

November: This is the best time for Mackerel. Atlantic bonito flow starts. Mud-fish is most delicious in this

season. Fish species caught abundantly and taste delicious in October can also be found in November.

December: Since Mackerel, bluefish, bonito and Atlantic bonito are fatty in this season; these species can be cooked all the way. Anchovy is delicious. Red mullet is caught abundantly (Republic of Turkey Ministry of Food, Agriculture and Livestock Official Website).

Fish Production, Farming System and Cultured Species

Before talking about the fish production figures in Turkey, it is useful to know the share in the gross domestic product in order to understand its place in the economy. However, when considering the potential of aquaculture in Turkey, it appears that the share of fisheries in GDP and agriculture is very little (0.2%). Aquaculture in Turkey grows at an annual average of 8% (between 1% and 13%). In the last 10 years, the total production in the aquaculture has increased by 99%, almost doubling. The highest production increase was in trout (130%) followed by sea bream (100%) and perch (52%). However, production through hunting has an annual average of 2.3% contraction (reduction). A total of 162.8 million tons of aquatic products were produced in 2013 in the world by 92.6 million tons (56.9%) of hunting and 70.2 million tons (43.1%) of aquaculture. Turkey is in the 30th place in the world with its current production and in the 6th place in Europe. When you look at the

composition of the production in Turkey, it is seen that your breeding has been constantly increasing and becoming more than half. In other sea products obtained by hunting, the sand navy stands out as the quantity. In other sea products obtained by hunting, the sand mussel is in the foreground as the quantity. However, the presence of a decline and unstable structure in hunting is noteworthy. In terms of fish consumption in Turkey, a threefold increase in production is required in order to catch the world average. 6.5% of total protein produced in the world and 16.7% of animal protein are obtained from fish. In Turkey, the same values are almost 1/4 less. In Turkey, the rate of export to import coverage is increasing every year and foreign trade is developing positively (Sarıözkan, 2016: 16).

The number of vertically integrated groups operating their own hatcheries, fish feed plants, fish farms, and processing and packaging facilities is increasing constantly. The main species farmed in 2015 are Seabass (75,164 tones) and Seabream (51,844 tones). The Black Sea is the site for a modest production of sea-raised trout (6,872 tones). There is also a large and growing production of freshwater rainbow trout (101,166 tones) in the interior of the country in 2015. In 2014, there were 2,392 inland and 520 marine marine aquaculture facilities. Each year approximately 60–70 new facilities commence operation. In Turkey, jobs are provided to approximately 25,000

people in the aquaculture industry (Eurofish, 2015).

The history of aquaculture in the Mediterranean goes back to a few centuries ago with a form of extensive aquaculture known locally as 'lagoon fisheries', practiced in the Mediterranean lagoons of Turkey. Modern aquaculture began in the late 1960s; initially, the first species cultured was the rainbow trout (*Oncorhynchus mykiss*) from eyed eggs imported from Italy. Common carp (*Cyprinus carpio*) farming followed during the 1970s, but little development happened until 1985 which marked the beginning of gilthead Seabream (*Sparus aurata*) and European Seabass (*Dicentrarchus labrax*) farming. The next major developments were commercial mariculture trials with rainbow trout and Atlantic salmon (*Salmo salar*) in the Black Sea during the early 1990s; only one experiment failed with kuruma prawn (*Penaeus japonicus*) on the Mediterranean coast and later mussels in the northern Aegean and the Sea of Marmara during the 1990s were introduced into the aquaculture activities. The Atlantic salmon farming initiative in the Black Sea failed, but rainbow trout mariculture is still practiced (FAO Official Website).

Aquaculture is dominated by finfish production; shellfish culture is represented just by 89 tons/year of mussel culture. For many years the sector was dominated by freshwater farmed trout, but in the last few years

the contribution of freshwater and marine fish species to overall aquaculture production has reached similar levels, with 77 000 tones for freshwater and 76 000 tons for marine production. Trout farms are widely spread across the country in freshwater and marine environment, while most Seabream and Seabass farms are located on the southern Aegean coast which provides optimum ecological conditions for marine aquaculture (FAO Official Website). Seabass and Seabream are suitable for farming here.

Seabass and Seabream are more common in the southern shores and in the Aegean coasts of Turkey. Generally dispersed in tropical, semi-tropical and temperate zones, sea bream lives in sandy-muddy and muddy environments. It is also very common in the river mouths and lagoons. It feeds especially on crustaceans and molluscs. The back of sea bass is gray or greenish black, its sides are silvery and its belly is white. There are 1 or 2 stickles on its opercula and black spots at the top. Its mouth is wide, the teeth located on the palate and tongue. Its body is long and thin. Its length which can reach 1 m is 50 cm on average and its weight can reach 12 kg. Seabreams take different local names according to their weights in Turkey. Those with a weight of 30-50 grams are called thin lidaki, those with a weight of 100 grams are called lidaki, and those with a weight of 100-180 grams are called coarse lidaki and those with 200 grams and over are called Seabream. It has an oval body, a large head, a blunt

nose and prominent lips. There is a V-shaped strap between the eyes. Its back is gray and dark blue in color. The average length of a sea bream which can reach 70 cm at maximum is 25-40 cm. Seabream and Sea bass grow best at temperatures between 22-24 °C; they can live in lethal temperature ranges, but the temperature range they can survive is 3-34 °C. Salinity value is between 05-040‰. Appropriate dissolved oxygen level in aquaculture is approximately 7-8 mg / l. Although they live in shallow waters (0.5 to 9 m) in summer, they migrate to the deeper (35-40 m) waters in winter (Republic of Turkey Ministry of Food, Agriculture and Livestock Official Website). Approximately, 95 percent (71 546 tones out of a total of 74 916 tones) of the total Seabass and Seabream production currently come from the Aegean region accounting for 47 percent of the total Turkish aquaculture production. The Mugla region provides 39 percent of the total production and is popular not only for Seabream and Seabass but also for rainbow trout (FAO Official Website).

Fishery production increased by 25.1% in 2015 with respect to the previous year and occurred as 672 thousand 241 tones. The total fishery production was composed of sea fish by 51.4%, other sea products by 7.7%, inland water products by 5.1% and aquaculture products by 35.8%. In 2015, capture of fishery products increased by 42.9% and aquaculture increased by 2.2%. While the production made by

capture was 431 thousand 907 tones, aquaculture production occurred as 240 thousand 334 tones. While the capture of marine production increasing by 49.5%, capture of inland water production decreased by 5.4% with respect to the previous year. 42.2% of the amount of aquaculture production took place at the inland waters and 57.8% at the seas. Within all the production of marine products by capture, East Black Sea Region was the first by the ratio of 60.8%. The regions West Black Sea by 19.8%, Aegean by 8.9%, Marmara by 8%

and Mediterranean by 2.5% followed this region (TUIK, 2016). According to data from TUIK fisheries statistics, information on fisheries in Turkey is as follows (TUIK, 2012):

Table 1 shows the quantity of fishery products as tons in Turkey. There is an increase of 7.73 % in 2011 compared to 2010. There is an increase in fishery products by catching, sea fish products and aquaculture in 2011 compared to 2010. However there is a little decrease in inland water products in 2011 compared to 2010.

Table 1: Quantity of fishery products (tons).

Quantity of fishery products (tons)	Share		Share		Change (%)
	2010	(%)	2011	(%)	
Fishery products	653 080,0	100,00	703 545,2	100,00	7,73
Fishery products by catching	485 939,0	74,41	514 755,2	73,17	5,93
Sea fish and other sea products	445 680,0	68,24	477 658,4	67,89	7,18
Sea fish	399 656,0	61,20	432 246,0	61,44	8,15
Other sea products	46 024,0	7,05	45 412,4	6,45	-1,33
Inland water products	40 259,0	6,16	37 096,8	5,27	-7,85
Aquaculture	167 141,0	25,59	188 790,0	26,83	12,95

Source: TUIK, 2012

Table 2 shows production quantity of sea fish as tons in Turkey. There is a visible increase in Albacore and Frigate mackerel production. Albacore (*Thunnus alalunga*) is highly migratory species and distributed in tropical and temperate waters of all oceans including the Mediterranean Sea, extending north to 45° to 50°N and south to 30° to 40°S but not at the surface between 10°N and 10°S. ICCAT (The International Commission for the Conservation of Atlantic Tunas) has separated the albacore stocks as North, South Atlantic

and Mediterranean for management purposes. In Turkey, targeted albacore fishery started in 2004. In the beginning of this fishery, one boat caught albacore by gillnet as target species. After joining the 8-10 boats in one year later, albacore fishery has tend to develop. Turkish albacore fishery reached approximately to 13% of the Mediterranean annual yield in 2007 (Ceyhan, Akyol and Karakulak, 2011: 1868).

Table 2: Production quantity of sea fish (tons).

Type of fish	Share		Share		Change
	2010	(%)	2011	(%)	(%)
Total	399 656,0	100,00	432 246,0	100,00	8,15
Leer Fish	883,0	0,22	585,9	0,14	-33,65
Greater Amberjack	53,0	0,01	31,4	0,01	-40,75
Albacore	402,0	0,10	1 395,7	0,32	247,19
Hake - European hake	1 256,0	0,31	921,1	0,21	-26,66
Red Mullet	2 351,0	0,59	1 861,4	0,43	-20,83
Goldon banded	446,0	0,11	427,8	0,10	-4,08
Sprat	57 023,0	14,27	87 140,8	20,16	52,82
Seabream	1 164,0	0,29	766,1	0,18	-34,18
Common sole	1 062,0	0,27	829,3	0,19	-21,91
John dory	90,0	0,02	67,4	0,02	-25,11
Common seabream	132,0	0,03	69,7	0,02	-47,20
Angler fish	219,0	0,05	193,0	0,04	-11,87
Shore rockling	9,0	0,00	15,3	0,00	70,00
Frigate mackerel	1 081,0	0,27	2 551,8	0,59	136,06
Meagre	101,0	0,03	30,9	0,01	-69,41
Sand smelt	1 442,0	0,36	1 472,7	0,34	2,13
Anchovy	115 892,0	29,00	100 883,5	23,34	-12,95
Anchovy (Fish meal - oil factories)	113 131,0	28,31	127 607,9	29,52	12,80
Painted comber	23,0	0,01	34,2	0,01	48,70
European barracuda	459,0	0,11	228,1	0,05	-50,31
Black scorpion fish	254,0	0,06	196,4	0,05	-22,68
Annular bream	745,0	0,19	195,9	0,05	-73,70
Horse mackerel	14 392,0	3,60	18 072,7	4,18	25,57
Scad	6 055,0	1,52	6 937,3	1,60	14,57
Brown mearge	20,0	0,01	6,6	0,00	-67,00
Picarel	1 243,0	0,31	877,5	0,20	-29,40
Turbot	295,0	0,07	166,4	0,04	-43,59
Two bandedbream	202,0	0,05	152,6	0,04	-24,46
Gobies	130,0	0,03	95,8	0,02	-26,31
Grey mullet	3 119,0	0,78	2 513,8	0,58	-19,40
Angelshark	19,0	0,00	15,7	0,00	-17,37
Sword fish	334,0	0,08	189,6	0,04	-43,23
Red gurnard	316,0	0,08	211,6	0,05	-33,04
Trigla lineata	92,0	0,02	54,7	0,01	-40,54
Chup mackerel	2 004,0	0,50	3 127,0	0,72	56,04
Topeshark	285,0	0,07	369,5	0,09	29,65
Bogue	2 761,0	0,69	2 113,5	0,49	-23,45
Waker	672,0	0,17	396,6	0,09	-40,98
Sea bass	577,0	0,14	316,5	0,07	-45,15
Small-scalled	80,0	0,02	84,2	0,02	5,25
Blue fish	4 744,0	1,19	3 122,0	0,72	-34,19
Saddled seabream	243,0	0,06	112,8	0,03	-53,58
Striped bream	742,0	0,19	635,6	0,15	-14,34
Whiting	13 558,0	3,39	9 454,8	2,19	-30,26

Table 2 (continued):

Type of fish	Share		Share		Change
	2010	(%)	2011	(%)	(%)
European cogger	8,0	0,00	0,8	0,00	-90,00
Striped seabream	281,0	0,07	196,2	0,05	-30,18
Corb	41,0	0,01	23,7	0,01	-42,20
Dusky grouper	63,0	0,02	34,0	0,01	-46,03
Bluefin tuna*	423,0	0,11	527,5	0,12	24,70
Little tunny	1 046,0	0,26	1 437,4	0,33	37,42
Piper	14,0	0,00	15,2	0,00	8,57
Atlantic bonito	9 401,0	2,35	10 018,9	2,32	6,57
Large-eye dentex	91,0	0,02	53,6	0,01	-41,10
Flounder	104,0	0,03	47,3	0,01	-54,52
Pilchard	27 639,0	6,92	34 708,6	8,03	25,58
Black sea bream	38,0	0,01	23,8	0,01	-37,37
Sauppe	305,0	0,08	166,9	0,04	-45,28
Dentex	170,0	0,04	82,8	0,02	-51,29
Sharpsnout seabream	21,0	0,01	13,8	0,00	-34,29
Striped red	4 455,0	1,11	3 876,5	0,90	-12,99
Twaite shad	2 574,0	0,64	2 581,5	0,60	0,29
Blue spatled bream	115,0	0,03	46,7	0,01	-59,39
Mackerel	226,0	0,06	147,3	0,03	-34,82
Thornback ray	668,0	0,17	401,0	0,09	-39,97
Gar fish	661,0	0,17	317,1	0,07	-52,03
Saury	565,0	0,14	319,2	0,07	-43,50
Other	646,0	0,16	673,1	0,16	4,20

Source: TUIK, 2012

Table 3 shows other sea products quantity as tons in Turkey. There is a visible increase in Oyster and Great scallop production. In addition to Table 3, commercial sea cucumber species in the Aegean Sea, Mediterranean Sea and the Sea of Marmara in Turkey are not consumed domestically but are exported to Asian countries. It is thought that 37 species in the family Holothuriidae are found in the Mediterranean. Prior to 2002, there was no regulation regarding the harvesting of commercial sea cucumbers. In 2002, a regulation was established prohibiting sea cucumber fishing during the reproduction period in order to protect sea cucumber stocks. However, there is

very little information concerning existing sea cucumber stocks and fishery activities in Turkey. These species reproduce especially in near shore areas during summer in the Mediterranean (July, August and September). They live in coastal areas on rocky or soft substrates, between 0 m and 100 m depth. Collected sea cucumbers are purchased by the piece by processing companies, and are transferred to processing facilities in plastic barrels. Sea cucumbers are first eviscerated and washed with cold water, regardless of processing methods. During processing, different techniques are applied.

Table 3: Other sea products quantity (tons).

Other sea products quantity (tons)	Share		Share		Change
	2010	(%)	2011	(%)	(%)
Total	46 024,0	100	45 412,4	100	-1,33
Octopus	509,0	1,11	321,8	0,71	-36,78
Spiny lobster	26,0	0,06	25,8	0,06	-0,77
Norway lobster	19,0	0,04	24,8	0,05	30,53
Sea snail	8 437,0	18,33	6 533,8	14,39	-22,56
Common lobster	7,0	0,02	4,7	0,01	-32,86
Oystre	1,0	0,00	5,9	0,01	490,00
Squid	528,0	1,15	394,1	0,87	-25,36
Speckled shrimp	417,0	0,91	301,2	0,66	-27,77
Green tiger prawn	562,0	1,22	543,4	1,20	-3,31
Caramote prawn	951,0	2,07	642,9	1,42	-32,40
Giant gamba prawn	1 362,0	2,96	1 800,9	3,97	32,22
Deepwater rose prawn	1 413,0	3,07	1 481,5	3,26	4,85
Carpet shell	56,0	0,12	26,7	0,06	-52,32
Striped venus	26 931,0	58,52	30 175,6	66,45	12,05
Mediterranean mussel	735,0	1,60	1 458,8	3,21	98,48
Bearded horse mussel	246,0	0,53	347,2	0,76	41,14
Warty venus	8,0	0,02	0,0	0,00	-100,00
Cuttle fish	1 597,0	3,47	1 163,3	2,56	-27,16
Common shore crab	3,0	0,01	8,7	0,02	190,00
Great scallop	4,0	0,01	17,8	0,04	345,00
Blue crab	46,0	0,10	10,7	0,02	-76,74
Other	2 166,0	4,71	122,8	0,27	-94,33

Source: TUIK, 2012

The processing method depends on recipient companies' requests, but sea cucumbers are generally exported in dried and frozen forms. The drying process is carried out in two ways: sun drying and oven drying. Sun drying is the preferred technique because of its low cost. However, oven drying (50–60°C for 30 min.) is also done, especially during winter. Sea cucumber prices range from USD 7– 32/kg. Singapore, Korea, Taiwan, Hong Kong and Norway are the main importing countries (Aydın, 2008: 40-41).

Table 4 shows aquaculture production as tons in Turkey. There is an increase

in 2011 compared to 2010 in total aquaculture production. There is also more increase in inland trout production than sea trout. However there is a visible decrease in carp production.

Table 4: Aquaculture production (tons).

Type of fish	Share		Share		Change
	2010	(%)	2011	(%)	(%)
Total	167 141	100	188 790	100	12,95
Inland Waters					
Trout	78 165	46,77	100 239	53,10	28,24
Carp	403	0,24	207	0,11	-48,64
Sea					
Trout	7 079	4,24	7 697	4,08	8,73
Sea bream	28 157	16,85	32 187	17,05	14,31
Sea bass	50 796	30,39	47 013	24,90	-7,45
Mussel	340	0,20	5	0,00	-98,53
Other	2 201	1,32	1 442	0,76	-34,48

Source: TUIK, 2012

Conclusion

Turkey with aspect of its seas and fresh water resources is one of the advantageous countries on the world in terms of fishery production. Fishery production makes substantial contribution to employment and GNP; therefore, it has the significant importance in Turkish economy due to its role in domestic and foreign markets. However, despite the fact that Turkey has extremely appropriate conditions especially in culture fisheries, its share in Turkish economy due to mainly caused problems related to marketing is lower than it would be. It is hard to say that fishery production can get the desired share from the national income due to the problems caused by marketing. In fact, while marketing circumstances, which are one of the most important problems in marketing, causing issues like in hunting, stock farming, processing and quality control, it also has trouble its train in marketing phases like warehousing and

transportation. Especially solving the marketing problems of fishery production in Turkey will enable to increase in contribution to employment, export opportunities as well adequate consumption of fishery products (Yılmaz, Akay and Gümü, 2008: 265). As one can see from the tables, there is generally a potential for aquatic products in Turkey. In particular, it can be said that Turkey is developing in the field of fisheries. However it cannot be said that this is sufficient level when considering the production rates. Whereas a country that is surrounded by sea on three sides and has rich water resources, Turkey has sufficient infrastructure. It is necessary to support this infrastructure with sufficient technology, education and government support.

References

Aegean Exporters Associations Official Website.
<http://en.eib.org.tr/>.

- Aydın, H., 2016.** Türkiye’de kültür balıkçılığı potansiyeli ve akuakültür sektörünün ekonomiye katkısı. *International Congress of Management Economy and Policy (ICOMEPE)(2016)*, Proceedings Book, pp. 1-6.
- Aydın, M., 2008.** The commercial sea cucumber fishery in Turkey. *SPC Beche de Mer Information Bulletin*, 28, 40–43.
- Ceyhan, A., Akyol, O. and Karakulak, F. S., 2011.** The Albacore fishery in Turkey. https://www.iccat.int/Documents/CVSP/CV066_2011/no_5/CV066051867.pdf.
- Demirbaş, A. and Bakış, R., 2003.** Turkey’s water resources and hydropower potential. *Energy Exploration and Exploitation*, 21(5 and 6), 405-414.
- Eurofish International Organization, 2015.** Overview of the Turkish fisheries and aquaculture sector. <https://www.eurofish.dk/index.php/turkey>.
- Food and Agriculture Organization (FAO) of the United Nations- Official Website.** http://www.fao.org/fishery/countrysector/naso_turkey/en#tcN9005B. http://www.fao.org/fishery/countrysector/naso_turkey/en#tcN9005B. gov.tr/ PreHaber Bultenleri.do?id=21720.
- Ordu Ticaret Borsası, 2014.** Karadeniz’de balıkçılık ve sorunları. [http://www.ordutb.org.tr/pdf/balikcilik_\(2014\)_2.pdf](http://www.ordutb.org.tr/pdf/balikcilik_(2014)_2.pdf).
- Republic of Turkey Ministry of Food, Agriculture and Livestock Official Website.** <http://www.tarim.gov.tr/Konular/Fisheries/Fish-For-Your-Diet>.
- Sanchirico, J.N. and Willen, J.E., 2007.** Global marine fisheries resources: Status and Prospects. *International Journal of Global Environmental Issues*, Inderscience Enterprises Ltd, 7 (2/3), 106-118.
- Şansal, B., 2016.** Seas of Turkey. <http://www.allaboutturkey.com/sea.htm>.
- Sarıözkan, S., 2016.** Türkiye’de balıkçılık sektörü ve ekonomisi. *Turkish Journal of Aquatic Sciences*, 31(1), 15-22.
- Turkish Statistical Institute, Fishery Products (TUIK) 2015 (2016).** <http://www.turkstat.gov.tr>.
- Turkish Statistical Institute, Fishery Statistics (TUIK), 2011 (2012).** <http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=10863>.
- Ye, Y., and Cochrane, K., 2011.** Global overview of marine fishery resources. <http://www.fao.org/docrep/015/i2389e/i2389e.pdf>.
- Yılmaz, S., Akay, A.Ş. and Gümüş, E., 2008.** Fisheries sector in Turkish economy and marketing of fishery products. *Akdeniz Üniversitesi Ziraat Fakültesi Dergisi*, 21(2), 265–272.