トピックス
No.5

SEA FISHERY AND SIGNIFICANCE OF ACOUSTIC RESEARCH OF FISHERY RESOURCES IN TURKEY

（トルコにおける漁業と音響資源調査研究の重要性）

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1.INTRODUCTION

Turkey, with its' coastal length of 8,883 km and continental shelf of 154,080 km^2 is surrounded by sea from three sides which have their own characteristics. These biologically, physically, chemically and ecologically different seas are located in Mediterranean system which is a semiclosed sea (Figure 1).

Figure l. Turkish Sea.

It is obvious from the statistical evaluation of the production in seas and the productivity of fish in Turkish seas that the order of density from the most to the least is as Black Sea, Marmara Sea, Aegean Sea and Mediterranean.

Regarding fishery, Black Sea is the most productive sea among the four seas surrounding Turkey. The 85% of sea fish production is obtained from Black Sea. The living area is limited by the H_2S gas in depths more than 100 m in this sea. The fishing area of Black Sea is divided into two subregion as West and East.

The Marmara Sea which is located between Black Sea and Aegean Sea has the area of 11,000 km^2 and the average depth of 540 m it is richer than Black Sea with regard to demersal and pelagic fish species. The 9% of total production is obtained from this sea.

In spite of many gulfs and coves, fishery is limited in Aegean Sea because of the continental shelf and fault topographic structure. The average production obtained from this sea is 4-5% of total amount.

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Mediterranean has the least productivity among the seas surrounding Turkey. But it has the most number of fish species. Its' portion in total production is approximately 3% (Figure 2).

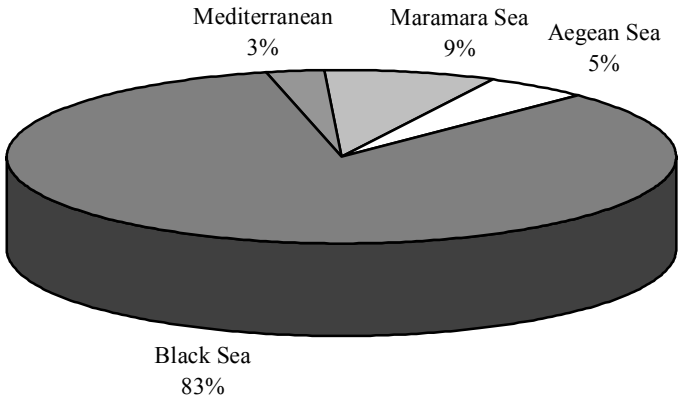

Figure 2. The Distribution of Total Sea Fish Production.

Since, the seas surrounding Turkey are semi-closed and have the appearance of inside sea, Turkish fishery is named as Inshore (short distance) and Coastal (medium distance) Fishery.

The purpose of these studies and investigations is to put forth the actuel position of Turkish fisheries for consideration. As the result of the data about our fisheries, one of the main problems of our fishery is uncontrolled fishery (catching) without taking the actuel stock amount into consideration. The lack of experienced staff is the most important problem in stock estimation. Due to the results of this research, an application to Japanese government was made while searching for a possibility to make some studies in developed countries. Some researches to get some experience especially about estimating pelagic fish stocks was made in National Research Institute of Fisheries Engineering in Japan with the help of Science and Technology Agency of Japan.

2.THE STRUCTURE OF SEA FISHERY IN TURKEY

2.1.The Developings in Sea Fishery

The hunting fleet Turkey have began to make progress especially since the end of World War II. These developings can be categorized into five main titles.

-The boats constructed of sheet iron took the place of wooden boats. The lengths of boats changed to 20-40 m from 8-10 m.

-The fishing vessels constructed of sheet iron took the place of wooden boats. The lengths of fishing vessels changed to 20-40 m from 8-10 m The motors of 400-1000 HP have been used instead of rowing.

-The nets are being made of nylon and in large sizes (800-1000 m of length and 120-150 m depth) instead of cotton and small sizes (100-120 fathoms of length and 15-20 fathoms of depth).

-The fish groups which were previously allocated according the experiences of fishermen are now being determined by echo-sounder and sonars.

-The nets are being lifted with modem cranes and net pulleys instead of manpower.

-The short distance communications which were previously performed by light movements are now replaced with WHF, CB, radiotelephones and coastal radios.

2.2.The Definition of Sea Fishery in Turkey

The fishery in sea waters encircling Turkey can be categorized into two main groups as Inshore Fishery and Coastal Fishery.

The Inshore Fishery is a daily fishery and performed by the Boats of 5-12 m length and 10-70 HP.

The fishing instruments used are trawl, longline, surface and deep nets with wide-mesh and without wide-mesh, casting net, small seine net.

During the Inshore Fishery in the areas very near to coast, fishing is performed especially in the areas very near the ports, where the fish is sold by the boats catching in 30-40 m depth with the deep nets and the boats catching in 100 m with fishing lines.

The 83% of total fishing vessels are the Inshore Fishing Boats. But the portion of this fishery in total production is just 10%.

The main fish species catched by the Inshore Fishing Boats are red mullet (*Mullus barbatus*), Striped red mullet (*Mullus surmuletus*), Gilt-head sea bream (*Sparus aurata*), Pandora (*Pagellus erythrinus*), Grey mullet (*Mugil cephalus* and *Liza spp.*) European sea bass (*Dicentrarchus labrax*), Saddled bream (*Oblada melanura*), Dogs-teeth dentex (*Dentex dentex*), Sea bream (*Pagrus pagrus*), Blue spotted sea bream (*Sparus ehtenbergi*), Salema (*Salpa sarpa*), Two-banded sea bream (*Diplodus vulgaris*).

The number of Inshore Fishery Boats in Turkey between 1986-1993 years are belown in Table l.

The catching duration of Coastal Fishery Vessels are longer and the catching areas are changing due to the behaviours of fish groups.

This kind of fishing is industrial and performed by Trawlers and Purseseiner.

Table l.The Inshore Fishery Boats in Turkey (1986-1993).

Year	Total	East Black Sea	West Black Sea	Marmara Sea	Aegean Sea	Mediterranean
1986	7336	2254	680	2447	1135	820
1987	7020	2376	535	2992	966	851
1988	7619	2307	669	2550	968	1125
1989	7203	2219	572	2419	975	1018
1990	7196	2092	529	2537	957	1081
1991	7514	2308	540	2498	1172	996
1992	6390	1905	514	1684	1308	979
1993	6941	2018	800	1206	1915	1002

The main pelagic fish species catched by Coastal Fishery Vessels are Atlantic horse-mackerel (*Trachurus trachurus*), Mediterranean horse-mackerel (*Trachurus mediterraneus*), European anchovy (*Engraulis encrasicholus*), European pilchard (*Sardina pichardus*), Atlantic bonito (*Sarda sarda*), Bluefish (*Pomatomus saltator*), Chup mackerel (*Scomber japonicus*), Mackerel (*Scomber scombrus*), Bogue (*Boops boops*), Atlantic bluefish tuna (*Thunnus thynnus*), Grey mullet (*Mugil cephalus* and *Liza spp.*) and the main demersal fishes are, Red mullet (*Mullus surmuletus*), Pandora (*Pagellus erythrinus*), Dover sole (*Solea vulgaris*), Flounder (*Platichthys flesus*), Turbot (*Psetta maxima*), Poor-cod (T*risopterus minitus capelanus*) Hake (*Merluccius merluccius*) and Prawn (*Penaeus spp.*).

More than 90% of pelagic fish production in Turkish sea waters is performed by Purseseiner fishery. The Purseseiner fishery is especially concentrated in Black Sea and Marmara Sea. Each of the Purseseiner catching in Black Sea and Marmara Sea has at least one carrier vessels.

The lengths of Purseseiner are between 18-32 m and the powers between 250-850 HP. The Purseseiner nets loaded by these vessels have the dimensions of 600-1200 m, length and 100-150 m depth. Most of the Purseseiner catching in West Black Sea and Marmara have the special nets for European anchovy and European pildchard beside the nets for Atlantic bonito, Atlantic bluefish tuna.

There are fish detectors in all the Purseseiner catching fishing vessels in order to observe the pelagic fish. There are Multi Beam Sonars in 80% of these fishing vessels which are used to observe the fish horizontally. In most of these boats, there are VHF radiophones. The Purseseiner net which is surrounding the fish groups is loaded up mechanically by hydrolic net pulleys (Powerblocks) and winches.

The Purseseiner of 23-22 m length can be catched continuously for 3-7 days. The number of Purseseiner in Turkey betvveen 1986-1993 is shown in Table 2.

The Carrier Vessels transport the catched fish to the marketing port. The loading capacity of these fishing vessels is between 20-40 ton/fish. The lengths are between 15-24 and the powers are between 150-300 HP.

Table 2.The Purseseiner in Turkey (1986-1993).

Year	Total	East Black Sea	West Black Sea	Marmara Sea	Aegean Sea	Mediterranean
1986	560	108	24	362	59	7
1987	554	120	30	330	56	15
1988	426	83	11	279	34	19
1989	605	97	29	416	52	11
1990	457	111	14	276	33	23
1991	426	113	18	227	51	17
1992	612	131	32	403	40	15
1993	615	112	175	216	94	18

The Purseseiner in Black Sea and Marmara Sea have at least one Carrier Vessels boat for transportation. But the daily productivities of the Purseseiner boats in Aegean Sea and Mediterranean Sea don't necessitate this kind of Carrier Vessels. But there are l or 2 small Carrier Vessels of 8-12 m together with the Purseseiner in Aegean Sea and Black Sea in order to carry especially the European sardina species.

The fish catched by the Purseseiner in Aegean Sea and Black Sea is transported to the marketing port in the deposit box of the boat.

The number of Carrier Vessels in Turkey between 1986-1993 is shown in Table 3.

More than 90% of demersal fish production in Turkish sea waters is obtained from Trawl Fishery which is concentrated especially in Black Sea, Aegean Sea and Mediterranean in order. The Trawl Fishery is forbidden in Marmara Sea which is accepted as inside sea.

It is free to catch by Trawler in the areas 3 miles faraway from the coasts in sea waters but Marmara Sea.

The length of Trawlers are between 15-25 m and the powers are between 150-500 HP. All the Trawlers are loading the nets from the back side of the boats.

All the Trawlers have their own echo-sounders, radars and VHF radiotelephones. Furthermore, there are holds large enough to keep the catched fish is cold air in these fishing vessels.

The amount of mesh in Trawlers is between 500-800.

The area of Trawl Fishery is limited to 100 m depth at Black Sea since there is no life after 100 m depth. The Trawlers in Black Sea have been going to the off-shore waters of Bulgaria, Romania and Russia in order to catch Sturgeon and Turbot.

The Trawlers can catch in these water continuously for at least one week.

Some of the Trawlers in Aegean Sea and Mediterranean are large enough to be catched in 150-200 m depth and have technical capacities.

The number of Trawlers in Turkish sea waters between 1986-1993 are shown in Table 4.

Table 3.The Carrier Vessels in Turkey (1986-1993).

Year	Total	East Black Sea	West Black Sea	Marmara Sea	Aegean Sea	Mediterranean
1986	496	189	45	148	98	16
1987	466	148	8	101	209	-
1988	389	111	2	144	132	-
1989	239	82	3	71	81	2
1990	613	236	-	148	225	4
1991	225	55	1	46	116	3
1992	253	87	-	132	34	-
1993	214	75	29	102	7	1

Table 4.The Trawlers in Turkey (1986-1993).

Year	Total	East Black Sea	West Black Sea	Aegean Sea	Mediterranean
1986	269	66	167	30	63
1987	544	53	325	72	94
1988	270	47	114	23	86
1989	441	51	193	36	161
1990	483	165	186	28	104
1991	481	58	209	51	194
1992	532	207	180	42	103
1993	531	154	247	31	99

3.SEA FISH PRODUCTION IN TURKEY

The production of sea fish in Turkey between 1986-1993 is shown in Table 5.

As it is clear from the statistics about the production of sea fish from 1986 to 1993, the values which increased by 1988 had decreased considerably from that years.

The production values of Inshore Fishery boats which forms the 5% of total production between (1986-1993) is as shown in Table 6.

The increasion which began in 1984 had began to decline from 1988. But there is not much difference between the totals of fishing vessels per years. The values obtained are approximately equal to the 10% of the production of Trawlers and Purseseiners. Because the results of statistical study including the years between 1986-1993 had shown that only 10% of the total fish production is from Inshore Fishery Boats.

Since the great majority of sea fish production in Turkey is obtained from Trawlers, Purseseiners the Inshore Fishery with its' 10% value doesn't mean much for fishing industry.

In our opinion, the financially little contribution of inshore fishing to the economy should be increased by maintaining national support as it is done in many developed countries.

Table 5. Sea Fish Production in Turkey (tons).

Year	Total	East Black Sea	West Black Sea	Marmara Sea	Aegean Sea	Mediterranean
1986	525381	297940	140979	50377	22024	14061
1987	562697	318915	151853	56190	22665	13074
1988	580701	352487	127913	53791	31505	15005
1989	361770	179130	85040	36892	37647	23061
1990	297123	105478	94352	42064	31731	23498
1991	290046	115177	67479	38505	43940	24945
1992	366060	185138	46577	36630	55801	41914
1993	453123	225979	76960	47733	60162	42289

Table 6.The production values of Inshore Fishing Boats (1986-1993, tons).

Year	Total	East Black Sea	West Black Sea	Marmara Sea	Aegean Sea	Mediterranean
1986	25489	11866	7239	2980	2064	1340
1987	25240	11102	6977	3599	2212	1350
1988	27008	9958	10432	3220	2108	1290
1989	26316	9588	9679	3006	2568	1480
1990	22308	7198	8175	2591	2745	1598
1991	19940	6570	6339	2116	3295	1620
1992	16144	5329	5134	1711	2663	1307
1993	22599	7458	7186	2329	3729	1831

The Inshore Fishing Vessels in Turkey are dimensionally small. The great majority of input is used to diesel fuel and other expenses and so this kind of fishing is not economic. The fisherman who couldn't earn enough wouldn't make his boat bigger and more modernized. But in case of earning much money, the production level would be higher. Because according to the stock estimations, Inshore Fish amount is more than that of Off-shore Fish (That it's forbidden for the industrial fishings vessels to approach shore less than 3 miles is supposed to be the major effect). This stock should be catched and contribute to economy. In spite of catching, it is not sufficient. Licences should be given to more modern and bigger fishing vessels rather than small ones. This idea should be supported by government and fishermen who get tired of doing this job should be encouroged to join together to have bigger and modernized fishing vessels and to produce more.

On the other hand, the set net system which has not been used in our coasts, yet, should be used for the development of Inshore Fishing. Besides, the economic cooperation of fishermen could be advantageous. Because this is no such cooperation in our country. But the industrial fishing vessels have to such cooperations.

The production values of Trawlers and Purseseiners + Carrier Vessels from 1986 to 1993 which constitute the 90% of total sea fish production in Turkey is shown in Table 7, 8.

Table 7.The production values of Purseseiner + Carrier Vessels (1984-1991, in tons).

Year	Total	East Black Sea	West Black Sea	Marmara Sea	Aegean Sea	Mediterranean
1986	478981	286581	127000	43000	14600	7800
1987	496597	284097	140000	50200	15900	6400
1988	489281	288581	132400	47200	15300	5800
1989	297455	152645	75097	30454	31394	7505
1990	239169	110835	65175	31541	22946	8672
1991	236527	109091	58614	30869	28846	9107
1992	286198	131662	70977	37491	34915	11162
1993	365780	168259	90713	47918	44625	14265

Table 8.The production values of Trawlers (1984-1991, tons).

Year	Total	East Black Sea	West Black Sea	Aegean Sea	Mediterranean
1986	46400	21400	13200	6200	5600
1987	66100	41600	11000	6400	7100
1988	91420	51000	26820	6500	7100
1989	64315	34381	17334	5700	6900
1990	57954	25536	18204	6900	7314
1991	53519	22760	17850	5180	7099
1992	79315	33909	26764	7893	10749
1993	87343	37321	29373	8772	11877

As it is clear from the all tables and the all figures, the outmost increasion of Purseseiner + Carrier Vessels in number is between 1985-1990. But the production had definite levels between 1984-1987 and it decreased to half of its' value after 1987. In spite of this negativeness, the number of fishing vessel had increased but these fishing vessels in excessive numbers have used up the existing stock unconsciously. In our opinion, this is the result of faulty fishing politics in Turkey. Because, fishing was encouraged and new credits were available to increase the number of fishing vessels without estimating the existing stocks in waters and finally production decreased.

Similarly, the increasion in number of fishing vessels was more than the increasion in production in all years but 1988.

The result of sea fish production in Table 6 is confirming the result about industrial fishing vessels.

The most detailed statistical studies about the unit per catching amounts of industrial vessels were between 1986-1988.

The statistical evaluation of production amount of industrial fishing and average catching amount per unit regarding fishing regions in Turkey is as follows:

l.There wasn't a great production increasion parallel to the increasion in numbers and grosstons of Purseseiner + Carrier Vessels in Eastern Black Sea. Because the unit catching amount per average grosston of fishing vessels decreased from 45 ton/fish production to 30 ton/fish production. Due to this decreasion, ton

over fish production proportion changed from 100 to 60 in Eastern Black Sea. There wasn't an important change in the average catching amount per unit of Purseseiner + Carrier Vessels in Marmara Sea. The least catching amount per unit in this region was 3-4 ton/fish production. These values for Aegean Sea and Mediterranean are 4-7 ton/fish production and 12 ton/fish production sequentially.

2.The only region, in which an increasion in unit catching amount per average grosston of Trawlers in 1984-1988 was estimated, was Eastern Black Sea. The average production per grosston in this region increased from 7 ton fish production to 15 ton fish production. It was estimated that unit per catching amount per average grosston of trawlers in West Black Sea increased from l.4 tons to 4.4 tons. This value decreased from 13 tons to 3 tons in Aegean Sea. There was no significant increase or decrease in values for Trawlers in Mediterranean.

We believe that the following solutions for the problems of Turkish fishery should be underlined.

l.Increasing the catching amount in order to increase the production without estimating the amount of stocks of commercial fish causes decreasion in stock amounts from the point of view of age groups.

2.1n order to solve the problems of fishing, the stocks of commercial demersal and pelagic fish must be estimated with current methods while keeping on catching fish commercially.

3.The production amount in one catching season and the necessary amount of hunting for this production should be determined after estimating stock compositions of commercial species.

4.The excess catching amount should be used in the seas of Mediterranean countries which have good relations with our country.

5.The fish stocks which were not accepted as commercial once should be evaluated again and new sources should be created for the catching amount out of production.

6.The production regions in depths more than 100 m especially in Aegean Sea and Mediterranean and the stocks of commercial demersal fish species in these regions should be estimated. Using of these resources in economy would be a solution for the decreasion of catching amount of Trawlers in Mediterranean.

7.The instruments of existing industrial fishing vessels should be modernized but the increase in number of fishing vessels should not be encouraged.

Estimation of pelagic fish stocks is especially very important for Turkish Fishery since anchovy and sardine take a great part in Turkish Fishery. The data about anchovy has really great importance for our country. The Target Strength studies of these species carried out in National Research Institute of Fisheries Engineering will contribute to the studies about stock estimation of same in Turkey in future.

Finally, I would like to thank to Japanese government and National Research Institute of Fisheries Engineering personnel for supporting me all the time.

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