# REMARKS ON THE FLUCTUATIONS OF BLUEFIN TUNA CATCHES IN TURKISH WATERS

F. Saadet Karakulak[1] and Işık K. Oray[2]

*SUMMARY*

*The history of the bluefin tuna fishery with traps dates back to the 15th century. Fish traps used to be set in the Sea of Marmara, Bosphorus and in the Black Sea from April/May to late August. Formerly, Filburnu, Çankaya, Beykoz, Bülbülsokak, Anaşya, Küçükçekmece, Salistra and Karamanoğlu fish traps were the most important traps. Purse seining of bluefin tuna began in the 1950s, primarily in the Sea of Marmara. The purse seine fisheries in the mid-1980s were limited to the Sea of Marmara catching large fish (even over 300 to 400 kg per fish), the fishing season being the winter months. Many tuna purse seiners replaced old boats, utilizing the special government credit and improved their fishing power considerably. Since 1989, the fishery has been conducted in the North Aegean Sea, expanding gradually to the South Aegean Sea, catching small to medium sized fish (25 to 45 kg) from winter to early spring, and later from early spring to the end of May. Between 1988 and 1990, the expansion of the bluefin tuna fishery was accelerated with the low production of anchovies. When the catch of anchovies declined, the effort of the purse seiners went to targeting more bluefin tuna. In 1994, the purse seiners started operating in the Mediterranean Sea. Since 2000, the Turkish bluefin tuna fishery is carried out in May and June in the eastern Mediterranean Sea in the international waters off northern Cyprus and in the waters between Cyprus and Turkey.*

*RÉSUMÉ*

*L'historique de la pêcherie de madrague ciblant le thon rouge remonte au XVème siècle. Les madragues de poissons étaient en général établies dans la Mer de Marmara, le Bosphore et la Mer Noire d'avril/mai jusqu'à la fin août. Les madragues de poissons de Filburnu, Çankaya, Beykoz, Bülbülsokak, Anaşya, Küçükçekmece, Salistra et Karamanoğlu étaient autrefois les plus importantes. La pêche à la senne de thon rouge a débuté dans les années 1950, principalement dans la Mer de Marmara. Au milieu des années 1980, les pêcheries de senneurs se limitaient à la Mer de Marmara et capturaient de grands poissons (jusqu'à 300-400 kg par poisson) ; la saison de pêche se déroulait durant les mois d'hiver. De nombreux senneurs thoniers ont par la suite remplacé leurs vieux bateaux à l'aide des crédits spéciaux alloués par le Gouvernement, améliorant considérablement leur puissance de pêche. Depuis 1989, la pêcherie se déroule dans le Nord de la Mer Egée et gagne peu à peu le sud de la Mer Egée, avec des prises de poissons de petite-moyenne taille (de 25 à 45 kg) de l'hiver jusqu'au début du printemps, et du début du printemps jusqu'à la fin mai. Entre 1988 et 1990, l'expansion de la pêcherie de thon rouge s'est accélérée avec la faible production d'anchois. Lorsque la capture d'anchois a diminué, l'effort des senneurs s'est exercé davantage sur le thon rouge. En 1994, les senneurs ont commencé à opérer en Méditerranée. Depuis l'an 2000, la pêcherie turque de thon rouge est réalisée de mai à juin, en Méditerranée orientale, dans les eaux internationales au large du nord de Chypre et dans les eaux situées entre Chypre et la Turquie.*

*RESUMEN*

*La historia de la pesquería de almadrabas de atún rojo se remonta al siglo XV. Las almadrabas solían estar caladas en el Mar de Mármara, el Bósforo y el Mar Negro desde abril/mayo hasta finales de agosto. Antiguamente, las almadrabas de Filburnu, Çankaya, Beykoz, Bülbülsokak, Anaşya, Küçükçekmece, Salistra y Karamanoğlu eran las más importantes. La pesca de atún rojo con cerco empezó en los 50, principalmente en el Mar de Mármara. Las pesquerías de*

[1]Istanbul University, Faculty of Fisheries, Ordu cad.No.200, 34470 Laleli-Istanbul,Turkey.
[2] Cyprus Marine Science Foundation, Girne/Cyprus.

*cerco a mediados de los 80 se limitaban al Mar de Mármara capturando peces grandes (incluso de más de 300 a 400 kg por pez) y la temporada de pesca era durante los meses de invierno. Muchos cerqueros atuneros sustituyeron sus antiguos barcos, utilizando los créditos especiales del gobierno y mejoraron su potencia de pesca de forma considerable. Desde 1989, la pesquería se llevó a cabo en el Mar Egeo septentrional, ampliándose gradualmente hasta el Mar Egeo meridional, capturando peces de pequeños a medianos (25 a 45 kg) desde invierno hasta el principio de la primavera y más tarde desde principios de la primavera hasta el final de mayo. Entre 1988 y 1990, la expansión de la pesquería de atún rojo se vio acelerada por la escasa producción de anchoas. Cuando la captura de anchoas descendió, el esfuerzo de los cerqueros se dirigió más hacia el atún rojo. En 1994, los cerqueros comenzaron a operar en el Mediterráneo. Desde 2000 la pesquería turca de atún rojo se realiza en mayo y junio en el Mediterráneo oriental en aguas internacionales a lo largo de la costa septentrional de Chipre y en las aguas que se encuentran ente Chipre y Turquía.*

*KEYWORDS*

*Thunnus thynnus, trap, purse seine, eastern Mediterranean Sea*

## 1. Introduction

The history of the bluefin tuna fishery in Asia Minor dates back to ancient times. Besides the taxes paid by the sailing ships passing through the Istanbul Strait, bonito and bluefin tuna fishery was, formerly, another important financial source during the Byzantium era. During this period, these fish have been selected as the symbols of the city. Reliefs of bonito and bluefin tuna had been imprinted on Byzantium coins, emitted between the 1st and 3rd centuries A.D. Many ancient authors, such as Homeros (8th century B.C.), Plinius (1st century A.D.) and Athenaios (2nd - 3rd centuries A.D.), wrote about bonito and bluefin tuna captured both in the Dardanelles and Istanbul Straits (Tekin, 2000). According to Devedjian (1926), Sará (1964) and Cuvier (1969) bluefin tunas and bonitos were once very abundant in the waters of Byzantium, especially in the "Golden Horn".

In the old days, bluefin tunas used to migrate from April on from the Sea of Marmara to the Black Sea. This migration between July and August was intensive and continued till the beginning of September. Following the small pelagic fish (mackerels, bonitos, bluefish, anchovy, horse-mackerel, etc.) they returned back to Marmara Sea **(Figure 1)**, some going to the Mediterranean Sea, whereas a part of the bluefin tunas stayed with other migratory fish in Marmara Sea (Devedjian, 1926; Sará, 1964). In this study, the history of the bluefin tuna fishery, the fishing grounds catch periods and the changes in bluefin tuna catches are discussed.

## 2. BFT historical fisheries

Until 1950, bluefin tunas were caught by traps (dalians), hand-line and spears. In 1950s fishing by purse seiners began (Iyigüngör, 1957).

Evliya Çelebi, a famous Turkish world traveller, mentions in his memories the presence of 300 dalian-locations, whereas especially in Beykoz Dalian, big quantities of swordfish and bluefin tunas were caught (Kahraman and Dağlı, 2003). Bluefin tuna traps may have been bigger and deeper than other dalians. The bluefin tuna dalians are traditionally called *Şıra* and *Kurtağzı* dalians (Devedjian, 1926; Iyigüngör, 1957; Sarıkaya, 1980) **(Figure 2)**. In the 1950's the 8 "dalians" namely (Filburnu, Çankaya, Beykoz, Bülbülsokak, Anaşya, Küçükçekmece and Karamanoğlu) were set up in the last week of May and operated till August. The production of each dalian was about 100-150 bluefin tuna. Each bluefin tuna caught weighed 100 to 450 kg (Iyigüngör, 1957). The catch of bluefin tuna by "dalians" ended in 1986 (Oray, Karakulak and Gönül, 1999; Karakulak, 2000).

The dimensions of some of these fish traps are around; 112-113 fathoms length, 33 fathoms width and 9-22 fathoms depth. Crews of 20-25 persons were employed in each of these fish traps. The number of the bluefin tunas captured in a single fish trap in one fishing season varied between 100 to 150 bluefin tunas, each weighing 100 to 450 kg.

Bluefin tuna were caught during the whole year in the Sea of Marmara and Bosphorus. The catches were made especially in three periods namely in a) November-December-January, b) March-April c) July-August intensive (Iyigüngör, 1957). The amount of sold bluefin tunas in 1909-1923 in Istanbul fish market is shown in **Table 1**.

**Table 2** shows the amount of landed bluefin tuna in 1921-1923, by month.

As the trap catches declined, Turkey started developing purse seine fisheries. In 1980, the Government took a new policy to develop the fisheries, crediting building new boats and having a special tax waiver. As a result, the fisheries developed quickly and the bluefin tuna purse seine fishery was no exception. Particularly since mid-1980's, the high prices for bluefin in the Japanese market draw a lot of attention of the Turkish fishing industry to bluefin tuna (Mert *et al.*, 2000).

The purse seine fisheries in mid 1980's were limited to the Sea of Marmara catching large fish (even over 300 to 400 kg per fish), and the fishing season was in winter months. Many tuna seiners replaced their old boats with newly built boats, utilizing the governmental special credit mentioned above, and improved the fishing power tremendously.

Since 1989, the fishery began in the North Aegean Sea, expanding gradually to the south Aegean Sea (Oray and Karakulak, 1997), catching small to medium size fish (25 to 45 kg) from winter to early spring time, and later (since 1995) from early spring to the end of May. This expansion was accelerated with the low production of anchovies in 1988 to 1990.

The tuna purse seiners also targeted anchovies. When the catch of anchovies declined, naturally their effort went targeting more bluefin tuna. In 1994, the purse seiners started operating even in the Mediterranean Sea where catches consisted of medium sized fish (60 to 100 kg), and the fishing season was from March to Middle of June. In the summer months, the quality of fish is relatively poor and fishermen abstain from fishing bluefin tunas. Currently the bluefin tuna fishing is carried out in the Aegean and Mediterranean Seas, mainly in the months of March till the end of May. In 1998 and 1999, only 3 and 30 tons of bluefin tuna (60 to 100 kg/fish), respectively, were caught in the Sea of Marmara (around Marmara Island), in April.

In 2002, after the on growing of bluefin tunas started, the catch is carried out mostly in the eastern Mediterranean Sea (northern Levantine Sea) in May and June. Although there are changes in years in the catch grounds, the catch of bluefin tunas in the Aegean Sea and Sea of Marmara is still continuing **(Figure 3)**.

In 1970, 138 metric tons (t) of bluefin tunas were captured in Turkish waters. The catches increased by 2230 t in 1985 and 5093 t in 1997 (TUIK, 1970-2006). The increase in the catch has probably been due to the rapid development of the fishing gears in the 1980's, as well as the increasing demand for exports. In 1999, ICCAT introduced catch quotas for bluefin tunas in the Mediterranean Sea Turkey becoming a member to ICCAT in 2003, could not receive a certain catch quota and used the quotas in others category with six other non-member Mediterranean countries (1184 t). In 2007, Turkey received in scope of the ICCAT management plan, a bluefin quota of 918.32 t **(Figure 4)**.

## 3. Results and discussion

Akyüz and Artüz (1957) reported the presence of 3 species of tunas, *Thunnus thynnus*, *Thunnus allalunga* and *Euthynnus alletteratus*, in the Sea of Marmara, Istanbul Strait and the Black Sea. Due to marine pollution, over fishing, and decrease in the stocks of small pelagic fishes, such as mackerel, of which the tunas prey upon, today none of the above three species are captured in the Black Sea.

Drastic reduction in the stocks of the bluefin tuna in the Black Sea, in the late 1980's, was reported by Zaitsev and Mamaev (1997). The bluefin tuna disappeared from the Romanian waters since 1960's (Dumont *et al.*, 1999). Furthermore, no individual of this species was captured or even sighted in the Turkish Black Sea since 1986. Unfortunately, the reduction in the Black Sea population of the bluefin tuna is, probably, reached the level of extinction. The reduction of bluefin tuna in the Black Sea belongs to marine pollution (Dumont *et al.*, 1999).

There are reports on the reproduction of bluefin tunas in the Black Sea (Devedjian, 1926; Slastenenko, 1955-1956), but no results of egg cultivation have been reported. Information on sampled bluefin tuna is insufficient (communication with Romanov, E.V.). In 1993 no eggs or larvae of the bluefin tunas have been sampled in a research conducted in the Black and Marmara Sea (Piccinetti-Manfrin *et al*., 1995).

Karakulak *et al.* (2004) evidenced a spawning ground of bluefin tunas in the eastern Mediterranean Sea (northern Levantine Sea). In 2004; in a larval survey, a new spawning ground of bluefin tunas and other tunas were found in the eastern Mediterranean Sea (Oray *et al.*, 2005; Oray and Karakulak, 2005).

By means of tagging carried out during the purse seine fishery and in the bluefin tuna farms in the eastern Mediterranean Sea (De Metrio *et al.*, 2004), it is evidenced that bluefin tunas do not migrate to Gibraltar after spawning. This shows the presence of a sub-population of bluefin tunas in the northern Levantine Sea which do not migrate towards the Strait of Gibraltar after spawning but stay all the year long in this area.

**References**


Akyuz, E. F., Artüz, I. 1957. Some Observations on the Biology of Tuna (*Thunnus thynnus*) Caught in Turkish Waters. Conseil général des pêches pour la Méditerranée, Document Techniques, No. 14, pp. 93-99, Rome.

Cuvier M. B., Valenciennes, M., 1969. Histoire Naturelle des Poissons. p. 57-113, Amsterdam.

De Metrio, G., Oray, I.K., Arnold, G.P., Lutcavage, M., Deflorio, M., Cort, J.L., Karakulak, S.**,** Anbar, N., Ultanur, M. 2004. Joint Turkish-Italian research in the Eastern Mediterranean: Bluefin tuna tagging with pop-up satellite tags. Collect, Vol. Sci. Pap. ICCAT, 56(3): 1163-1167.

Devedjian, K., 1926. Pêche et Pêcheries en Turquie. Imprimerie de l'Administration de la Dette Publique Ottomane, Istanbul, 480 pp.

Dumont, H., Mamaev, V.O., Zaitsev, Y.P. 1999. Black Sea Red Data Book. P. 413, United Nations Office for Project Services.

Iyigungor, D. 1957. Méthods et Moyens de Pêche au Thon Actuellement en Usage en Turquie. Gen. Fish. Coun. Medit., No. 33, pp. 251-255.

Kahraman, S.A., Dağlı, Y. 2003. Evliya Çelebi Travel Book: Istanbul. Vol.1, 386 p., Yapı Kredi Culture Center.

Karakulak, F.S. 1999. The Fishing Technology and the Biology of the Bluefin Tunas (*Thunnus thynnus* L. 1758) in Turkish Waters, (Doctoral thesis). pp.169, Istanbul University, Istanbul. (In Turkish)

Karakulak, F.S. 2000. The trap nets in and around the Strait of Istanbul. In: Öztürk, B., Kadioğlu,M., Öztürk,H. (eds). "Marmara Sea 2000" Symposium, 11-12 November 2000, Istanbul Turkish Marine Research Foundation (TUDAV), Publication Number No: 5, Istanbul, p. 426-435. (In Turkish)

Karakulak, S., Oray, I., Corriero, A., Deflorio, M., Santamaria, N., Desantis, S., De Metrio, G. 2004. Evidence of a spawning area for the bluefin tuna (*Thunnus thynnus* L.) in the eastern Mediterranean. J. Appl. Ichthyol. 20:318-320.

Mert, I., Oray, I.K., Patrona, K., Karakulak, F.S**.**, Kayabaşı, Y., Gündoğdu, M., Miyake, P. 2000. Historical review of turkish bluefin tuna fisheries and their development. Collect. Vol. Sci. Pap. ICCAT, 51(3): 813-826.

Oray, I.K., Karakulak, F.S. 1997. Some remarks on the bluefin tuna (*Thunnus thynnus* L.1758) fishery in Turkish waters in 1993, 1994, 1995. Collect. Vol. Sci. Pap. ICCAT, 46(2): 357-362, Madrid.

Oray, I.K., Karakulak, F.S., Gönül, M. 2000. Some remarks on the bluefin tuna fishery in turkey. Il Mondo delle Tonnare Tratradizione Eproduzione, 15-16 May 1999, I.CI.MAR Istituto delle civiltà del mare, Periodico di studi, ricerca e informazione, pp. 11-13, Sardegna.

Oray, I., Karakulak, S.**,** Alıçlı, Z., Ateş, C., Kahraman, A. 2005. First evidence of spawning in the eastern Mediterranean Sea: preliminary results of TUNALEV larval survey in 2004. Collect. Vol. Sci. Pap. ICCAT, 58(4): 1341-1347.

Oray, I.K., Karakulak, F.S. 2005. Further evidence of spawning of bluefin tuna (*Thunnus thynnus thynnus* L., 1758) and the tuna species (*Auxis rochei* Ris., 1810, *Euthynnus alletteratus* Raf., 1810) in the eastern Mediterranean Sea: preliminary results of TUNALEV larval survey in 2004. J. Appl. Ichthyol. 21, 236-240.

Piccinetti-Manfrin, G., Marano, G., De Metrio, G., Piccinetti, C. 1995. An attempt to find eggs and larvae of bluefin tuna (*Thunnus thynnus*) in the Black Sea. Collect. Vol. Sci. Pap. ICCAT 44(1): 316-317.

Sara, R. 1964. Données, Observations et Commentaires sur La Présence, Le Comportement, Les Caractéristiques et Les Migrations des Thons en Méditerranée. Proc. Gen Fish. Coun. Medit., 7: pp.371-388.

Sarikaya, S. 1980. Fishery and the fishing technology. Publications of the Departmant of Fisheries, Ministry of Agriculture, pp. 65-103, Ankara. (In Turkish)

SlastenenkO, E. 1955-1956. The fishes of the Black Sea basin. Publications of the Meat and Fish Department of State, pp. 518-521, Istanbul. (In Turkish)

Tekin, O. 2000. Golden Horn and the Tunas of Istanbul. Istanbul Dergisi, Sayı 32, p. 92-94, Golden Horn Istanbul. (In Turkish)

Tuik 1970-2006. Fishery Statistics. Prime Ministry Republic of Turkey, Turkish Statistical Institute, Ankara, Turkey (In Turkish).

Vodyanitsky, V. A. 1936. Observations on pelagic eggs of epy Black Sea fishes. Travaux de la Station Biologique de Sebastopol, Tome V, p. 3-40 (in Russian).

Zaitsev, Yu. P., Mamaev, V. 1997. Marine Biological Diversity in the Black Sea. A Study of Change and Decline. GEF Black Sea Environmental Programme, 208 p., United Nations Publications, New York.

**Table 1.** The amount of sold bluefin tunas which were caught in dalians at Istanbul fish market in 1909-1923 (Devedjian, 1926).

| *Year* | *Catch (kg)* |
|---|---|
| 1909 | 85 279 |
| 1910 | 86 023 |
| 1911 | 129 052 |
| 1912 | 255 452 |
| 1913 | 537 455 |
| 1914 | 204 375 |
| 1915 | 135 027 |
| 1916 | 44 242 |
| 1917 | 46 098 |
| 1918 | 74 995 |
| 1919 | 77 300 |
| 1920 | 63 648 |
| 1921 | 50 338 |
| 1922 | 83 782 |
| 1923 | 104 503 |

**Table 2.** The amount of bluefin tunas sold at Istanbul fish market in 1921-1923, giving the catches per month in kg (Devedjian, 1926).

| *Months* | *1921* | *1922* | *1923* |
|---|---|---|---|
| January | 137 | 671 | 394 |
| February | - | 9 339 | 93 |
| March | 285 | 1 169 | 49 687 |
| April | 3 198 | 28 629 | 16 378 |
| May | 5 129 | 3 639 | 6 176 |
| June | 540 | 978 | 1 195 |
| July | 29 985 | 24 106 | 20 895 |
| August | 3 829 | 8 182 | 1 042 |
| September | 4 288 | 1 195 | 534 |
| October | 2 119 | 185 | 2 816 |
| November | 828 | 2 | 3 270 |
| December | - | 5 687 | 2 023 |
| **Total** | **50 338** | **83 722** | **104 503** |

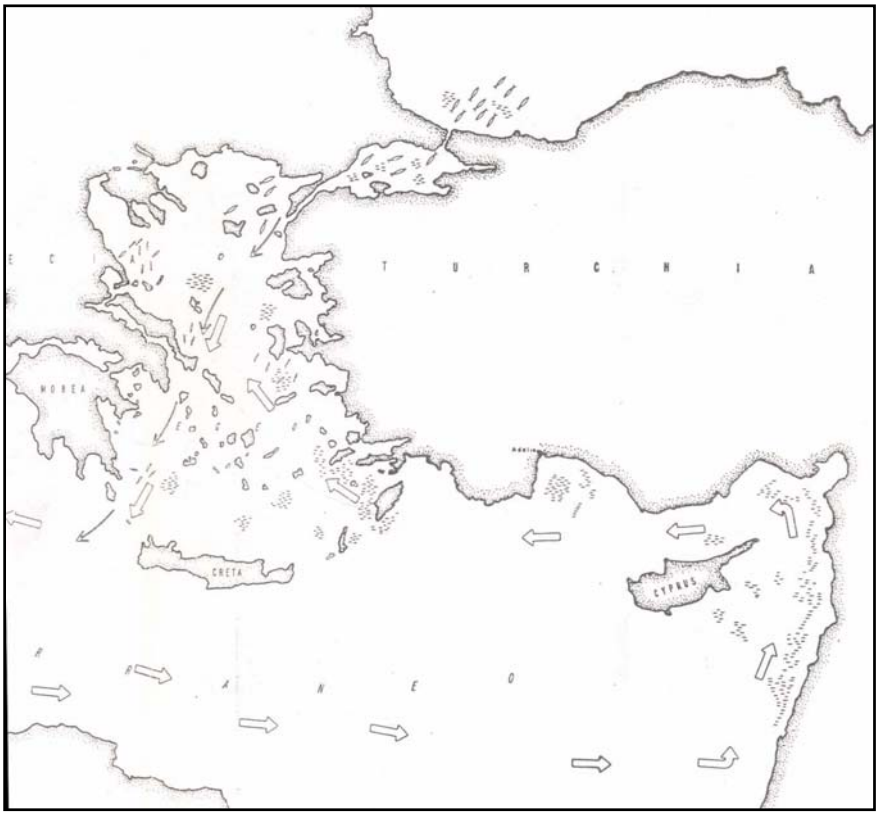


**Figure 1.** The migration routes of the bluefin tuna in Turkish waters (Sara, 1964).

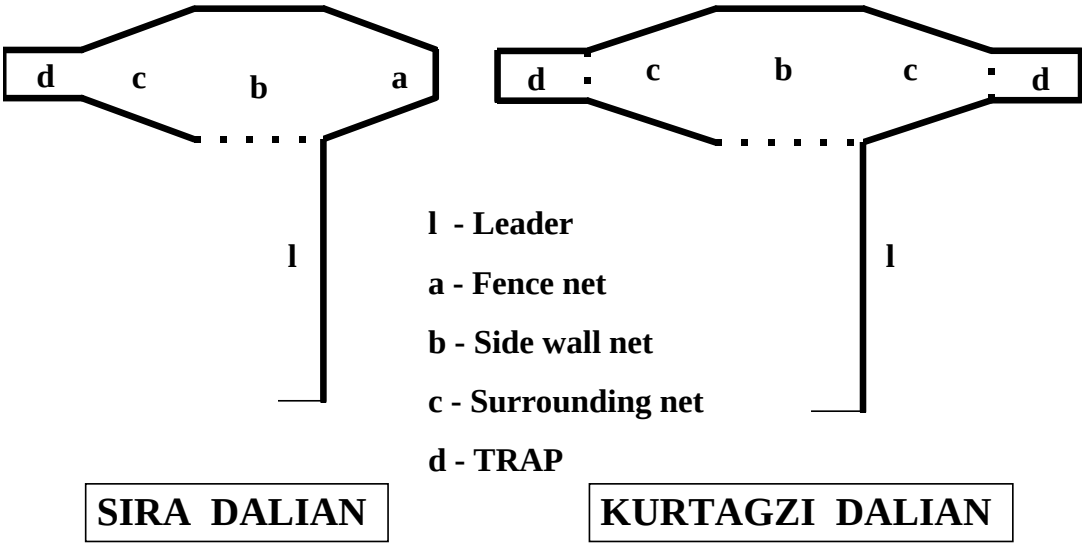


**Figure 2.** Kinds of traps (Dalians).

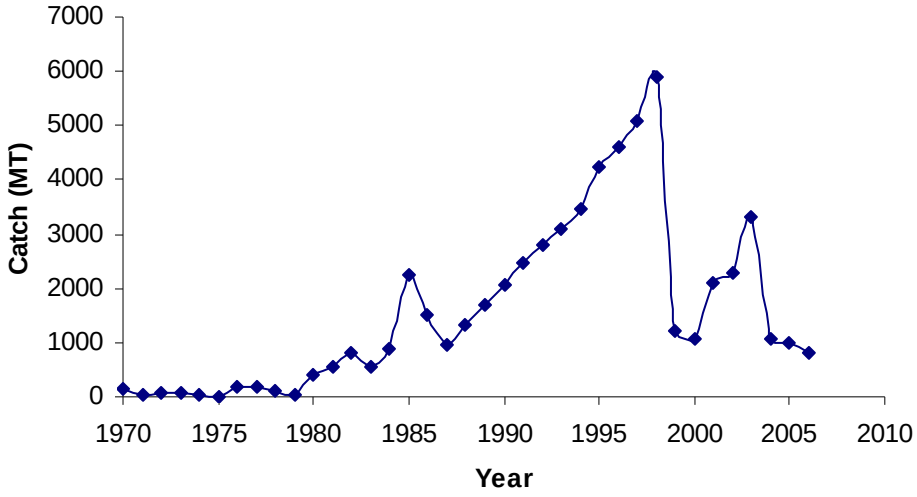


**Figure 3.** Quantity (metric tons) of bluefin tuna captured in Turkish seas. (TUIK, 1970-2006).

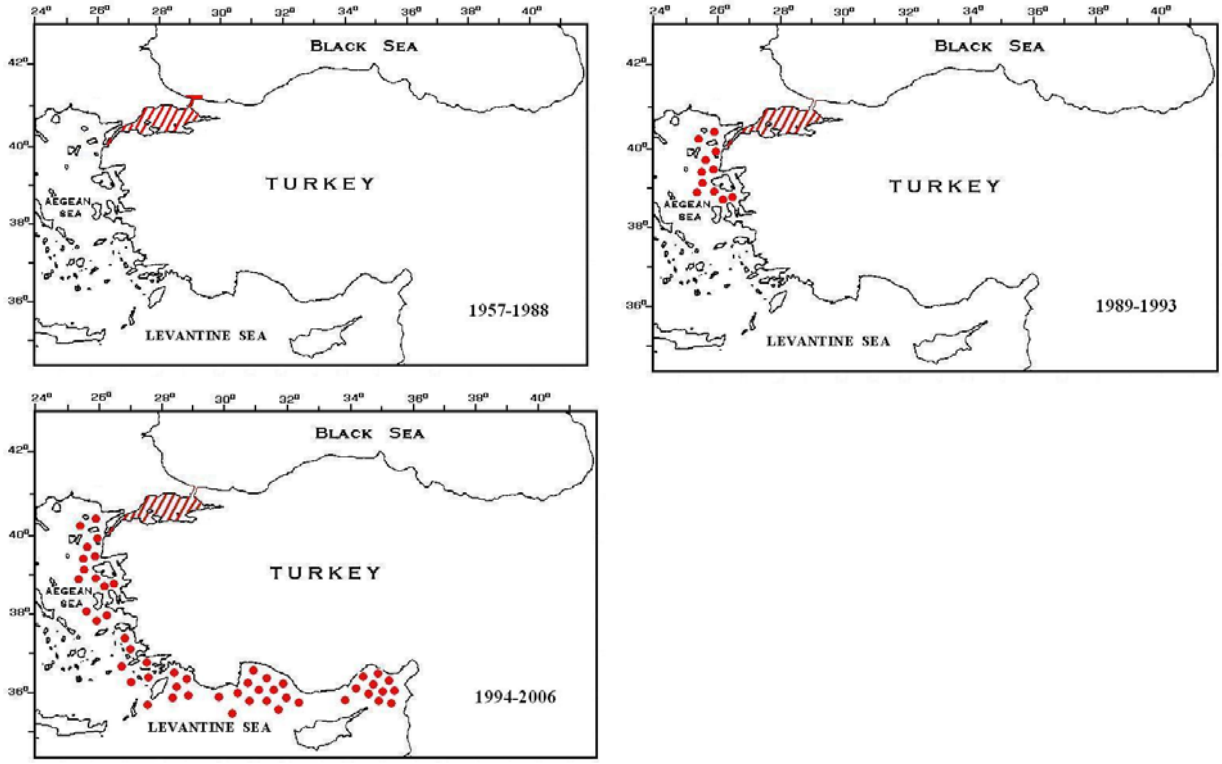


**Figure 4.** Geographic distribution of bluefin tuna catches by purse seiners, from the period 1957-2006.