

COMITÉ DES POISSONS PÉLAGIQUES

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FLUCTUATIONS IN THE CATCH OF SOME TONIDS

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As it is known, there are many different factors which influence the fluctuations the number of fish caught. The variations of oceanographical and biological characters cause these fluctuation. In seas, the maturing and the recruitments of fish cause the increase of fish stocks, whereas natural mortality and the cathing cause the decrease of fish stocks. These are many properties and characteristics of seas which effect the above mentioned factors. Two kinds of fluctuation be clearly distinguished from each other. One of them is the fluctuation of stocks and the other is the fluctuation of the catch. These two fluctuations are important in fishery. On the other hand, the factors which effect the fluctuation cause an increase or a decrease in the numbers caught. In other words, these factors also cause pollution in the sea. Therefore, the similarity between the pollution and the fluctuation can be attributed to the similarity between the cause and the result.

As it is known, the variation of surface temperature shows a harmonic variation. The mathematical equations of the surface temperature in Bosphorous (ACARA A., 1958) are as following :

$$\begin{array}{ll} 1954 & y = 13.4 - 11.7 \sin \frac{\pi}{6} (\chi + 1.6) + \varepsilon_1 \quad \chi = \text{month } (0, 1, 2, \dots, 11) \\ 1955 & y = 14.7 - 7.5 \sin \frac{\pi}{6} (\chi + 1.5) + \varepsilon_2 \quad y = \text{The montly mean} \\ & \text{value of surface tem-} \\ 1956 & y = 13.4 - 9.3 \sin \frac{\pi}{6} (\chi + 1.8) + \varepsilon_3 \quad \text{perature (T}^\circ\text{C).} \end{array}$$

The migrations of the fish are regularly carried out under this harmonic variation from the Sea of Marmara to the Black Sea. During the migration, a sudden variation in the temperature effects the migration. The catch increases when the temperature approaches or attains the minimum temperature of fish. This state is shown in the catch of mackerel in figure 1. In the Black Sea, when the surface temperature falls below 8°C, the decrease in the quantity of mackerel caught in the Bosphorous doesn't always show the decrease of mackerel in the stock. On the other hand, during the spawning period, if many mackerel remain in the Black Sea, this may cause a fluctuation, because, mackerel eggs do not develop into the larvae form in the Black Sea (DEMIR M. and ACARA A., 1958). During the migration of Tonids (torik, pelamid and mackerel) when the temperature falls suddenly below their minimum temperatures, fainted tonids may be caught very easily a along the shores of the Bosphorous. The sudden fall of temperature can be considered one of the causes of natural pollution. Under the normal oceanographical constitution of the Bosphorous, the Black Sea water flows from the Black Sea to the Sea of Marmara as a leyer 45 meters deep. While the Sea of Marmara

water flows from the Sea of Marmara to the Black Sea as a layer from the depth of 45 meters to the bottom. The eliminating of this natural constitution causes an increase in the catch

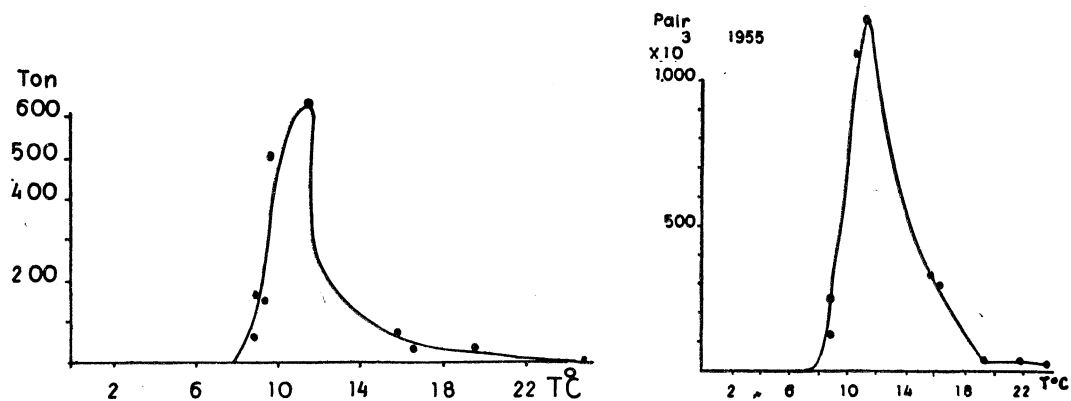
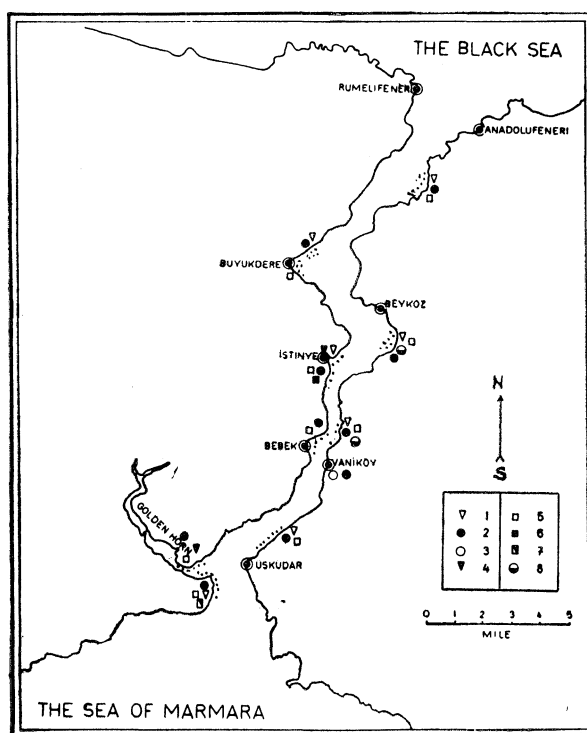


FIG. 1. — The relation between the catches of *Scomber scomber* (left), *Sarda sarda* (right) and the monthly mean values of surface temperatures ($T^{\circ}\text{C}$) in the Bosphorus.



MAP. 1. — The locations where the fainted fishes were caught.

- 1) *Trachurus trachurus*; 2) *Sarda sarda* (*pelamid*);
- 3) *Sarda sarda* (*Torik*); 4) *Mugil cephalus*; 5) *Temnodon saltator*; 6) *Dicentrarchus labrax*; 7) *Lepidotrigla aspera*; 8) *Zeus faber faber*.

during the winter. Such a phenomenon was observed in march 3, 954. The location where the fainted fish were caught is shown in Map 1. During this phenomenon, in the Bosphorus, no found the water of the Sea of Marmara.

Upon another occasion, *Sarda sarda*, *Scomber scomber*, *Temnodon saltator*, *Mugil cephalus*, *Dicentrarchus labrax*, *Lepidotrigla aspera*, *Zeus faber faber* were caught by landing nets. This continued in the Bosphorous for one week. During this event, at different times fainted fish were easily caught by landing nets along both sides of the Bosphorous. During this period fainted or dead fish groups were observed at different times, because of the elimination of warm deep water by the cold water from the Black Sea. On the other hand, a comparison between the catches of some Tonids and the monthly mean value of the surface temperature is shown in figure 1. According to figure 1, in the Bosphorous, the maximum catch is obtained at 11°C. Whereas a sudden increase in the catch of mackerel is sometimes observed below 8°C which is the minimum temperature for mackerel. The reason of this is the sudden passing of mackerel from the Black Sea to the Sea of Marmara. This observed high value is not due to the increase of the fish stock but to the fall of the temperature to or near the minimum temperature of mackerel. As seen in figure 1 the maximum catch of torik and pelamid is obtained when the surface temperature is 11°-12°C. A fall in the temperature causes an increase of the catch of the fish in the Bosphorous. The critical temperature is 11°-12. C, because the maximum catch is obtained at this temperature. If the environmental temperatures of fish correspond to the same intervals or if some the parts of the intervals are equal to the same values, the fish may effect each other, some preying on others. This effect is clearly seen during the migration of torik, pelamid and mackerel in the Bosphorous. The environmental temperature of mackerel has been found to be 8°-21°C and the environmental temperature of pelamid and torik have been found to be 9°-25°C. Mackerel enter the Bosphorous before the temperature drops below 8°C whereas pelamid and torik enter the Bosphorous before the temperature drops below 9°C. In other words, mackerel can remain in the Black Sea until the temperature drops below 8°C and pelamid and torik can stay in the Black Sea until the temperature drops below 9°C.

In short, the reason of the unchanging order in their migration and the difference between their catches come from the difference between their minimum temperatures. The difference which is 1°C between 8°C and 9°C, causes a typical and unchanging order in their migration both during the return to the Sea of Marmara and the passing to the Black Sea.

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