

Comparison of the Fish Fauna in the Bardawil lagoon and the bitter Lakes

by

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Introduction

Coastal lagoons are of special interest because of their extreme physical conditions which limit the number of organisms able to tolerate the unusual salinities and temperatures prevailing during most of the year. In areas with little rain and a high rate of evaporation, the lagoons are usually characterized by salinities much higher than the adjacent sea [HEDGPETH, 1956].

Such hypersaline lagoons are encountered along the coast of the Gulf of Suez (e.g. El Bilaiyim) and on the north-western coast of Sinai (Bardawil Lagoon). Similar conditions are also found in the Bitter Lakes in the southern section of the Suez Canal. The distribution and biology of fishes in these lagoons are of special interest, since they demonstrate : a. the selective preference and adaptability of various species to the hypersaline biotope; b. the progress of colonizing migrations through the Suez Canal; c. the possibilities of using selected species for fish culture.

Bardawil Lagoon (Sabkhat el Bardawil)

Because of the rigorous physical conditions prevailing in the lagoon, the number of species is small in comparison to the open sea. For convenience we can divide the Bardawil fishes into three groups : (1) commercial species; (2) common non-commercial species; (3) rare species.

Among the commercial fishes three groups are important : *Sparus auratus*, six species of Mugilidae and two species of *Dicentrarchus*. They constitute at least 95 % of the total. The other fishes of some commercial importance are *Solea vulgaris*, *Argyrosomus regius*, *Umbrina cirrosa* and *Epinephelus aeneus*. This is in striking contrast to the commercial catches of the open Mediterranean Sea, which usually contain a great number of species.

In total, 65 species have been collected in the Bardawil Lagoon, which is about a fifth of the total number of species collected in the Mediterranean [BEN-TUVIA, 1971].

Although all the common and commercial species clearly belong to the Mediterranean group, ecologically they are of special character in their ability to inhabit the hypersaline waters. The main fish, *Sparus auratus*, is rare in the open Mediterranean Sea, and occurs in commercial concentrations only in Bardawil Lagoon. On the other hand, the two species of Mugilidae — *Mugil cephalus* and *Liza ramada* — most common in Bardawil, are also common in the inshore waters of the Mediterranean coast of Israël, although there they constitute a different proportion of the catch. In Bardawil, Mugilidae constitute about 30 % of the total catch, but in the open Mediterranean coast probably no more than 2-3 %.

The number of Red Sea immigrants, in proportion to the total number of species, is much higher in Bardawil than on the Mediterranean coast of Israël. From the total of 31 Red Sea species, 17 have been collected in Bardawil Lagoon, including two species (*Crenidens crenidens* and *Herclotsichthys punctata*) that have not as yet been found along the other sections of the Mediterranean coast. The Red Sea species in Bardawil constitute about one quarter of the total number of species collected. In the Mediterranean Sea they constitute only 10 % of the total [BEN-TUVIA, 1971].

The small non-commercial fishes are represented by three species. *Atherina mochon* is the most common one, appearing in schools in all parts of the lagoon. *Aphanius dispar* is especially abundant in

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sections of high salinity waters. The demersal fishes are represented by an as yet unidentified small gobiid, which burrows in the muddy bottom.

The Bitter Lakes

Sporadic collections were made in the Bitter Lakes between 1967 and 1973. STEINITZ and BEN-TUVIA (1973) reported on the fishes collected. An additional collection was made on 26-27 December 1973. In total, 18 species have been found. Of these, 13 species belong to the Red Sea fauna, and the remaining five to the Mediterranean fauna. About half of the Red Sea species belong to the "Lessepsian" migrants that have been recorded from the Eastern Mediterranean [BEN-TUVIA, 1971]. These are: *Tylosurus choram*, *Apogonichtyoides nigripinnis*, *Leiognathus klunzingeri*, *Rhonciscus stridens*, *Crenidens crenidens*, *Hepsetia pinguis*, *Siganus rivulatus* and a gobiid of some problematic status. Most of them were found also in the Bardawil Lagoon.

All the five Mediterranean immigrants (*Dicentrarchus punctatus*, *Sparus auratus*, *Atherina mochon*, *Liza aurata* and *Liza ramada*) are known as the most common fishes in the Bardawil Lagoon. Two of them (*Dicentrarchus punctatus* and *Liza aurata*) were also found in the northern Red Sea. From my observations made between 26-27 December 1973, the most common in the inshore waters of the Bitter Lakes were *Crenidens crenidens*, *Siganus rivulatus*, *Hepsetia pinguis* and *Leiognathus klunzingeri*. One large *Sparus auratus* and a large *Dicentrarchus punctatus* were caught near the north-eastern shore. In the same area the shores were covered by hundreds of dead *Liza aurata*, perhaps killed by explosives as a result of war activities. The collection from the area also included *Diplodus noct* and several specimens of *Hyporhamphus* sp.

It is significant that all the species collected recently in the Suez Canal were reported also by TILLIER [1902] about 75 years ago. Evidently, the immigration ('Lessepsian migration' of F.D. POR, or 'colonizing migration' of J. BRIGGS) took place shortly after the opening of the Suez Canal, saturating the biotope with the most suitable species from the two adjacent zoogeographical areas. From the scanty information available, it seems that the main commercial species in the Bitter Lakes originate from the Mediterranean Sea. They include *Sparus auratus*, *Mugil cephalus*, *Liza ramada*, *L. aurata*, *L. saliens*, *Dicentrarchus punctatus*, *D. labrax* and *Solea vulgaris*. These species are also commercial fishes in Bardawil. Among the Red Sea fishes exploited commercially in the Bitter Lakes are *Crenidens crenidens*, *Sparus haffara* and *Siganus rivulatus*. As pointed out in the chapter dealing with Bardawil fishes, *C. crenidens* and *S. rivulatus* are present in the Mediterranean Sea.

The small non-commercial species show similarities in both areas. Among the Atherinidae, *Hepsetia pinguis* is common in the Bitter Lakes, while *Atherina mochon* is common in the Bardawil Lagoon.

Discussion

Although a considerable number of Red Sea fishes has been found in the Bardawil Lagoon, none of them has proved to be common in this unusual biotope. Only *Crenidens crenidens* occurs occasionally in small numbers. Other species are either rare or very rare. Evidently, the Mediterranean fish in the Bardawil Lagoon are well adjusted to the hypersaline biotope, and are less vulnerable in competition with the invading Red Sea species. Moreover, several Mediterranean fishes are living in the waters of the Suez Canal including the Bitter Lakes; at least two of them (*Liza aurata* and *Dicentrarchus punctatus*) have succeeded in extending their range of distribution into the northern Red Sea.

Sparus auratus has not been found as yet in the Red Sea, although it seems to be common in the Great Bitter Lake. I believe that the explanation lies in its reproductive cycle. This fish spawns in winter, when the temperatures of the Mediterranean waters are about 17° C or less, while the usual temperatures of the northern Red Sea seldom fall below 18° C.

References

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