

# Euryhaline elements in the plankton of the Bardawil Lagoon (Northern Sinai)

by

B. KIMOR

*Israël Oceanographic and Limnological Research Ltd., Haïfa Laboratories (Israël)*

The examination of a number of plankton samples collected in the Bardawil Lagoon at irregular intervals over a number of years revealed the presence of several euryhaline species, both among the phytoplankton and the zooplankton. Some of these species thrive in a salinity gradient from about 39 ‰, close to the opening into the Mediterranean sea [OREN & HORNUNG, 1972], to about 60-70 ‰, in the southern part of the lagoon [OREN, ROTH, *personal communications*].

These species are also able to withstand reductions in salinity such as prevail in estuarine environments. In this respect, the euryhaline elements in the plankton of Bardawil form a distinct community within a wider one comprising shallow, neritic forms, all of which are capable of withstanding extreme conditions of existence characteristic of this environment. Foremost among these conditions are strong evaporation and considerable diurnal fluctuations in temperature pH and probably dissolved oxygen, owing to the shallowness of the basin, the long, hot summer and the absence of a freshwater inflow.

The following is a description of some distribution aspects of the more important euryhaline organisms occurring in the plankton of the lagoon.

## The phytoplankton

On the whole, the phytoplankton of the Bardawil Lagoon is characterized by an abundance of dinoflagellates, a characteristic feature of estuarine environments [GREEN, 1968].

Among the dinoflagellates, three species of the genus *Ceratium*, *C. furca*, *C. fusus* and *C. egyptiacum* constitute perennial elements of the plankton, reaching at times considerable proportions of the total phytoplankton. Thus, for example, *C. furca*, recorded also from a number of stations in the Suez Canal [GHAZZAWI, 1936; KIMOR, 1972], as well as in the Kishon River Estuary [KIMOR, *unpublished data*], constituted up to 59 % of the total phytoplankton. The dinoflagellates as a whole constituted 83.8 % of the total phytoplankton in samples collected in the central area of the lagoon in August 1974. *C. egyptiacum* and *C. fusus* are both recorded also in the plankton of the Suez Canal [HALIM, 1963; DOWIDAR, 1971; KIMOR, 1972] and the latter species also from the Kishon River Estuary in the Bay of Haïfa region [KIMOR, *unpublished data*].

Two species of blue-green algae belonging to the order Chroococcales, *Gomphonema aponina* and *Chroococcus turgidus*, proved common both in the plankton of the lagoon and in the guts of mugilid post-larvae (14.0 - 29.5 mm total length). These post-larval mugilids (*Mugil cephalus* and *Liza saliens*) were collected in the central part of the lagoon where salinities of 55-57 ‰ prevailed [ZISMANN *et al.*, 1974]. Both the above species of blue-green algae have also been recorded in the plankton of Lake Kinneret, where a salinity level of 350 mg Cl/l prevailed at the time of sampling [KIMOR & POLLINGHER, 1965].

The third group of microscopic algae comprising euryhaline elements in the plankton of the lagoon are the diatoms. Many of the species are of benthic and neritic origin, often in cluster-shaped colonies, individual cells of which have become detached from their base and float freely in the plankton. Foremost among these is the pennate diatom *Campylostylus striatus*, an unusual species with curved, transversely striated valves inflated at one of the apices and very greatly attenuated at the other. This species was recorded in the plankton of the Suez Canal at most stations [KIMOR, 1972], as well as on the eastern shores of the Dead Sea in an algal crust [POLLINGHER, *personal communication*].

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### The zooplankton

Among the fairly limited number of species recorded in the plankton of the Bardawil Lagoon, there are several euryhaline organisms belonging primarily to the entomostracan crustaceans. Of these, the species *Acartia clausi* and *A. latisetosa* of the calanoïd copepods and the cladoceran *Bosmina coregoni maritima*, the only representative of the genus *Bosmina* in the marine environment [KIMOR & BERDUGO, 1969], are particularly noteworthy. The genus *Acartia* is known to include several highly euryhaline species, such as *A. clausi*, which can penetrate considerable distances into estuaries [GREEN, 1968]. Other species of copepods also recorded from Bardawil, like *Euterpina acutifrons*, *Centropages kröyeri*, *Paracalanus parvus* and *Oithona nana* [KIMOR & BERDUGO, 1969] used to thrive, according to DOWIDAR & EL-MAGHRABY [1973], in shallow dilute surface waters at salinities lower than 8 ‰ during the outflow of the Nile flood into the sea. According to the same authors, other species, such as *Euterpina acutifrons*, *Acartia latisetosa* and *Oithona nana* penetrate the coastal shallow and brackish Delta lakes.

The plankton of Bardawil abounds at times in swarms of cirripede nauplii, possibly *Balanus amphitrite*, the prevailing balanid in the lagoon [PISANTY, *personal communication*]. This species is recorded in the Suez Canal and described as adapted to high salinity waters [POR & FARBER, 1972].

### Summary and conclusions

The list of planktonic species exhibiting a wide range of salinity tolerance could be extended to include representatives of additional systematic groups such as pteropods and larval gastropods and pelecypods. These groups constitute at times an important proportion of the total plankton. However, the present contribution has been limited to two specific cases where the species has been recorded (1) in the hypersaline waters of the lagoon as well as in the estuarine environment, and (2) in the hypersaline waters of the lagoon as well as in a far more advanced hypersaline environment such as the Dead Sea.

These euryhaline planktonic species are important elements in the general community structure of the lagoon, and hence are likely to play an important role in the primary and secondary productivity of this environment.

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