

# The benthic Copepoda of the Sirbonian Lagoon (Sabkhat el Bardawil)

by

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## Introduction

The Sirbonian Lagoon, a system of hypersaline waterbodies along the Mediterranean coast of Sinai is since 1967, one of the research areas of a joint project of the Hebrew University and the Smithsonian Institution. The Lagoon measuring 700 square kilometers is a big salt swamp which has been artificially turned into a 2-3 m deep Lagoon. Three openings to the sea were built and artificially maintained during the last few decades and the Lagoon served as a feeding grounds for a very productive fish population. By 1969, two of these openings became obstructed by sand bars. Consequently the salinity of the Lagoon increased steeply.

It is evident that the fauna of the "open" Lagoon, with salinities fluctuating between 45-70 ‰ has been built up from two sources; highly euryhaline species which lived and survived in the old hypersaline swamps and euryhaline marine species which penetrated through the artificial openings. Presently, the fauna is reverting to the situation which probably existed over millenia in the salt swamps, and the overall salinities are around 90 ‰.

Under the conditions of the open Lagoon, there existed a very clear gradient of increasing salinities from the openings to the more distant corners of the Lagoon, especially to the high salinity point of Nakhal Yam (Mitzfaq), the locality most distant from the openings. This gradient has now almost disappeared in the big eastern basin of the Sirbonian Lagoon.

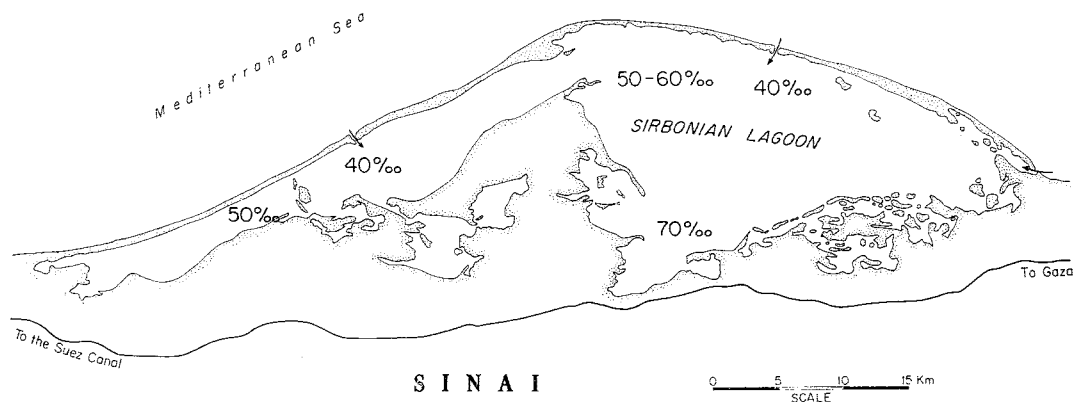


FIG. 1. — Schematic distribution of salinities in the Sirbonian Lagoon, while all three openings were functioning (1967).

There existed also, as shown by BEN YAMI (*in letteris*) a very marked seasonal fluctuation in the salinities, with a high in October and a low in March-April. The range of fluctuation was at places of some 20 ‰. The seasonal fluctuation is still existing after the closure of the openings, but the range is probably much narrower.

*Rapp. Comm. int. Mer Médit.*, 21, 3, pp. 113-116, 3 fig. (1972).

A schematic representation of the salinities, while the openings were functioning, and after the closure of two of them is shown in Fig. 2.

It should be also added that on the sand bars and islands there is a variety of salt pools with salinities as high as 311.8 ‰.

Further general data on the Sirbonian Lagoon may be found in OREN [1968] and POR [1968].

### The Copepoda and their relation to salinity

There is a surprisingly rich fauna of benthic Copepods in the Lagoon. To date, 15 species of harpacticoids and 2 species of cyclopoids have been identified :

#### Harpacticoida :

*Longipedia minor* T. et A. Scott, *Canuella perplexa* T. et A. Scott, *Canuellina insignis* Gurney, *Harpacticus flexus* Brady et Robertson, *Stenhelia minuta* A. Scott, *Robertsonia knoxi* (Thompson et A. Scott), *Robertsonia salsa* (Gurney), *Robertgurneya similis* (A. Scott), *Paramphiascella sirbonica* Por, *Nitocra lacustris* (Schmankewitsch), *Nitocra affinis* Gurney, *Mesochra rostrata* Gurney, *Enhydrosoma vicinum* Por, *Cletocamptus confluens* (Schmeil), *Heterolaophonte quinquespinosa* (Sewell);

#### Cyclopoidia :

*Euryte* sp. *Neocyclops salinarum* Gurney.

Samples of the Copepoda have been collected in the Lagoon from different sites and at different dates (21.7.67; 13.3.68; 10.9.69; 17.12.69; 20.1.70 and 23.6.70).

The richest fauna is found around the openings; with increasing salinities there is a progressive fading out of the species, as shown in Fig. 3.

A number of species (*Canuella perplexa*, *Stenhelia minuta*, *Robertgurneya similis*, *Nitocra affinis*, *Mesochra rostrata* and *Enhydrosoma vicinum*) are always found only in the vicinity of the openings and the limit of their salinity tolerance is situated probably around 45 ‰.

Another five species (*Longipedia minor*, *Canuellina insignis*, *Harpacticus flexus*, *Robertsonia knoxi* and *Paramphiascella sirbonica*) are still species of marine origin but being able to survive to salinities of 65-70 ‰, they are widespread in the Sirbonia Lagoon, when the openings are active. Presently they are restricted to the narrow, western part of the Lagoon, where the normal influence of the sea is still felt.

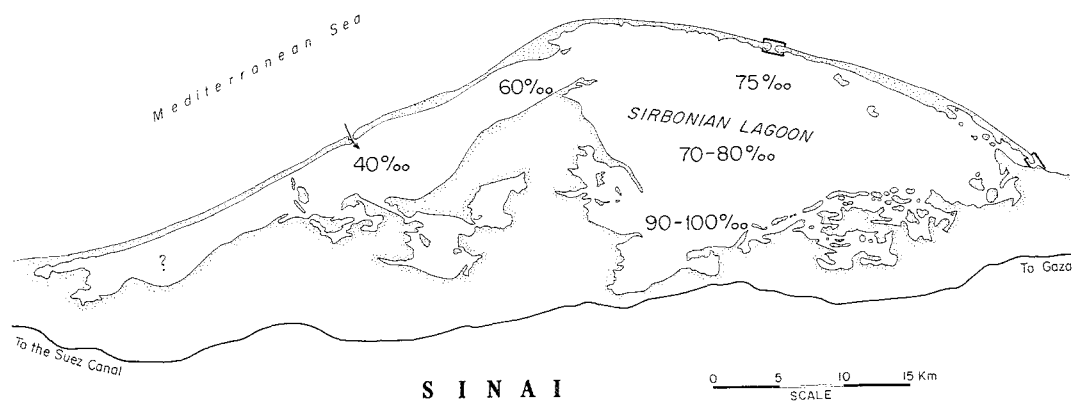


FIG. 2. — Schematic distribution of salinities in the Sirbonian Lagoon, while only one of the openings is functioning (1969).

*Robertsonia salsa*, *Heterolaophonte quinquespinosa* and *Euryte* sp. were still found at salinities of around 85 ‰, in September 1969. They probably do not survive however, at such salinity for a long period, since in June 1970, when at the neighbouring sites salinity dropped to 76.7 ‰, the first two species were found only in very small numbers.

*Neocyclops salinarum* survives even salinities of over 90 ‰. Here it is joined by *Cletocamptus confluens*, a species which appears in scattered numbers already at salinities of over 60 ‰. In June 1970 they thrived in big numbers all over the western basin of the Sirbonian Lagoon, and were found at S 91,05 ‰ near Nakhal Yam. Besides them only four other benthic invertebrates survived from the original rich zoobenthos (Por, 1968); the ostracod *Cyprideis littoralis* the sabellid polychete *Augeneriella lagunari* Gitay, the chironomid *Cricotopus mediterraneus* and one species of nematods.

In the highly hypersaline pools on the sand bars two copepods are living: *Nitocra lacustris* and *Cletocamptus confluens*. The first of them was never found in the Lagoon proper. In the pools salinity is probably always well over 100 ‰. In a pool of 169.5 ‰, for instance, *N. lacustris* has been found together with *Cletocamptus confluens*. At 311.8 ‰, the highest water salinity measured, there was no fauna.

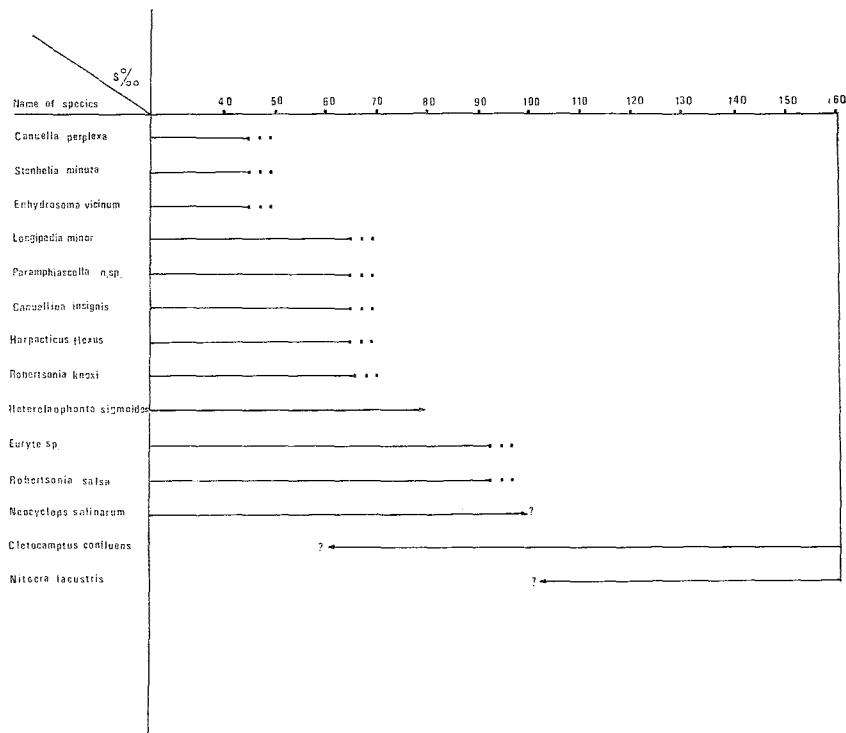


FIG. 3. — Distribution in field of the main species of benthic copepods of the Sirbonian Lagoon, according to salinities.

### General faunal connections

Besides *Paramphiascella sirbonica* a new species and *Enhydrosoma vicinum* described and found till now only at Eilat, all the other species are known from the area.

As much as 12 species are known from the water of or connected with the Suez Canal. *Canuellina insignis*, *Canuella perplexa*, *Stenhelia minuta*, *Robertsonia knoxi*, *Nitocra affinis* and *Mesochra rostata* have been reported from the open waters of the Suez Canal (GURNEY, 1927, POR & MARCUS, 1970). *Longipedia minor*, *Robertsonia salsa*, *Nitocra lacustris*, *Cletocamptus confluens*, *Neocyclops salinarum* and *Euryte* sp., are known from lagoons and salt pools related to the Canal. *N. lacustris* has recently been found in a salt pool near the Great Bitter Lake, at S 93.15 ‰. This species is accompanying the dominant *R. salsa* also in the Solar lake near Eilat, at salinities of over 80 ‰ (Por, 1970). *Harpacticus flexus* is a marine Atlanto-Mediterranean species.

The only Indopacific immigrants living in the Sirbonian Lagoon are *Canuellina insignis* and *Stenohelia minuta* and of these only the last species is living already along the Mediterranean coast. *Mesochra rostrata* is known only from the Suez Canal. *Robertsonia salsa* has not been reported outside the saline water of the Sinai Peninsula.

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