

ACTUOPALEONTOLOGY OF THE MESSINIAN SALINITY CRISIS

by F.D.Por, Department of Zoology, Hebrew University, 91904 Jerusalem, Israel

ABSTRACT

A number of highly polymorphic species-groups are recognized in the present Mediterranean fauna as Messinian survivors. A preliminary listing of these species is given and their evolution is compared to that of the contemporaneous Pontocaspic relics.

RESUME

Un groupe d'espèces méditerranéennes contemporaines, extrêmement euryhalines et polymorphiques, est caractérisé comme étant des survivants messiniens. L'histoire évolutive de ce groupe est comparée à celle des espèces endémiques du bassin Pontocaspien. On considère aussi que c'est la crise Messinienne qui a mis fin à l'évolution d'une faune hypogée dans la Méditerranée récente.

The Mediterranean biota of today bear the deep marks of the Messinian Salinity Crisis. When 5.3 MY ago the Trubi transgression reestablished the Atlantic connection and marine biota newly invaded the Mediterranean, this resettlement was easy and smooth for the planktonic and nektonic biota. Among the benthic biota however, the Messinian hiatus is still being felt: Many taxa did not reenter the Mediterranean or are still represented by the few species that managed to survive the crisis "in situ".

The 700,000 years of the Salinity Crisis were not a mere catastrophe. The Paleomediterranean started to turn already hypersaline soon after the uplift of the Syrian landbridge, some 10 MY ago. After the Trubi transgression too, there has been no return to the pre-Miocenic hydrography: The Mediterranean (and the Red Sea) remained with aberrant salinities.

Within the Mediterranean there is a West-East salinity gradient which corresponds to a much steeper but similarly directed gradient in the Messinian sea. Even then, the Sea of Alboran had "milder" conditions and the Adriatic lagoons were more diluted than the very hypersaline ones of the Eastern Mediterranean and the Northern Red Sea.

An irreversible impact of the Messinian crisis is found in the marine subterranean fauna. With few exceptions, all the hypogean Crustacea of the Mediterranean have to be considered as pre-Miocenic. In the Carribean, another Tethyan fragment, where there has been no saline crisis, the immigration into the subterranean waters is still going on (Stock, 1977). A wealth of benthic Calanoida are found there both in epigeic and hypogean waters. Such Calanoida are missing in the Mediterranean. Several species of *Cyathura* (Isopoda) live in the open sea and the caves; in the Mediterranean only one euryhaline species lives, namely *C. carinata*. The atyid decapods,

other important suppliers of cave species, disappeared from the Mediterranean altogether.

After the dying-out of the setnohaline marine fauna, the Messinian basins remained inhabited by a very reduced set of holeuryhaline species. These biota are still very successful in the Mediterranean perimeter. Some of them, like Cyprideis torosa (Ostracoda) and Aphanius dispar (Pisces) have a good fossil documentation. Other species may be recognized using actualistic criteria. The Messinian survivors are holeuryhaline, ranging from oligo- to metahaline waters. They are polymorphic species which on genetical basis should rather be considered "species groups". Today they are preferentially found in littoral lagoons (like the Nile lakes) or terminal lakes (the Jordan lakes and the Tunisian Ehotts).

Among the Messinian biota one may count Pirenella conica, Cerastoderma glaucum and the Hydrobiidae (Mollusca); Cyprideis and other Ostracoda; Calanipeda aquae-dulcis, Neocyclops salinarum and Nitocra spp. (Copepoda); Echinogammarus spp. and Orchestia spp. (Amphipoda); Cyathura carinata and Sphaeroma hookeri (Isopoda); Diamysis bahirensis (Mysidacea); Aphanius spp. (Pisces) (Almeida Prado Por, 1982; Por, in press; Por and Dimentman, in press).

These are often widespread and even cosmopolitan species and in this sense they should not be considered "relics" but "survivors".

Concomitant evolution in the Paratethys took another direction. There, brackish euryhaline conditions became permanent and large river deltas provided smooth salinity gradients. Many endemic species evolved there and retreat into and colonization from the deltas resulted in a kind of marine "island fauna". In the Messinian Mediterranean there were several isolated and rather shortlived stenoionic terminal lakes of holeuryhaline or hypersaline waters. Here the biota became restricted to a few, genetically, physiologically and morphologically adaptable species groups.

The student of the modern biota of the Mediterranean should take into consideration that, besides the more dynamic Atlantic resettlers and the recent colourful Lessepsian immigrants, there exists the biotic component of the few and ungainly, but extremely resistant Messinian survivors.

REFERENCES

- Almeida Prado Por, M.S. 1982. Two new subspecies of the Diamysis bahirensis group (Crustacea Mysidacea) from extreme salinity environments of the Israel and Sinai coasts. *Isr. J. Zool.* 30:161-175
- Por, F.D. in press. Crustacean Biogeography of the late Miocene Middle Eastern Landbridge. F. Schramm ed. "Crustacean Issues" Balkema.
- Por, F.D. and Ch. Dimentman, in press. The Continuity of the Messinian Biota in the Mediterranean Basin. D.J. Stanley and F.C. Wezel eds. "Geological Evolution of the Mediterranean" Springer
- Stock, J.H. 1977. Microparasellidae (Isopoda Asellota) from Bonaire. *Studies Fauna of Curacao.* 55:69-91