

ANTONIO RUSSO

THE PSYCHROSPHERIC CORAL FAUNA FROM THE LOWER PLIOCENE OF NORTHERN ITALY

RUSSO, A.: The psychrospheric coral fauna from the Lower Pliocene of northern Italy. *Acta Palaeont. Polonica*, 25, 3/4, 613-617, January 1981.

The coral fauna of various localities in Northern Apennines shows that the isolation of the Mediterranean at the end of the Miocene period (Messinian) deeply affected the geological and biological history of the Tethys during and after the "salinity crisis". The coral fauna includes several species (*Flabellum bertii*, *Stephanocyathus strobili*, *Caryophyllia communis*, *Caryophyllia felsinea*, etc.) which are similar to deep water species of the present N-E Atlantic. The presence of these corals in the earliest Pliocene period of the "Mediterranean" together with other deep-and-cold water forms involves hydrologic conditions similar to those occurring at present in the N-E Atlantic, possibly by an intercommunication between the Ocean and the Tethyan Sea which was deeper than the Recent Gibraltar threshold.

Key words: corals, Scleractinia, Pliocene, fauna migration, palaeogeography, Tethyan province, Italy.

Antonio Russo, *Istituto di Paleontologia, Via Università 4, 41100 Modena, Italy.*

Received: September 1979.

Many authors accept that the "salinity crisis" in the Late Miocene (about 6.5-5.3 million years ago), controlled by the instability or even by the periodic closure of the intercommunication with the Atlantic Ocean, caused the extinction of the marine faunas in the Mediterranean Sea (Ruggieri 1967).

The beginning of the closure of the passage between the Ocean and the Mediterranean at the end of the Miocene deeply affected the fauna, first with the presence of shallow, warm water fauna, rich in hermatypic reef corals (known as "sahelian faunas"), and, then, with the deposition of gypsum and marls, containing a fresh or brackish water fauna.

Coral fauna evidence, in several outcrops of Mediterranean localities, shows that there are deep water corals in the Lower-Middle Miocene (Maltese Archipelago, Pantano of Reggio Emilia, etc.). In the Tortonian we found circalittoral-bathyal corals, but not psychrospheric ones (Maltese Archipelago, Sicily, Tortona, Montegibbio, etc.). With the beginning of the

Messinian (Sahelian) we find hermatypic (reef) corals. They are present in different regions in the Tethys area from Spain to Sicily (Purchena, Carboneras, Mallorca Isle, Maltese Archipelago, Landro, Calatafimini, Vibo Valenzia, Palmi, Rosignano, etc.). Many of these localities are mentioned as Tortonian by Chevalier (1961). With the almost complete closure of the threshold of Gibraltar area we note the isolation of the Tethys and the deposition of "evaporites" (fig. 1).

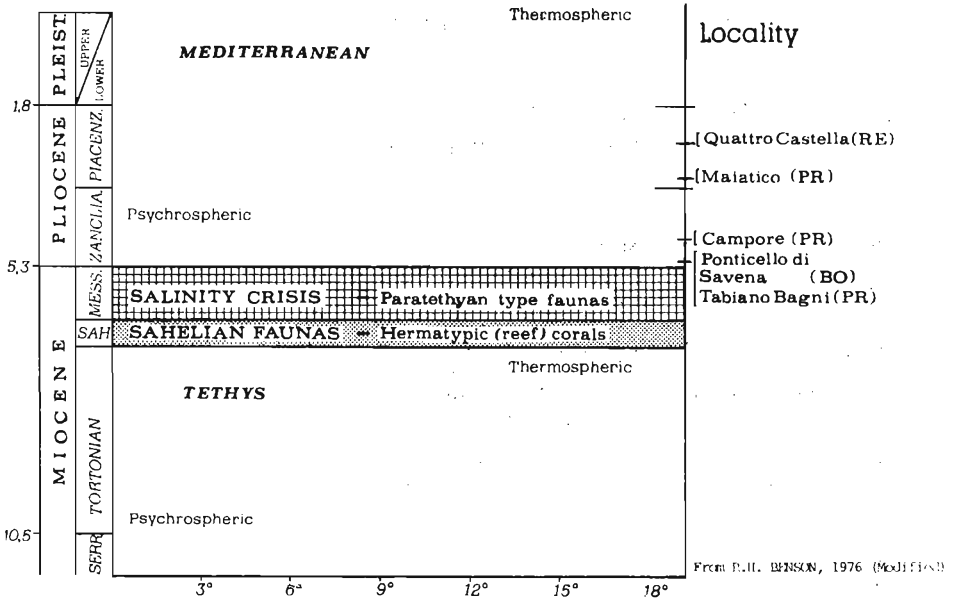


Fig. 1. Evolution scheme of the Tethys Basin before and after the "salinity crisis" and stratigraphic position of the coral outcrops.

The repopulation of the Mediterranean could only have taken place from the Atlantic Ocean in the Lower Pliocene age.

The coral fauna, collected in Ponticello di Savena (Bologna district), Quattro Castella (Reggio Emilia district), Tabiano Bagni, Maiatico and Campore (Parma district), prove the re-establishment of normal marine conditions, in accordance with the other associated taxa (Ostracoda, Mollusca, Foraminiferida, etc.).

Ponticello di Savena, Tabiano Bagni and Campore are of Lower Pliocene Age (*Globorotalia margaritae* — *Globorotalia bononiensis* Zone), whereas Quattro Castella and Maiatico are of Middle Pliocene age (*Globorotalia crassaformis* Zone).

The corals of Ponticello di Savena (which belong to Simonelli's collection, deposited in the Museum of the Institute of Geology and Paleontology, Bologna, pl. 54) were collected above the sediments containing a lagoonal or brackish fauna similar to the Paratethyan fauna (Pannonian age). They are: *Flabellum berti*, *Caryophyllia communis*, *Caryophyllia*

zancleus, *Caryophyllia ingens*, *Stephanocyathus strobili*, *Ceratotrochus* gr. *multiserialis*, etc.).

These species are similar to the Recent deep and cold water species of the N-E Atlantic, studied by Zibrowius (1976, 1977). This similarity was pointed out by him, but his analysis of fossil faunas was derived only from literature data; in several cases the age of the coral fauna was Pleistocene, not Lower Pliocene.

Similarity exists among the following species:

| Lower Pliocene | Recent |
|---|--|
| <i>Caryophyllia communis</i> (Seguenza) (Ponticello di Savena) | <i>C. ambrosia</i> Alcock (Celtic Sea) |
| <i>Caryophyllia zancleus</i> (Seguenza) (Ponticello di Savena) | <i>C. seguenzae</i> Duncan (Celtic Sea) |
| <i>Stephanocyathus strobili</i> (Simonelli) (Ponticello di Savena) | <i>S. nobilis</i> (Moseley) (Gascony Gulf) |
| <i>Stephanocyathus hemisphericus</i> (Simonelli) (Ponticello di Savena) | <i>S. moseleyanus</i> (Sclater) Celtic Sea |
| <i>Flabellum berti</i> Simonelli (Tabiano Bagni) | <i>F. alabastrum</i> Moseley (Celtic Sea) |

Zibrowius (1976) described these Recent species from deep and cold waters (about 2000 m). The fossil corals are associated with psychrospheric and deeps water Tethyan ostracodes (*Agrenocythere pliocenica*, *Quasi-buntonia radiatopora*, *Oblitacythereis mediterranea*, etc.).

The corals of Tabiano Bagni were collected above the sandy, limnic, conglomeratic sediments of Late Miocene, containing hypohaline faunas. The same species of Ponticello di Savena are present.

On the other hand, the corals of Campore were collected in the upper part of Lower Pliocene. The species present are, *Flabellum berti*, *Caryophyllia felsinea*, *Caryophyllia polymorpha*, etc.

The coral fauna of Quattro Castella and Maiatico (Middle Pliocene) includes the species: *Flabellum vaticani*, *Caryophyllia felsinea*, *Flabellum ponderosus*, *Flabellum* gr. *avicula*, *Balanophyllia guidotti*, etc. These species are similar to circalittoral-bathyal species of the Atlantic Ocean.

Similarity exists among the following species:

| Middle Pliocene | Recent |
|--|---------------------------------------|
| <i>Caryophyllia felsinea</i> Simonelli (Maiatico) | <i>C.</i> sp. B. Zibrowius (Açores) |
| <i>Flabellum vaticani</i> Ponzi (Maiatico) | <i>F. chunii</i> Marenzeller (Açores) |
| <i>Balanophyllia guidotti</i> Simonelli (Quattro Castella) | <i>B.</i> sp. A Zibrowius (Madere) |

Zibrowius (1976) described these Recent species from circalittoral-bathyal waters of many Atlantic regions (about 200—500 m).

The occurrence of these deep-and-cold water species in the earliest Pliocene of the Mediterranean involves an immigration from the Atlantic Ocean. It also involves hydrologic conditions similar to those occurring at present in the N-E Atlantic and implies that the intercommunication between the Ocean and the Mediterranean Sea was deeper and wider than the Recent Gibraltar threshold.

The corals from the Middle Pliocene of North Italy (Quattro Castella and Maiatico) suggest shallowing of the sea until the end of the Pliocene.

These conclusions coincide with those of Benson (1972a, 1972b, 1975), who found, in the Lower Pliocene of the Mediterranean, psychrospheric ostracodes, similar to the Recent ostracode species of North Atlantic, living at about 1500 m water depth.

REFERENCES

- BENSON, R. H. 1972a. Ostracodes as indicators of threshold depth in the Mediterranean during the Pliocene. *In*: D. J. Stanley (ed.), *The Mediterranean Sea*, 63—72. Dowden, Hutchinson and Ross. Stroudsbury, Pa.
- 1972b. Psychrospheric and continental Ostracoda from ancient sediments in the floor of the Mediterranean. *In*: W. B. F. Ryan *et al.* (eds), *Initial Reports of the Deep Sea Drilling project*, 13, 1002—1008. U. S. Government Printing Office, Washington, D. C.
- 1973. An ostracodal view of the Messinian salinity crisis. *In*: C. W. Drooger (ed.), *Messinian Events in the Mediterranean*, Utrecht 1973, 235—242. North Holland, Amsterdam.
- 1975. Ostracodes and Neogene history. *In*: *Late Neogene Epoch Boundaries*, 41—48.
- 1976. Miocene deep-sea ostracodes of the Iberian portal and the Balearic Basin. — *Marine Micropaleont.*, 1, 249—262.
- MARASTI, G, and RAFFI, S. 1976. Osservazioni biostratigrafiche e paleoecologiche sulla malacofauna del Piacenziano di Maiatico (Parma, Emilia occidentale). — *Boll. Soc. Paleont. Italiana*, 15, 189—214.
- 1979. Observations on the paleoclimatic and biogeographic meaning of the Mediterranean during the Pliocene molluscs. State of the problem. 7th Intern. Congr. Mediterranean Neogene, 1—8.
- RUGGIERI, G. 1967. Miocene and later evolution of the Mediterranean Sea. *In*: *Aspects of Tethyan Biogeography. — System Ass. (London)*, 7, 283—290.
- SIMONELLI, V. 1896. Gli Antozoi pliocenici del Ponticello di Savena presso Bologna. — *Palaeont. Ital.*, 1, 149—168.
- 1897. Antozoi neogenici del Museu parmense. — *Ibidem*, 2, 185—291.
- ZIBROWIUS, H. 1976. Les Scléactinaires de la Méditerranée et de l'Atlantique Nord-Oriental. Thèse Univ. Aix-Marseille, N. enregist. CNRS: A.O.11515, 1—302.
- 1977. La faune profonde de la Méditerranée pliocène: Scléactinaires. 25° Congr. Ass. plénière Split. Comité géol. géoph. marines, 1—2.

EXPLANATION OF THE PLATE 54

1. *Caryophyllia communis* (Sequenza). Type of Simonelli's collection, Bologna Museum; a lateral view, b calicinal view, $\times 1.5$.
 2. *Caryophyllia zancleus* (Sequenza). Type of Simonelli's collection, Bologna Museum; a lateral view, b calicinal view, $\times 1.5$.
 3. *Caryophyllia felsinea* Simonelli. Campore, upper part of Lower Pliocene; a lateral view, b calicinal view, $\times 3$; c septal ornamentation in calicinal view, $\times 12$.
 4. *Ceratotrochus* gr. *multiserialis* (Michelotti). Tabiano Bagni, Lower Pliocene; a lateral view, b calicinal view, $\times 3$.
 5. 6. *Stephanocyathus strobili* (Simonelli). Types of Simonelli's collection, Bologna Museum; 5 aboral view, 6 calicinal view, $\times 1.5$.
 - 7, 8. *Flabellum vaticani* Ponzi. Middle Pliocene, Maiatico; 7 lateral view, 8 calicinal view, $\times 1$.
 9. *Balanophyllia guidotti* Simonelli. Quattro Castella, Middle Pliocene; a lateral view, b calicinal view, $\times 1.5$.
-

