

## BRYOZOAN AND FORAMINIFERAN FAUNAS OF THE QUATERNARY SEDIMENTS FROM IZMIT BAY

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Quaternary faunas of the Sea of Marmara zone are still poorly known. This paper deals with bryozoans and forams from the Quaternary sediments of Izmit bay, a narrow embayment located along the eastern coast of the Sea of Marmara. The bay is elongated in a E-W direction in correspondence to the Pontide central uplift zone (SAKAMURA, 1971 fide PIRAZZOLI *et al.*, 1991) following the regional main geodynamic context. Recent sediments of Izmit Bay consist of muds, silts, sands, sandy and muddy clays and gravels which alternate with each other, sometimes within the thickness of a few metres, recording a strong variability of sedimentation through time. Layers of gravels at depth are especially useful as guides in constructing the stratigraphy. Studied samples come from nine different drill-sites on a proposed bridge-crossing the bay. From the South to the North, these are KS-2, S-5, S-3, S-8, S-7, S-2, S-4, S-1 and S-6. Only the southernmost drill-site (KS-2) is located on land while the other eight are situated in the bay. Seven of these drills end at about 80 metres in the Quaternary sediments, while only the two northernmost ones (S-1 and S-6) reach the overlying substratum (locally represented by Triassic rocks) at 50 and 26.50 m, respectively. Bryozoans are completely absent from SK-2 and S-4 cores and usually lacking or poorly represented in the basal parts of other cores. Moreover, they are present in sediments exclusively made up by gravels or to some extent containing gravels. Finally, bryozoan associations are typically oligo-to-monospecific comprising at most four species in a single sample. In most cases, only one taxon, sometimes with a single specimen, is found. On the whole, nine species, belonging to nine genera, have been found: *Crisia eburnea* (L.), *Caberea boryi* (Aud.), *Cellaria salicornioides* Lamaroux, *Scrupocellaria scrupea* (L.), *Escharoides mamillata* (Wood), *Schizomavella* sp., *Hippaliosina depressa* (Busk), *Cryptosula pallasiana* (Moll) and *Celleporina lucida* (Hincks). All live in the Recent Mediterranean Sea, except *Schizoporella* sp.. No species typical of the Black Sea has been found. From the analysis of the bryozoan faunas, it has been possible to distinguish three different groups of cores:

1) S-2, S-3 and S-5 cores, characterized by the exclusive presence of *C. pallasiana*, an euryhaline species of the second degree (WINSTON, 1977), sometimes associated with *Schizomavella* sp.;

2) S-1 and S-6 cores, showing a basal part somewhat similar to the previous group, while the top evolves to more rich and diversified communities comprising both euryhaline species of the first degree (WINSTON, 1977), such as *S. scrupea* and *C. eburnea* together with the normal marine species *C. boryi* and *E. mamillata*.

3) S-7 and S-8 cores, where only typical marine species, such as *C. boryi*, *C. salicornioides*, *H. depressa* and *C. lucida*, were discovered.

Foraminiferan faunas have been studied for the southernmost cores (S-5 and S-3). They are exclusively made up by benthic species and planctonic forms are lacking. Along S-5 core, between 8.00 and 22.70 m the following species have been determined: *Spiroloculina depressa* d'Orb., *Siphonaperta aspera* (d'Orb.), *S. dilatata* (le Calvez J. & Y.), *Massilina secans* (d'Orb.), *Quinqueloculina cf. bidentata* d'Orb., *Q. laevigata* d'Orb., *Q. seminula* (L.), *Milionella subrotunda* (Montagu), *Triloculina marioni* Schlumberger, *T. tricarinata* d'Orb., *Neoconorbina orbicularis* (Terquem), *Rosalina bradyi* Cushman, *Lobatula lobatula* (Walker-Jacob), *Cibicides floridanus* (Cushman), *Asterigerinata mamilla* (Williamson), *Ammonia compacta* (Hofker), *A. parasovica* Stshedrina-Mayer, *A. parkinsoniana* (d'Orb.), *Porosonion* sp., *Elphidium advenum* (Cushman), *E. complanatum* (d'Orb.), *E. crispum* (L.), *E. macellum* (Fichtel-Moll), *E. ponticum* Dolgopolskaya-Pauli. Along S-3 core, between 44.00 and 80.20 m the following species have been identified: *Spiroplectinella sagittula* (d'Orb.), *Textularia sagittula* DeFrance, *T. truncata* Höglund, *Spiroloculina excavata* d'Orb., *S. ornata* d'Orb., *Cycloforina colomi* (le Calvez J. & Y.), *Quinqueloculina limbata* d'Orb., *Q. seminula* (L.), *Biloculinella depressa* (Wiesner), *Milionella labiosa* (d'Orb.), *M. subrotunda* (Montagu), *Pthycomiliola separans* (Brady), *Pyrgo elongata* (d'Orb.), *Triloculina marioni* Schlumberger, *Lenticulina gibba* (d'Orb.), *Lagena mollis* Cushman, L. cf. *vulgaris* Williamson, *Favulina hexagona* (Montagu), *Brizalina alata* (Seguenza), *B. spathulata* (Williamson), *Cassidulina carinata* Silvestri, *Rectuvigerina phlegri* le Calvez, *Bulimina aculeata* d'Orb., *B. elongata* d'Orb., *B. marginata* d'Orb., *Reussella spinulosa* (Reuss), *Fursenkoina complanata* Egger, *Valvulinera bradyana* (Fornasini), *Neoconorbina orbicularis* (Terquem), *Rosalina bradyi* Cushman, *Hyalinea baltica* (Schröter), *Lobatula lobatula* (Walker-Jacob), *Cibicides advenum* (d'Orb.), *C. floridanus* (Cushman), *Planorbulina mediterraneensis* d'Orb., *Asterigerinata mamilla* (Williamson), *Biasterigerina planorbis* (d'Orb.), *Hynesina depressula* (Walker-Jacob), *Pullenia* sp., *Nonionella opima* Cushman, *N. turgida* (Williamson), *Gyroidina umbonata* (Silvestri), *Aubignyna perlucida* (Heron-Allen-Earlan), *Ammonia compacta* (Hofker), *A. parasovica* Stshedrina-Mayer, *A. parkinsoniana* (d'Orb.), *Elphidium advenum* (Cushman), *E. crispum* (L.) and *E. macellum* (Fichtel-Moll). These foraminiferan associations allow us to refer the Izmit Bay sediments to the Quaternary.

Moreover, the occurrence of the same sediments (in particular the gravel layers) and of bryozoan and foraminiferan communities, recording similar environmental conditions, at different depths along the drill series, indicate that tectonic movements have affected the region during the Quaternary. Molluscs dated by ESR methods, suggest for the studied cores ages of 500 + 200 years for the top part at 37.00 m and 817,000 + 105,000 years for the lower part at a depth of 55.00 m. Considering the ages and the geometric relationships of sediments along the studied cores, under the control of the tectonics, three different unconformity events, probably interpreted as transgressions, could be identified in the Izmit bay area: an Eopleistocene event (817,000 + 105,000 yrs) corresponding to the lowest layer of slightly gravelly mud; it is followed by Lower-middle Pleistocene unconformities (664,000 + 94,000 yrs and 186,000 yrs); above, the Upper Pleistocene-Holocene sediments show unconformities at 35,000 + 8,100 yrs and 500 + 200 yrs. Bryozoan and foraminiferan associations together, exclusively made up of marine-to-euryhaline species suggest that Izmit Bay was under the influence of Mediterranean water, at least three times during the Pleistocene-Holocene. In contrast, the absence of species exclusively limited to the Black Sea testifies that it was, very likely, not linked, at any time, with this sea, as were other localities in the N part of the Marmara Sea (UNSAL, 1993).

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