

Late Quaternary palaeoenvironmental evolution of the central Adriatic coast in the Trigno mouth area (Molise Region)

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INTRODUCTION

Three cores (MBS1, MBS2 and MBS3), 15-12 m thick, were drilled offshore near the Trigno river mouth (Central Adriatic coast, Molise Region), 150-300 m from the present coastline. Palaeoecological analyses by means of benthic foraminifers, molluscs and ostracods, supported by stratigraphic and chronological data, have been performed to reconstruct the Late Quaternary palaeoenvironmental evolution of the northern sector of the Molise Adriatic coast.

STRATIGRAPHY

Five main lithofacies (G, Cg, Csg, Csb, S) were recognized in the studied cores (fig. 1).

Lithofacies G: this lithofacies is present at the bottom of the cores MBS1 and MBS3 and is made up of matrix supported gravels mostly represented by poorly sorted sub-spherical calcareous clasts of variable dimensions (cm to dm). Matrix consists in light brown, silty sands. Moreover, in MBS1 this lithofacies is also characterized by clast-supported gravel.

Lithofacies Cg: lithofacies Cg is present in MBS2 and MBS3 where it overlays lithofacies G. It is made up of homogeneous grey clays with locally scattered calcareous concretions ("calcinelli").

Lithofacies Csg: this lithofacies, recognized in MBS1, overlays lithofacies G. It is made up of homogeneous grey silty clays with locally scattered plant remains (seeds, leaves).

Lithofacies Csb: lithofacies Csb, recognized in MBS2 and MBS3, overlays lithofacies Cg. It consists in light brown,

consolidated silty clays occasionally interrupted by grey layers. The top of this lithofacies is always characterized by brown silty sands.

Lithofacies S: this lithofacies is characterized by fine to medium and light brown to brown sands. In MBS1, lithofacies S is characterized by a 2 m thick intercalation of medium to coarse sands. In MBS3, at 5.20 m core depth, a 20 cm thick intercalation of gravel is observed. Intercalations of amalgamated sands with silt are also present. At the top of the cores MBS1 and MBS3 silty sand intervals with dark grey organic matter locally occur.

FORAMINIFERS

A total of 101 samples from the three cores have been processed. The foraminiferal content is generally scarce; 10 samples are barren of benthic foraminifers. A total of 91 benthic species were identified. Moreover, 16 planktonic species were recognized. Conservation status of foraminiferal tests is generally good. The 91 samples with foraminiferal tests can be grouped into three main groups (fig. 1).

The first group (FA) comprises 52 samples where the benthic foraminifers are very scarce and characterized by a mixing between infralittoral and circalittoral species. This group was found in all the three cores, in particular in the lower part of the cores.

The second group (FB, 28 samples) dominated by typical infralittoral species as *Ammonia beccarii*, *A. inflata*, *A. papillosa*, *A. parkinsoniana*, *Buccella granulata* and *Elphidium granosum*, was found in the central part of the three cores and at the top of MBS2 and MBS3.

The third group (FC), present only in cores MBS2 and MBS3, shows a dominance of circalittoral species such as *Bolivina spathulata*, *Bulimina marginata*, *Cassidulina carinata*, *Valvulineria bradyana*, with subordinate percentages of infralittoral species (*Ammonia* spp., *E. crispum* and *E. granosum*).

MOLLUSCS

A total of 197 samples from the three cores have been analyzed. 128 mollusc species were recognized. All the identified species were previously reported for modern non-marine and

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marine settings of the Mediterranean area. Faunal changes through the sequences of the three cores allowed to recognize eight local mollusc zones (fig. 1).

- Zone MA: barren samples from lithofacies G.

- Zone MB: poor oligotypic terrestrial assemblages with *Carychium minimum*, *Punctum pygmaeum*, *Succinea* sp., *Vallonia pulchella*, *Vitrea subrimata* and *Vitrinobrachium breve*. This zone is present in all the three cores.

- Zone MC: poor marine infralittoral assemblages. Molluscs are scanty and represented by juveniles of *Donax semistriatus*, *Glycymeris insubrica* and *Lucinella divaricata*. This zone is present in cores MBS2 and MBS3.

- Zone MD: marine infralittoral assemblages characterized by the co-occurrence of species of different benthic infralittoral biocoenoses (PÉRÈS & PICARD, 1964). Molluscs consist mainly of juveniles forms. Species richness and abundances of species are higher than that of the zone MC. Species mainly represented are *Abra alba*, *Chamelea gallina*, *D. semistriatus*, *G. insubrica*, *Spisula subtruncata* and *Antalis dentalis*. This zone is present in all the three cores.

- Zone ME: rich polytypic marine infralittoral assemblages characterized by high species richness, high abundances of marine species and co-occurrence of taxa belonging to different infralittoral biocoenoses. Juveniles specimens are dominant; however adults of *A. alba* and *D. semistriatus* were locally found (MBS3). Marine species such as *C. gallina*, *Corbula gibba*, *Dosinia lupinus*, *G. insubrica*, *L. divaricata*, *Mytilaster lineatus*, *S. subtruncata*, *Tellina* spp., *Bittium reticulatum* and *A. dentalis* were also recorded. This zone is present in cores MBS2 and MBS3.

- Zone MF: poor marine infralittoral assemblages. Samples record low values of both species richness and specimen abundances. Both shell fragments and specimens are generally reworked. This zone is present in all the three cores.

- Zone MG: rich marine infralittoral assemblages. High species richness, high abundances of marine species with both juveniles and adults, and the dominance of species of the upper clean-sand biocoenosis (*C. gallina*, *D. semistriatus* and *Lentidium mediterraneum*) characterize this zone. This zone is present in all the three cores.

- Zone MH: poor mixed marine infralittoral and non-marine assemblages characterized by the co-occurrence of marine infralittoral and terrestrial mollusc assemblages, both with low species richness and low specimen abundances. Marine record consists mainly of juveniles and fragments often reworked of *C. gallina*, *D. semistriatus*, *L. mediterraneum*, *M. lineatus*. Non-marine assemblages consist of relatively better preserved specimens and shell fragments of *Discus rotundatus*, Hygromiidae indet., *P. pygmaeum*, *Succinea* sp. and *T. cylindrica*. This zone is present in all the three cores.

OSTRACODS

100 samples of the three cores have been studied. 8 samples resulted devoid of ostracods; the remaining 92 yielded 84 ostracod species. Analysis of fossil assemblages indicates the presence of three different ostracod groups (fig. 1).

The first group (OA) comprises shallow marine water species mostly living in the Mediterranean. In the main part of the samples they are well preserved and with both adults and juvenile specimens. The most abundant forms are *Pontocythere turbida*, *Cytheretta subradiosa*, *Semicytherura incongruens*, *Loxoconcha ovulata*, *L. rubritincta* and various species of the genera *Callistocythere*, *Leptocythere*, *Semicytherura*, *Xestoleberis*.

The second group (OB) is formed by ostracod taxa presently occurring in continental waters pertaining to the families Candonidae, Cyprididae, Ilyocyprididae and Limnocytheridae. These species have been recognized alternatively as autochthonous, thus indicating non-marine palaeoenvironment, or displaced on sea bottom sediments.

The third group ("allochthonous species") is formed by specimens preserved in the Plio-Pleistocene marine clays of the Montesecco Clays outcropping near the study area (BRACONE *et alii*, 2012), which were eroded by the Trigno River. Species characteristic of outer circalittoral - bathyal palaeoenvironment (e.g. *Henryhowella*, *Krithë*) are represented. All of these forms indicate influence of fluvial sediment supply.

DISCUSSION AND CONCLUSIONS

At the bottom of the cores MBS1 and MBS3 (fig. 1), fluvial barren gravels (lithofacies G) are present. In the core MBS2 the succession starts with grey clays (lithofacies Cg) containing marine infralittoral foraminifers, hygrophilous terrestrial molluscs and freshwater ostracods. Sediments of lithofacies Cg were also recognized above lithofacies G in the core MBS3; here the fossil record consists of marine infralittoral foraminifers, freshwater and hygrophilous terrestrial molluscs, freshwater and marine infralittoral ostracods. Two AMS C dates constrain the deposition of lithofacies Cg (MBS3) between 19945 ± 345 and 19165 ± 195 yr BP (fig. 1). In the cores MBS2 and MBS3, lithofacies Cg is overlaid by light brown silty clays (lithofacies Csb) containing marine infralittoral foraminifers and molluscs, and marine and freshwater ostracods. In the core MBS1, both lithofacies Cg and Csb lack, and lithofacies G is overlaid by grey silty clays (lithofacies Csg) containing hygrophilous terrestrial molluscs and mainly freshwater ostracods. The three cores are closed up by brown, fine to medium sands (lithofacies S) recording the dominance of marine infralittoral fauna. One AMS C date carried out on benthic foraminifers (*Ammonia* sp.) collected from the lower portion of lithofacies S (core MBS3) gave an age of 8120.5 ± 108.5 yr BP (fig. 1).

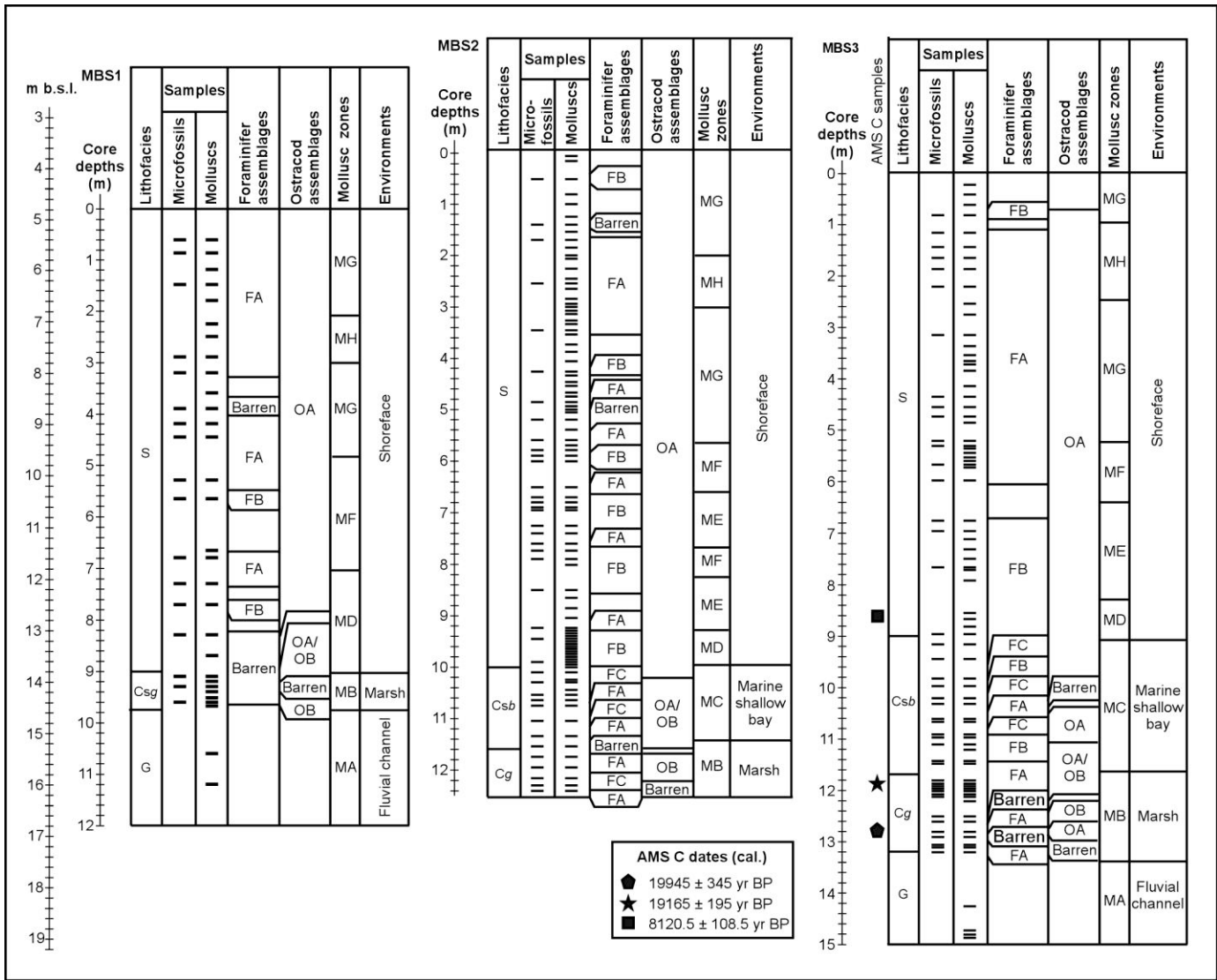


Fig. 1 – General scheme showing the results of stratigraphic and paleontological analyses carried out on the three studied cores.

The results of this study point out that, in the Trigno river mouth area, during the Last Glacial, as the eustatic sea-level dropped and the coastline was located several km seaward with respect to its present position (VAI & CANTELLI, 2004), fluvial gravels (lithofacies G) deposited and successively were incised. Incisions were filled by clays (lithofacies Cg) of marshes developed on the alluvial plain. At the end of the Last Glacial, as the eustatic sea-level rose, a shallow marine bay developed and sediments of lithofacies Csb deposited. Lithofacies Csg, overlaying lithofacies G in the core MBS1, is very likely heteropic with lithofacies Csb of the cores MBS2 and MBS3; therefore marshes on fluvial deposits located at major heights developed contemporaneously to the shallow marine bay. Finally, both the lithology and the faunal content of lithofacies S suggest the development in the study area of a shoreface under marine infralittoral conditions.

REFERENCES

- BRACONE V., AMOROSI A., AUCELLI P.P.C., ROSSKOPF C.M., SCARCIGLIA F., DI DONATO V. & ESPOSITO P. (2012) - *The Pleistocene tectono-sedimentary evolution of the Apenninic foreland basin between Trigno and Fortore rivers (Southern Italy) through a sequence stratigraphic perspective*. Basin Research, 24, 213-233.
- PÈRES J.M. & PICARD J. (1964) - *Nouveau manuel de Bionomie benthique de la Mer Méditerranée*. Recueil des Travaux de la Station Marine d'Endoume, Bulletin, 31 (47), 5-137.
- VAI G.B. & CANTELLI L. (Eds.) (2004) - *Litho-Palaeoenvironmental Maps of Italy During the Last Two Climatic Extremes*. 32nd IGC Florence 2004, Bologna.