| Bollettino della Società Paleontologica Italiana | 23 (2) | 1984 | 421-437 | 5 pls. | Modena, Settembre 1985 |
|---|---|---|---|---|---|

# The Miocene Ostracodes of Sardinia

Giacchino BONADUCE
Stazione Zoologica
Napoli

Antonio RUSSO
Istituto di Paleontologia
Università di Modena

*KEY WORDS — Ostracodes, Miocene, Stratigraphy, Paleoecology, Sardinia.*

*ABSTRACT — Four sections sampled in Marmilla region (Central-Southern Sardinia) and one sampled on the Sinis promontory (Central-Western Sardinia) were analyzed for the studying the ostracode faunas. The Ostracodes of Marmilla region (Early-Middle Miocene) yelds a deep water assemblages, whereas the Ostracodes of Sinis (Late Tortonian-Early Messinian) indicate a very shallow environment with few evidences of brackish water episodes.*

*RIASSUNTO — [Gli Ostracodi miocenici della Sardegna] — Sono stati studiati gli Ostracodi provenienti da quattro sezioni situate nella regione della Marmilla (Sardegna centro meridionale) ed una sezione ubicata nel promontorio del Sinis (Sardegna centro occidentale). Le ostracofaune rinvenute nelle sezioni della regione della Marmilla (Miocene inferiore-medio) testimoniano un ambiente di sedimentazione profondo (batiale), mentre l'ostracofauna presente nella sezione del promontorio del Sinis (Tortoniano superiore-Messiniano inferiore) testimonia un ambiente di sedimentazione di acque basse con evidenze di episodi di acque salmastre.*

## INTRODUCTION

In the last years many important papers on Neogene Ostracodes of the Mediterranean Basin increased considerably the knowledge of their taxonomy, biostratigraphy, paleoecology and paleogeography.

However, informations on Early to Middle Miocene Ostracodes are scarce and specially there are no data on Miocene Ostracodes from Sardinia.

This paper deals with the description of ostracode faunas from some Miocene sequences outcropping in Sardinia. Section and stop sampling are the same as those analyzed for the other fossil groups in preparation of the 19th European Micropaleontological Colloquium.

Additional lithologic and biostratigraphic informations can be found in the guide-book of the Colloquium.

Four sections (Ales, Sardara-Villanovaforru, Tuili-Giara and Gesturi-Giara) sampled in Marmilla region (Central-southern Sardinia) and one sampled on the Sinis promontory (Capo S. Marco section, Central western Sardinia) were selected for studying the ostracode faunas.

The location of section is shown in text-figs. 1 and 2, while the list of Ostracodes are given in tabs. 1-5.

## GENERAL REMARKS

The stratigraphic extension of the single section is different one to the other. Considering them as a complex they range from the lower part of NN1 nannofossil zone in Ales section up to NN11 nannofossil zone in the Capo S. Marco section.

The Marmilla region sections include sediments deposited in a rift, which is interpreted as the eastermost arm of a complex system that affected the European plate (Cherchi & Montadert 1982, 1984).

These sediments (Oligo-Miocene in age according to previous Authors) occurr along a sedimentary basin, about 220 km long and 40-50 km large, which extends longitudinally N-S and corresponds to the middle belt of island. Cherchi & Montadert (1982, 1984) stated that this system was active from the Mid Oligocene to the Aquitanian, before the rotation of the Corsica-Sardinia microplate.

The Sardinian rift was infilled by Oligocene-Miocene continental-to-marine sediments about 1 km

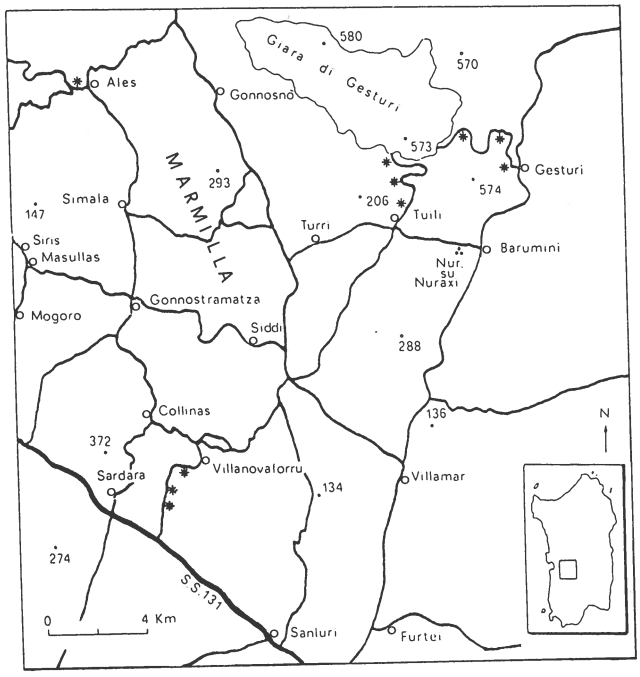
thick. The types of sediments record the different phases of opening and evolution of the rift. So they can be distinguished in *pre-rift, sin-rift* and *post-rift* sediments.

*Pre-rift sediments* — They are represented by littoral and paralic-continental deposits with coal (« Lignitifero » Auct.), Ilerdian-Early Lutetian in age and continental deposits of the Cixerri Formation, Lutetian-Oligocene (?) in age.

*Sin-rift sediments* — The main structural change, corresponding to the formation of the rift, is recorded by the onset of deposition of the tick clastic Ussana Formation (Middle Oligocene). As it approaches the axis of the rift, the Upper Ussana Formation rapidly changes to open marine marls (Ales and Marmilla Formations), while on the flanks shallow-water limestones are present. Cherchi & Montadert (1982, 1984) dated the beginning of Ales and Marmilla Formations as Latest Oligocene-Aquitanian.

The plankton/benthos Foraminiferal ratio would indicate a paleodepth of 1000-1300 m along the axis of the rift, meanwhile on the flanks the sediments consist of shallow-water limestones.

Cherchi & Montadert (1982, 1984) suggested that the rift began in a continental environment during the Middle to Late Oligocene, followed by sea transgression along the his subsident axis by Chattian until the Aquitanian time. By Burdigalian time any evidence of rifting disappeared.




Text-fig. 1 - Location of the Marmilla region section (*) (Central southern Sardinia).

After this distensive phase, the basin registred generalized transgression over the entire area (except over the higher Paleozoic relief) as a consequence of eustatic change of sea level of subdsidence by cooling after the rifting phases.

The sedimentation continued in the basin until the Late Miocene (Sinis area) with shallow-water sediments.

## Ales Section (AC)

This section crops out near the Ales Village along the road running from Ales to Gemma Spina (Text-fig. 1).

The sequence contains arenaceous episodes (slumping or debris flow) rich in Larger Foraminifera especially in the lower part of the section.

The lowermost part (samples 7 and 6) belongs tc the lower part of NN1 nannofossil zone, while the samples 5-4 belong to the NN1-NN2 nannofossil zone. The Ostracodes are present only in samples 7,6 and 4ter. The list of species in alphabetic order is given in Tab. 1.

## Sardara-Villanovaforru Section (SV)

This section crops out along the road running from Sardara to Villanovaforru (Text-fig. 1).

| Calcar nannofossil Zone (Martini,1985) | Lower part NN 1 | | NN 1 NN 2 | |
|---|---|---|---|---|
| Ostracodes \ Samples | 7 | 6 | 5 | 4 ter |
| *Argilloecia tenuis* Ciampo | | | | 2 |
| *Argilloecia* sp.2 | 2 | 1 | | |
| *Buntonia minima* Russo | 3 | | | |
| *Buntonia* sp.1 | 1 | 4 | | |
| *Cytherella postdenticulata* Oertli | 3 | 2 | | 2 |
| *Cytherella vulgata* Ruggieri | | | | 2 |
| *Henryhowella ruggierii* Oertli | 5 | 1 | | 5 |
| *Krithe citae* Oertli | | | | 3 |
| *Krithe langhiana* Oertli | 1 | 2 | | 2 |
| *Loxoconcha* sp. | 3 | | | |
| *Paleoblitacythereis ruggierii* (Russo) | 7 | 4 | | 8 |
| *Parakrithe dactylomorpha* Ruggieri | 8 | 2 | | 21 |
| *Parakrithe* aff.*dimorpha* Bonaduce *et al.* | 2 | | | |
| *Platyleberis* sp. | 1 | 3 | | |
| *Quasibuntonia* gr.*radiatopora* (Seguenza) | 4 | | | |

Tab. 1 - Distribution of Ostracodes in Ales section.

Samples 0-19 belong to NN1-NN2 nannofossil zone, while samples 20-26 to NN2-NN3 zones.

The Ostracodes are present only in three samples (10, 12 and 26). The list of species in alphabetic order is given in Tab. 2.

### Tuili-Giara (TG) and Gesturi-Giara (GG) Sections.

This two sections are discussed togheter because they crop out on opposite sides of the same high plain (Text-fig. 1).

The Tuili-Giara (TG) section crops out along the road running from Tuili village to Giara high plain (« Giara » is the regional name of Plio-Pleistocene basalt covering).

Samples 1-3 belong to NN3 nannofossil zone, while samples 4-25 to NN4 zone. The list of species in alphabetic order are plotted in Tab. 3.

The Gesturi-Giara (GG) section crops out along the road running from Gesturi village to Giara high plain.

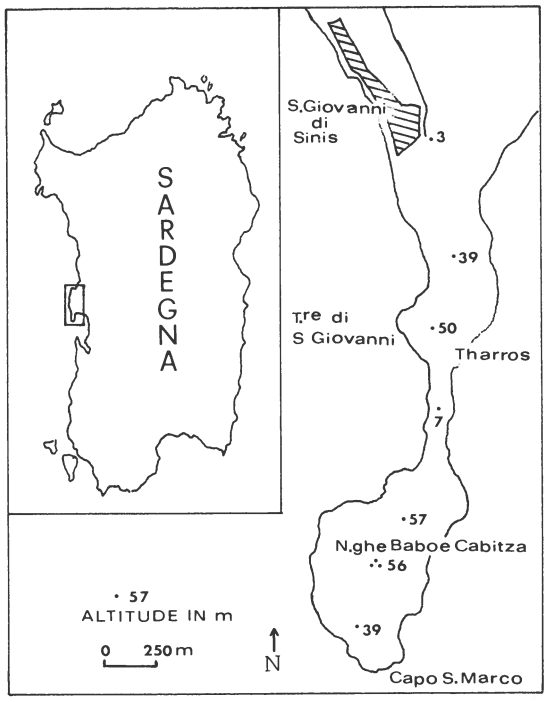
Samples 1-3 belong NN3 nannofossil zone, while samples 4-18 to NN4 zone. The list of species in alphabetic order is given in Tab. 4.

### Capo S. Marco Section.

This section crops out along the cliff of Capo S. Marco (Sinis promontory), from the S. Giovanni Tower to Nurage Baboe Cabitza (Text-fig. 2). It represents the type-section chosen by Cherchi *et al.* (1978) for the Capo S. Marco Formation. For the detailed litho-

| Calcar nannofossil Zone (Martini, 1985) | NN 1 NN 2 | | NN 2-3 |
|---|---|---|---|
| Ostracodes \ Samples | 10 | 12 | 26 |
| *Argilloecia* sp.2 | 4 | | |
| *Bythocypris lucida* (Seguenza) | | 1 | |
| *Cytherella postdenticulata* Oertli | | | •5 |
| *Cytherella russoi* Sissingh | 1 | 2 | |
| *Henryhowella ruggierii* Oertli | | 1 | |
| *Krithe citae* Oertli | 1 | | |
| *Parakrithe dactylomorpha* Ruggieri | 3 | | |
| *Platyleberis* sp. | 1 | | 1 |

Tab. 2 - Distribution of Ostracodes in Sardara-Villanovaforru section. •) Including juvenile specimens.




Text-fig. 2 - Location ol Capo S. Marco section (Sinis, Central western Sardinia).

logy and biostratigraphy the reader should refer to the same paper.

The sample analyzed in the present study are referred to NN11 nannofossil zone.

The list of species in alphabetic order is given in Tab. 5.

## PALEOECOLOGICAL AND PALEOBIOGEOGRAPHICAL REMARKS

The Ostracodes are one of the most useful groups able to indicate the paleobathymetry. Benson (1984) stated that the modern ostracodes show significant morfologic and taxonomic changes with increasing depth.

Deep psychrospheric faunas are less diverse and more cosmopolitan than shallow faunas. The individuals are larger, rarer, and blind. Speciation is slower, taxa are older, longer ranging and for the most part now confined to abyssal and bathyal environments.

Deep thermospheric ostracodes are diversified, and shallow water faunas ever more.

Many Authors interprete the presence of high numbers of closed carapaces (Pokorny, 1965; Bordovsky, 1965; Oertli, 1971) as the effect of high sedimentation rate. The ostracode faunas from all the studied sequences consist mostly of closed carapaces and consequently a high sedimentation rate can be hypothized.

| Ostracodes \ Samples | Calcar nannofossil Zone (Martini,1985) | NN 3 | | | NN 4 | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| *Argilloecia acuminata* Müller | | 1 | 2 | 1 | 7 | 6 | 1 | | 1 | | | | 13 | | 1 | 2 | | | 1 | | 2 | | | | | |
| *Argilloecia kissamovensis* Sissingh | | | | | | | 1 | | | | | | | | | 6 | | | | | | | | | |
| *Argilloecia tenuis* Ciampo | | | | | | 1 | | | 2 | | | | | | | | | | | | | | | | |
| *Argilloecia* sp.1 | | | | | | | | | | | | | | | | 5 | | 5 | 2 | 1 | | | | | |
| *Bairdia* sp. | | | | | | | | | | 1 | | | | | | | | | | | | | | | |
| *Buntonia dertonensis* Ruggieri | | | | | | | | | | | 2 | | | | | | | | | | | | | | |
| *Buntonia minima* Russo | | | | | 3 | | 1 | | | | | | 2 | | | | | | | | | | | | |
| *Buntonia* sp.1 | | 1 | | 1 | 2 | | | | | | | | | | | | | | | | | | | | |
| *"Buntonia"* sp.2 | | | 1 | | | | | | | | | | 1 | | 2 | 6 | | | | | | | | 1 | |
| *Bythocypris lucida* (Seguenza) | | 1 | 4 | | 18• | 10 | 7• | | | | | | 5• | | 1 | | | | 4• | | | | | | |
| *Cytherella postdenticulata* Oertli | | 7 | 14 | 1 | 21 | 12 | 11 | | | 7 | | | 8• | 2• | 8• | 11• | | 1 | 7• | | | | | 15• | |
| *Cytherella russoi* Sissingh | | | 1 | | 5 | 2 | 2 | | 1 | 1 | | | 2 | | 2 | | 1• | 1 | | | 2 | | | | |
| *Cytherella vulgata* Ruggieri | | 2 | 2 | | 7 | | | | 1 | | 1 | | 8• | | | | | | | | | | | 5 | |
| *Cytherella* sp.1 | | | | | | | | 1 | | 1 | | | | | | | | | | | | | | | |
| *Cytheropteron* sp.1 | | 1 | | | | | | | | | | | | | | | | | | | | | | | |
| *Cytheropteron* sp.2 | | | | | | | 1 | | | | | | | | | | | | | | | | | | |
| *Cytheropteron* sp.3 | | | | | | | | | | | | | | | | 1 | | | | | | | | | |
| *Henryhowella ruggierii* Oertli | | | | | | 4 | 7 | 1 | 3 | | 1 | 9• | | | 5• | 12 | 2 | 1 | 5 | | | | | | |
| *Krithe citae* Oertli | | 1 | 2 | | 2 | 6 | 4 | | | | | | 1 | | | 2 | 1 | | | | | | | | |
| *Krithe contracta* Oertli | | | | | | | 3 | | | | | | | | | 2 | 1 | | | | | | | | |
| *Krithe dolichodeira* van den Bold | | | | | | 5 | 12 | | | 1 | | | | | | | | | | | 5 | | | | |
| *Krithe langhiana* Oertli | | 1 | | | 1 | 1 | 1 | | 2 | 4 | | | | | | 2 | | 1 | | | 3 | | | | |
| *Krithe* sp. | | | | | | 1 | | | | | | | 1 | | | | | | | | | | | | |
| *Loxoconcha* sp. | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | |
| *Macrocypris cylindracea* (Bornemann) | | | | | | | 2 | | | 2 | | | 1 | | | 1 | | | | | | | | | |
| *Paijenborchella* sp. | | | 1 | | | | | | | | | | | | | | | | | | | | | | |
| *Paleoblitacythereis ruggierii* (Russo) | | | 2 | 1 | 2 | 5 | | | | | | | | | | 2 | | | 1 | | | | | 1 | 1 |
| *Parakrithe dactylomorpha* Ruggieri | | 4 | 12 | 2 | 15 | 10 | | | 2 | | | | 15 | | 4 | 11 | | 4 | 2 | 1• | | | | 4 | 1 |
| *Parakrithe* aff. *dimorpha* Bonaduce *et al.* | | | | | | | | | | | | | | | 2 | | | | | 2 | | | | | |
| *Platyleberis* sp. | | 4 | 8 | 1 | 3 | | 1 | | | | | | 1 | | | | | | 4 | | | | | 1 | |
| *Propontocypris* sp. | | | | | 1 | | | | | 1 | | | | | | | | | | | | | | | |
| *Pseudopsammocythere* sp. | | 2 | 3 | | 9 | 5 | 7 | | 1 | | 1 | | 2 | | | 4 | | 1 | | | | | | | |
| + *Aurila* sp.1 | | | | | | | | | | 1 | | | | | | | | | | | | | | | |
| + *Aurila* sp.2 | | | | | | | | | | 1 | | | | | | | | | | | | | | | |
| + *Callistocythere* sp. | | | | | | | | | 1 | | | | | | | | | | | | | | | | |

Tab. 3 - Distribution of Ostracodes in Tuili-Giara section. +) Reworked species. •) Including juvenile specimens.

| Calcar nannofossil Zone (Martini, 1985) / Ostracodes — Samples | NN3 | | | | NN4 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ferrov. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| *Argilloecia acuminata* Müller | 1 | | | 1 | 2 | | | 1 | | | 4 | | 3 | 1 | | | | |
| *Argilloecia kissamovensis* Sissingh | | | | | | | | | | | 2 | | | | | | | |
| *Argilloecia* sp.1 | | | | | | | | | | | 1 | | | | | | | |
| *Buntonia dertonensis* Ruggieri | | | | | | | | 1 | 1 | | | | | | | | | |
| *Buntonia minima* Russo | 1 | 1 | 2 | | | | | 1 | | 1 | | | | 20 | | | | |
| *Buntonia* sp.1 | | | | | | | | 1 | | | 2 | | | | | 1 | | |
| *Bythocypris lucida* (Seguenza) | | | | 3 | •1 | 2 | | | 1 | | | | | 1 | | | | |
| *Cytherella postdenticulata* Oertli | 5 | 3 | 1 | | 1 | | | | | | | | | | 1 | 1 | | 1 |
| *Cytherella russoi* Sissingh | 2 | 1 | 4 | | | 3 | | 2 | | 4 | | | | | | | | |
| *Cytherella vulgata* Ruggieri | | | 2 | | | | | 1 | | 2 | •3 | | | 4 | | 1 | •4 | |
| *Cytherella* sp.1 Ciampo 1981 | 5 | 4 | | 1 | •2 | | | 3 | | 1 | | | 1 | | | | | 1 |
| *Henryhowella ruggierii* Oertli | 1 | | 1 | 1 | | 1 | | 3 | 1 | | | | | | | | | |
| *Krithe citae* Oertli | | 1 | 1 | 2 | 2 | 1 | | 2 | 2 | | | | | | | | | |
| *Krithe dolichodeira* van den Bold | | | | | | | | | 1 | | | | 1 | | | | | |
| *Krithe langhiana* Oertli | | | 1 | | | | | | | | | | | | | | | |
| *Krithe* sp. | | | | 1 | 4 | 1 | | | | | | | | | | | | |
| *Macrocypris cylindracea* (Bornemann) | | | | 1 | | | | | | | 1 | | | 2 | | | | |
| *Paleoblitacythereis ruggierii* (Russo) | 1 | 3 | | | | | | 1 | | 1 | | | | 2 | •1 | 2 | | |
| *Parakrithe dactylomorpha* Ruggieri | 7 | | | | 1 | 1 | | 4 | 4 | 8 | | | 2 | | | | | |
| *Platyleberis* sp. | 2 | | | | | | | | 3 | 4 | 7 | | 1 | 16 | 3 | 5 | 6 | 1 |
| *Pseudopsammocythere* sp. | 2 | | | | 1 | | | | 1 | 1 | | | 1 | | | | | |
| + *Callistocythere* sp. | | | | | | | | | | | | | | | 1 | | | |
| + *Eucytherura* sp. | | | | | | | | | | | | | | | 1 | | | |

Tab. 4 - Distribution of Ostracodes in Gesturi-Giara section. + Reworked species. •) Including juvenile specimens.

The lower part of the Ales section (Aquitanian in age, lower part of NN1 nannofossil zone) yelds a deep water assemblage which includes the psychrospheric species *Quasibuntonia radiatopora,* associated with *Henryhowella ruggierii, Buntonia minima, Cytherella postdenticulata, Paleoblitacythereis ruggierii, Parakrithe dactylomorpha,* and *Parakrithe* aff. *dimorpha.*

The occurrence of *Quasibuntonia radiatopora* suggest an oceanic influence, at least in the lowermost part of section. This fauna is typical of deep basin with psychrospheric conditions. Similar associations are described by Ruggieri (1960) from a drill-hole near Donnalucata (Ragusa, Sicily). The sicilian fauna, attributed to the Oligocene by the Author, but now considered Aquitanian in age by the same Author (personal communication), contains *Quasibuntonia radiatopora, Buntonia minima* (sub *B. dertonensis*), *Paleoblitacythereis* (sub *Costa* n. subsp.) and *Henryhowella.*

Ciampo (1981) described an Aquitanian ostracode fauna from Monte Cammarata (Central Western Sicily) with *Quasibuntonia radiatopora, Argilloecia tenuis, Parakrithe* aff. *dimorpha, Buntonia* and *Krithe,* suggesting a psychrospheric environment with oceanic influence.

Brestenska & Carbonnel (1981) listed the ostracofaunas of several sections at the Oligo-Miocene boundary from Piedmont and Marche regions. The species listed are: *Agrenocythere hazelae, Henryhowella asperrima, Krithe* cfr. *citae, Krithe* cfr. *saundersi,* ? *Atlanticythere* sp., *Paleoblitacythereis* sp.

*Agrenocythere hazelae* and ? *Atlanticythere* sp. are typical psychrospheric species.

Russo & Bossio (1976) listed an Aquitanian deep ostracofauna from some sections of the Malta Island, where some species are in common with the Ales section.

However, it has be noted that *Quasibuntonia radiatopora* is represented in the Ales section only in the first (basal) sample, meanwhile the other species continue also in the NN1-NN2 zones.

The ostracofauna of Sardara-Villanovaforru section (ranging from NN1 to NN3 nannofossil zones) is poorly represented, but all the species pertain to a deep environment, even if the psychrospheric forms are missing.

The ostracofaunas of Tuili-Giara and Gesturi-Giara sections (ranging from NN3 to NN4 nannofossil zones) are belong to a deep thermospheric assemblage (bathyal). Even if most the species are in common with other coeval sections from the Mediterranean Basin [Sicily (Ruggieri 1960, Ciampo 1981), Piedmont (Oertli 1961), Modena district (Russo 1968), Malta island (Russo & Bossio 1976), Spain (Benson 1976)], in the Sardinia sections the psychrospheric species are missing, whereas they are represented in the other areas.

It appears that, while in the rifting basin of western Mediterranean the psychrospheric conditions persisted until Langhian and perhaps Serravallian, in the Sardinia rift the initial psychrospheric phase was followed by the deep thermospheric conditions. The oceanic connection was possible through the Iberian Portal (Benson 1976).

The Capo S. Marco ostracofauna is totally different from the previous sections. The recorded species indicate a very shallow environment with few evidence of brackish water episodes.

The most abundant species are *Cytheridea josephinae, Xestoleberis* gr. *communis, Callistocythere* div. sp., *Aurila* div. sp., *Pontocythere* gr. *lithodomoides,* ecc. The brackish conditions in some intervals are evidenced by the presence of *Cyprideis* and *Leptocythere,* which become almost exclusive in the samples.

## STRATIGRAPHIC REMARKS

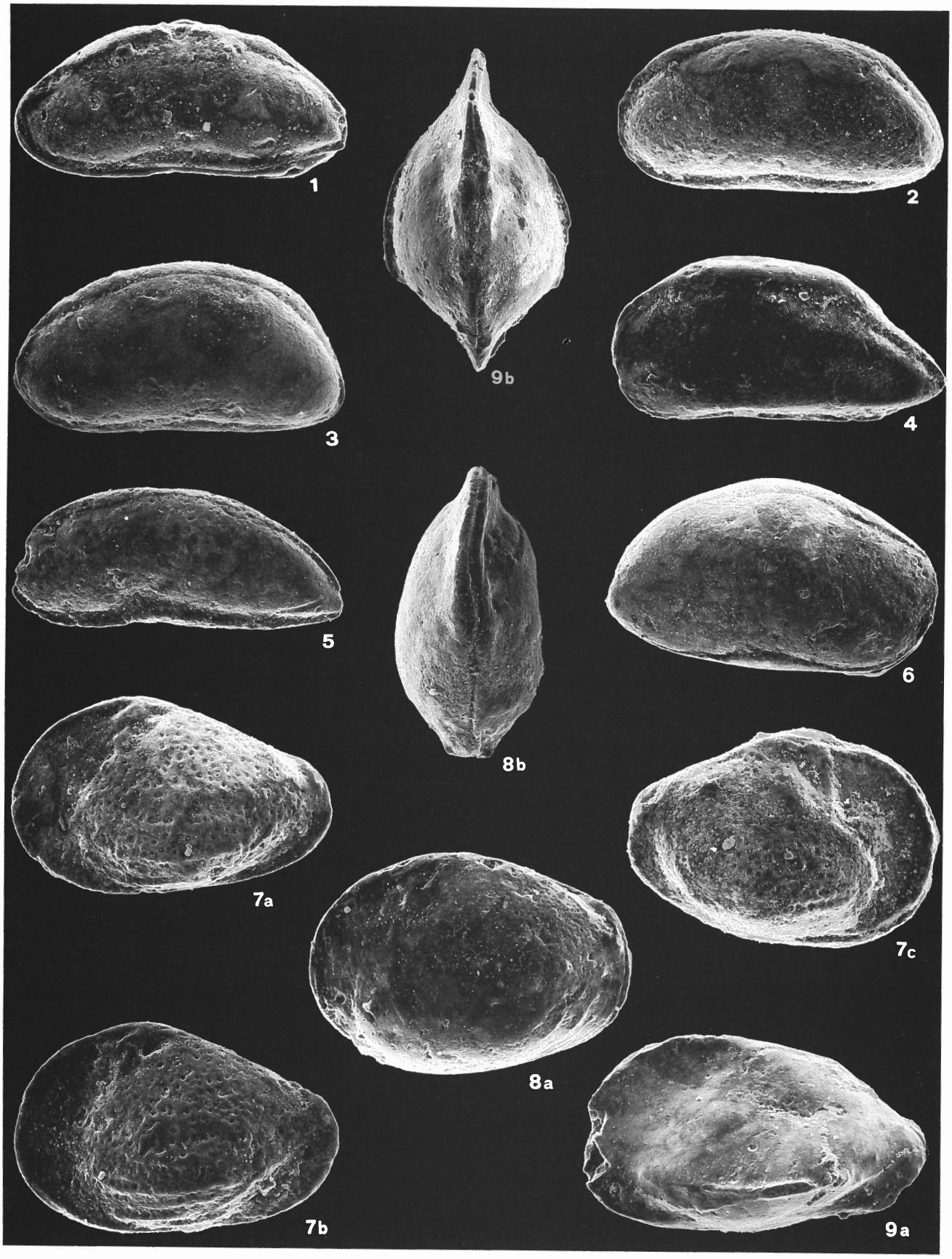
As previously said, generally the Ostracodes are quite useful as indicators of past environmental conditions, whereas at present they seem to be less useful for stratigraphic correlations over long distance.

Except for *Quasibuntonia radiatopora,* present only at the base of the Ales section and perhaps related to peculiar conditions, all the other species are distributed randomly in the stratigraphic intervals from NN1 to NN4 nannofossil zone. The Sardinian Early Miocene species are similar to the Aquitanian-Serravallian deep species from Sicily (Ruggieri 1960; Ciampo 1981), Marche (Brestenska & Carbonnel 1981), Modena province (Russo 1964), Piedmont region (Oertly 1961; Brestenska & Carbonnel 1981), and Spain (Benson 1976).

The Ostracodes of Capo S. Marco section show a good affinity with the Sahelian (Late Tortonian-Early Messinian) species of the Mediterranean basin. In fact *Aurila albicans, Aurila glabra, Callistocythere molesta, C. excanaliculata, C. perfossa, Cytheridea josephinae, Carinocythereis galilea, Hermanites rectangularis* are species which occur commonly or are typical of this age in the Mediterranean basin from Greece to Spain (Ruggieri 1962, 1967, 1976; Dieci & Russo 1964; Borragan 1966; Ascoli 1968; Sissingh 1972; Russo & Bossio 1976; Aruta 1969; 1983; Ciampo 1980, 1984; Bonaduce, Bismuth, Ruggieri, Russo & Mascellaro, in progressing).

## EXPLANATION OF PLATE 1

Fig. 1 - *Argilloecia acuminata* Müller. Hypotype, TG 4, carapace LV, x 119.
Fig. 2 - *Argilloecia tenuis* Ciampo. Hypotype, AC 4ter, carapace LV, x 108,7.
Fig. 3 - *Argilloecia kissamovensis* Sissingh. Hypotype, TG 6, carapace LV, x 124.
Fig. 5 - *Argilloecia* sp. 2. AC 4ter, carapace LV, x 119.
Fig. 6 - *Bythocypris lucida* (Seguenza), Hypotype, TG 4, carapace RV, x 67.
Figs. 7a-c - *Buntonia minima* Russo. Hypotype; 7a) carapace ♂ LV, AC 4ter, x 141; 7b) carapace ♀ RV, AC 6, x 130; 7c) carapace ♀ LV, AC 4ter, x 141.
Figs. 8a-b - *Buntonia* sp. 1. 8a) carapace LV, TG 4, x 119; 8b) carapace DV, AC 6, x 119.
Figs. 9a-b - « *Buntonia* » sp. 2. 9a) carapace LV, 9b) carapace DV, TG 15, x 119.


1
2
9b
3
4
5
8b
6
7a
7c
8a
7b
9a

## TAXONOMIC REMARKS

This chapter deals with short remarks on the more significant species. Some of them, probably new, are given in open nomenclature and will be treated in a next systematic paper.

*Argilloecia acuminata* (Müller, 1884) — (Pl. 1, fig. 1). The species, erected by Müller on Recent material of Gulf of Naples, has been found by Ciampo (1981) in the Langhian of the Monte Cammarata (Sicily). In Sardinia it is present in TG and GG sections ranging from the base until sample 20 in TG and sample 13 in GG (NN3 and NN4 zones).

*Argilloecia kissamovensis* Sissingh, 1972 — (Pl. 1, fig. 3). The species, erected by Sissingh on Tortonian material of Kissamou Formation (Crete island, Greece), is present only in the NN4 zone of TG and GG sections.

*Argilloecia tenuis* Ciampo, 1981 — (Pl. 1, fig. 2). The species, established by Ciampo from the Aquitanian-Serravallian of Sicily, is present in AC section (NN1-NN2 zone) and in the lower part of NN4 zone of TG section. *Argilloecia* aff. *minor* described by Russo (1964, p. 238, tav. 43, figs. 2a,b-3) from the « Langhian » of Valle del Pescale (Modena) must be included in this species.

*Argilloecia* sp. 1 — (Pl. 1, fig. 4). The species is probably new. It is characterized by a pointed posterior margin and by a postero-dorsal margin falling down. It occurs in the middle part of NN4 zone of TG and GG sections.

« *Argilloecia* » sp. 2 — (Pl. 1, fig. 5). The species is probably new. It show an unusual shape for an Argilloecid, consisting of a very pointed posterior margin, of a postero-dorsal margin falling down and making a little step, whereas the ventral margin is more regular. It appears in the lower part of NN1 zone of AC section and in sample 10 of SV section (NN1-NN2 zone).

*Buntonia minima* Russo, 1964 — (Pl. 1, figs. 7a-c). The species, established by Russo from the « Langhian » of Valle del Pescale (Modena), occurs in AC, TG and GG sections.

*Buntonia* sp. 1 — (Pl. 1, figs. 8a,b). This species is very similar to *Buntonia* sp. 2 Russo (1968) from Lower Tortonian of Montebaranzone (Modena). The carapace is smooth with a few feeble plications in the postero-ventral area. It is present, always very rare, in AC, TG and GG sections ranging from the lower part of NN1 to NN4 zones.

« *Buntonia* » sp. 2 — (Pl. 1, figs. 9a,b). This species is characterized by a feeble wing running from the anterior margin to 1/4 of the distance from the posterior margin. In dorsal view the carapace is very large in the middle part and arrowed to both the extremity. The surface is smooth. The shape is unusual for the genus *Buntonia* and probably it belongs to a new genus and new species. This species is present only in TG section from the base to the top.

*Bythocypris lucida* (Seguenza, 1880) — (Pl. 1, fig. 6). This species is frequent in Neogene-Recent deep sediments. It occurs in SV, TG and GG sections, ranging from NN2-NN3 to NN4 zone.

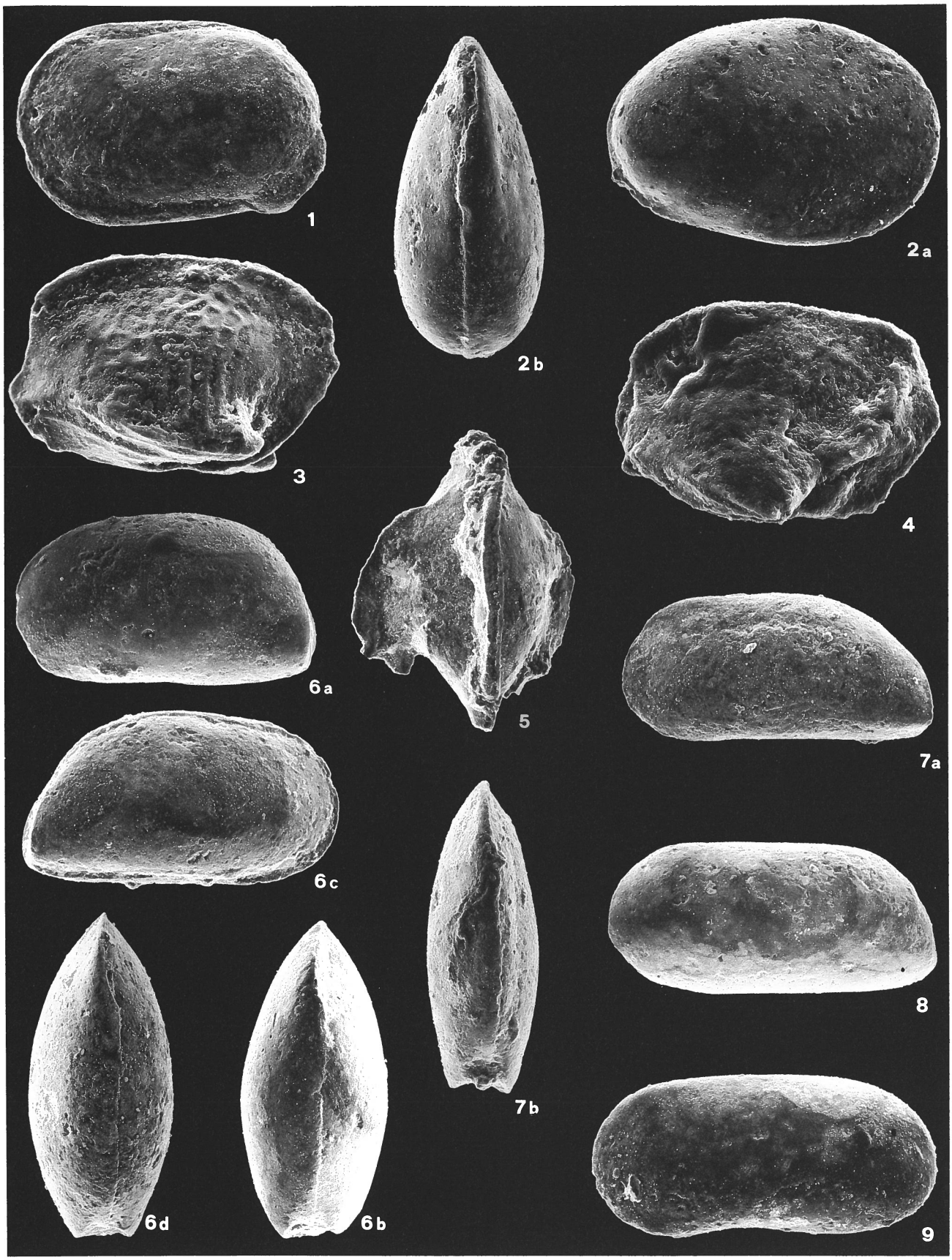
*Cytherella postdenticulata* Oertli, 1961 — (Pl. 2, fig. 1). The species established by Oertli from the type-Langhian of Piedmont region, where it is present also in the Aquitanian and Serravallian, occurs in AC, SV, TG and GG section ranging from lower part of NN1 to NN4 zone.

*Cytherella russoi* Sissingh, 1972 — (Pl. 2, figs. 2a, b). Sissingh established this species from Tortonian of Kissamou Formation (Crete, Greece). Its stratigraphic range is from « Langhian » (in Russo, 1964, as *Cytherella* sp. cfr. *C. compressa*) to Tortonian. In Sardinia the species ranges from NN1-NN2 zone in SV section to NN4 in TG and GG sections.

---

## EXPLANATION OF PLATE 2

Fig. 1 - *Cytherella postdenticulata* Oertli. Hypotype, AC 4ter, carapace LV, x 83,5.
Figs. 2a-b - *Cytherella russoi* Sissingh. Hypotype, 2a) carapace RV, 2b) carapace DV, TG 4, x 83,5.
Fig 3 - *Cytheropteron* sp. 1. TG 1, carapace LV, x 200.
Fig. 4 - *Cytheropteron* sp. 2. TG 6, carapace LV, x 155.
Fig. 5 - *Cytheropteron* sp. 3. TG 15, carapace DV, x 119.
Figs. 6a-d - *Krithe langhiana* Oertli. Hypotype, 6a) carapace ♀ LV, TG 6, x 108,7; 6b) carapace ♀ DV, TG 6, x 110; 6c) carapace ♂ RV, AC 4ter, x 99,5; 6d) carapace ♂ DV, AC 6, x 99,5.
Figs. 7a-b - *Krithe citae* Oertli. Hypotype, 7a) carapace LV; 7b) carapace DV, AC 4ter, x 83,5.
Fig. 8 - *Krithe dolichodeira* van den Bold. Hypotype, TG 6, carapace LV, x 110.
Fig. 9 - *Pseudopsammocythere* sp. TG 15, carapace LV, x 130.


1
2b
2a
3
4
6a
5
7a
6c
7b
8
6d
6b
9

*Cytheropteron* sp. 1 — (Pl. 2, fig. 3). This species is similar to *C. striatum* Ciampo (1985), by which it differs for the shorter and more blade-like wing process and the less rectangular shape in lateral view. It is present only in sample 1 of TG section (NN3 zone).

*Cytheropteron* sp. 2 — (Pl. 2, fig. 4). This species is similar to *Cytheropteron* sp. 1, by which it differs for the more prominent and central wing and the external surface nearly smooth. It is present only in sample 6 of TG section (NN4 zone).

*Cytheropteron* sp. 3 — (Pl. 2, fig. 5). In dorsal view the species is characterized by a very protruding wing, which in dorsal view appears arched. It is present, with a single carapace, in sample 15 of TG section (NN4 zone).

*Krithe dolichodeira* van den Bold, 1964 — (Pl. 2, fig. 8; Pl. 3, fig. 1). Our specimens are identical to the species illustrated by Ruggieri (1960) as *K. dolichodeira* from the Langhian of Donnalucata (Sicily). The species was established by van den Bold from the Middle-Upper Miocene of Giamaica and Dominican Republic. It is present only in NN4 zone of TG and GG sections.

*Khithe citae* Oertli, 1961 — (Pl. 2, figs. 7a,b). This species erected by Oertli from the type-Langhian of Piedmont, is recorded also in the Aquitanian. It is frequent in other Langhian deep deposits (Modena, Sicily, Marche). In Sardinia the species occurs from NN1-NN2 to NN3 and lower-middle part of NN4 of TG and GG sections.

*Krithe langhiana* Oertli, 1961 — (Pl. 2, figs. 6a-d). This species erected by Oertli from the type-Langhian of Piedmont region, occurs also in the Aquitanian and Serravallian. In literature the same species is listed also from the Tortonian. In Sardinia it ranges from the lower part of NN1 of AC section to NN4 of TG section.

*Loxoconcha* sp. — (Pl. 3, fig. 2). This small species is characterized by suboval carapace swollen in the ventral area. The ornamentation is constituted by irregular foveolae. The eye-spot is missing. A similar species was found in deep Aquitanian sediments of Malta island (Russo & Bossio, 1976). In Sardinia it is present in the lower part of NN1 zone of AC section and at the base of NN3 zone of TG section.

*Paijenborchella* sp. — (Pl. 3, fig. 3). The specimen is particularly damaged and consequently we were not able to identify it at specific level. It is characterized by a projecting wing process and by a median ridge which crosses the vertical sulcus. The only one specimen was found in the sample 2 of TG section (NN3 zone).

*Paleoblitacythereis ruggierii* (Russo, 1964) — (Pl. 3, figs. 4a-c). This species erected by Russo as *Carinocythereis ruggierii,* was chosen by Benson (1977) as type-species of the new subgenus *Paleoblitacythereis,* here considered at the rank of genus. The specimens described by Benson as *P. ruggierii* are identical to those illustrated by Russo & Bossio (1976) and by Ciampo (1980) as *Oblitacythereis (Paleoblitacythereis)* sp. 3, that probably are a new species. In Sardinia *P. ruggierii* ranges from the lower part of NN1 to NN4 zone of AC, TG and GG sections.

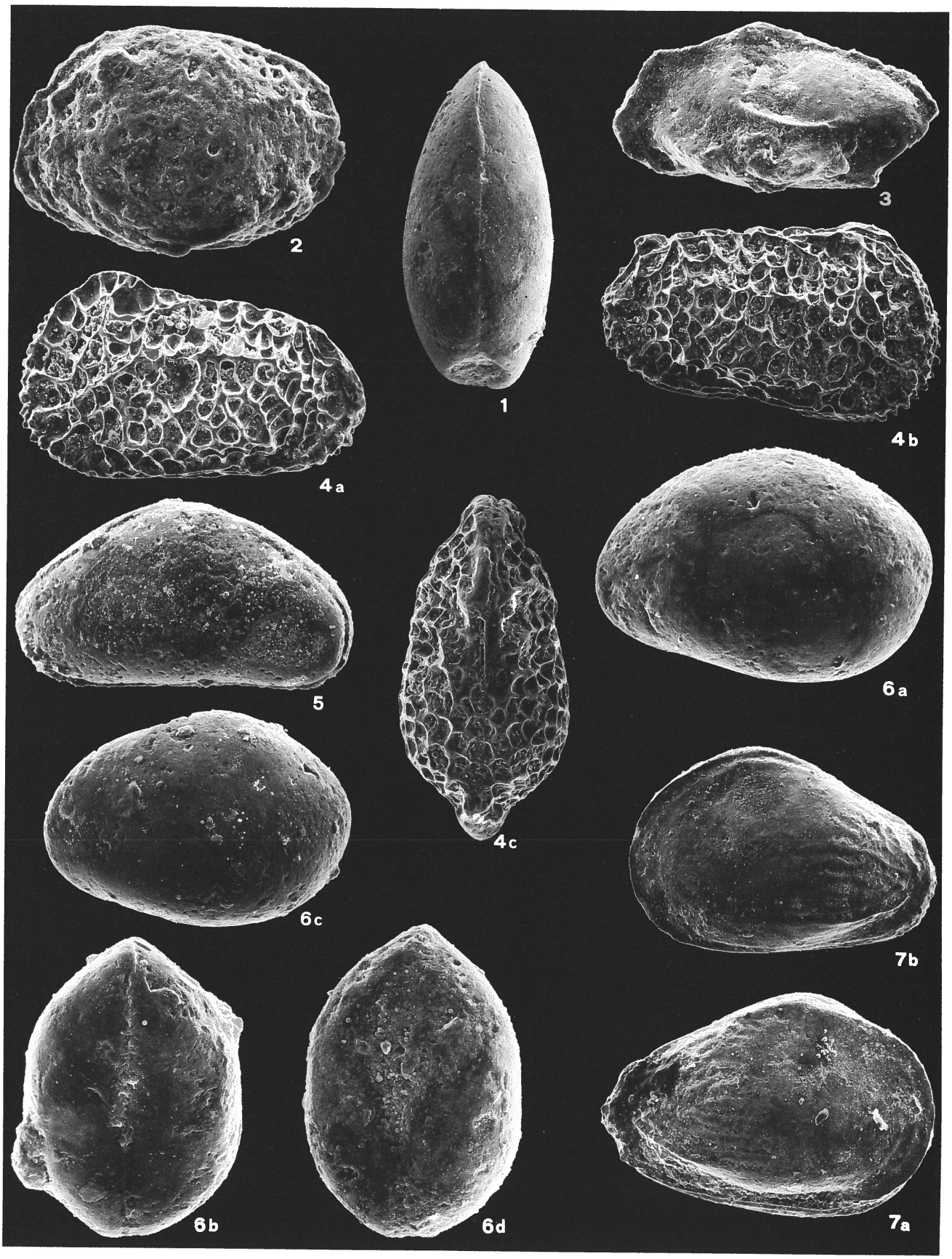
*Platyleberis* sp. — (Pl. 3, figs. 6a-d). The species is characterized by the ventral area very flat and large, by the oval shape in lateral view, with the anterior margin acutely rounded and the posterior regularly arched. This species has been attributed to the genus *Platyleberis* Bonaduce & Danielepol (1985, in press) for the characteristic flat and large ventral area. In Sardinia it is present in all the sections from the lower part of NN1 to NN4 zone.

*Propontocypris* sp. — (Pl. 3, fig. 5). The species is characterized by the anterior and posterior margins rounded, dorsal margin acutely arched in the middle part and the ventral margin straight. It is present only in sample 4 and 9 of TG section (NN4 zone).

---

EXPLANATION OF PLATE 3

Fig. 1 - *Krithe dolichodeira* van den Bold. Hypotype, TG 6, carapace DV, x 104.
Fig. 2 - *Loxoconcha* sp. TG 2, carapace LV, x 167.
Fig. 3 - *Paijenborchella* sp. TG 2, carapace LV, x 160.
Figs. 4a-c - *Paleoblitacythereis ruggierii* (Russo). Hypotype, 4a) carapace LV, TG 15, x 73; 4b) carapace RV, TG 15, x 70; 4c) carapace DV, AC 4ter, x 83.
Fig. 5 - *Propontocypris* sp. TG 4, carapace LV, x 135.
Figs. 6a-d - *Platyleberis* sp. 6a) carapace ♀ LV, AC 4ter, x 160,6; 6b) carapace ♀ VV, TG 2, x 179,5; 6c) carapace ♂ LV, AC 4ter, x 160,6; 6d) carapace ♂ VV, AC 4ter, 160,6.
Figs. 7a-b - *Quasibuntonia* gr. *radiatopora* (Seguenza). Hypotype, 7a) carapace RV; 7b) carapace LV; AC 6, x 70.


2
1
3
4a
4b
5
4c
6a
6c
7b
6b
6d
7a

*Pseudopsammocythere* sp. — (Pl. 2, fig. 9). This species is identical to *Psammocythere*? sp. 2 Oertli (1961) from the type-Langhian of Piedmont region. In Sardinia it is present in TG and GG section (NN3 to NN 4 zone).

*Quasibuntonia radiatopora* (Seguenza, 1980) — (Pl. 3, figs. 7a,b). It is a long range psychrospheric species frequent in many sections from Early Miocene to Pleistocene. In Sardinia the species is present only in sample 7 of AC section (lower part of NN1 zone).

## SYSTEMATIC REMARKS ON SOME SIGNIFICANT SPECIES OF CAPO S. MARCO SECTION

*Acanthocythereis hystrix* (Reuss, 1850) — (Pl. 4, fig. 1). This species is very frequent from Miocene to Recent in fine sand and very sandy pelite.

*Aurila albicans* Ruggieri, 1976 — (Pl. 4, fig. 4). The species erected by Ruggieri from the Sahelian of Casa dei Gessi (Northern Apennines), is frequent in many sequences of the same age.

*Aurila impressa* Ruggieri, 1976 — (Pl. 4, fig. 5). The species is frequent in the Miocene sequences. Our specimens show some variability in shape.

*Aurila* ex gr. *impressa* Ruggieri, 1976 — (Pl. 4, fig. 6). This species is similar to *A. impressa* figured by Aruta (1983). According to Ruggieri (personal communication) this group of forms shows a different ornamentation of carapace from *A. impressa* s.s., and probably belongs to another taxon.

*Aurila* gr. *philippi* (Reuss, 1860) — (Pl. 4, figs. 2 a,b). This species, originally described from the Vienna basin, was found by Ruggieri (1962, 1976) from Upper Tortonian of Italy.

*Aurila* sp. 1 — (Pl. 4, figs. 3a-c). This species is probably new. It is characterized by the surface completely ornated by small and rounded foveolae concentrically arranged, changing in to pits peripherally. In dorsal view it is very large.

*Bosquetina pectinata* (Bosquet, 1852) — (Pl. 4, fig. 7). This is a long range species from the Upper Oligocene to Recent.

*Callistocythere excanaliculata* Bonaduce *et al.*, 1985 — (Pl. 5, fig. 4). The species has been erected by Bonaduce *et al.* from the Sahelian of Tunisia.

*Callistocythere molesta* Bonaduce *et al.*, 1985 — (Pl. 5, figs. 3a,b). The species has been erected by Bonaduce *et al.* from the Sahelian of Tunisia.

*Callistocythere perfossa* Ciampo, 1984 — (Pl. 5, figs. 1a,b). The species has been erected by Ciampo from the Upper Tortonian of Rio Mazzapiedi (Piedmont region).

*Cytheridea josephinae* Kollmann, 1960 — (Pl. 5, figs. 2a-c). This species, erected by Kollmann from the Upper Miocene of Vienna basin, was found in the Upper Tortonian of Rio Mazzapiedi and Sahelian of Vigoleno (Piacenza) by Ascoli (1963, 1968).

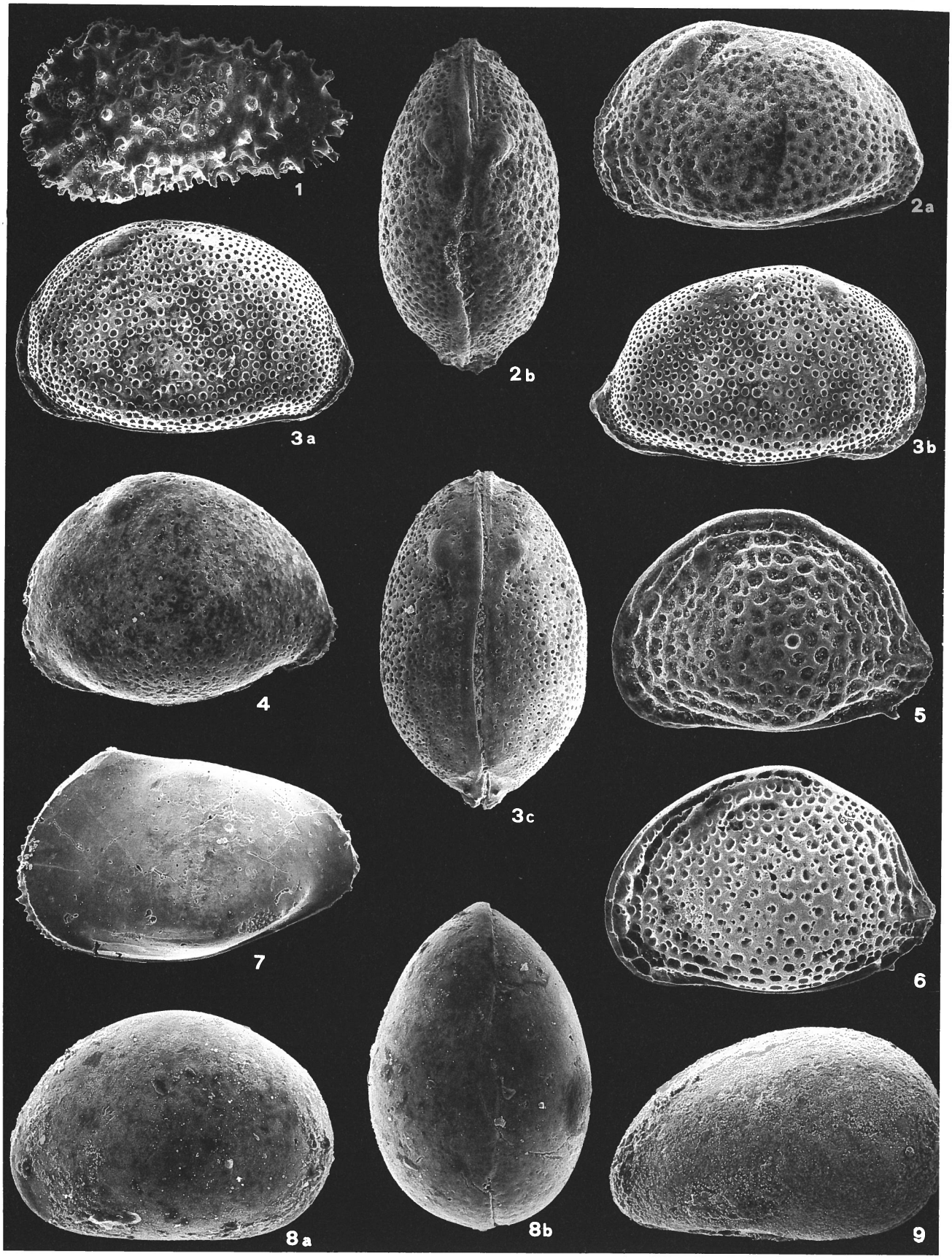
*Hermanites rectangularis* Ruggieri, 1962 — (Pl. 5, fig. 8). This species is frequent in the Upper Tortonian-Sahelian of many sequences of the Mediterranean basin.

*Hiltermannicythere* sp. — (Pl. 5, fig. 6). This species is similar to *H. turbida* (Müller, 1894), by which it differs for the different ornamentation and shape of foveolae in the anterior area. The ridges are also less developed especially in the anterior margin.

*Incongruellina* ex gr. *testudo* (Namias, 1900) — (Pl. 5, fig. 7). This species is very similar to *I. marginata* (Terquem, 1878), figured by Sissingh (1972) from South Aegean Island. This Author includs in his synonimy also Miocene, Pliocene and Pleistocene species. At present we can observe that the name *Cythere marginata* Terquem 1878 is a preoccuped name (by *Cythere marginata* Norman 1862), and for this reason we prefer, in this paper, to indicate this species as *Incongruellina* ex gr. *testudo* (Namias), waiting the taxonomic revision of this group of forms.

## EXPLANATION OF PLATE 4

Fig. 1 - *Acanthocythereis* gr. *hystrix* (Reuss). Hypotype, Capo S. Marco, 1201-c, LV, x 77.
Figs. 2a-b - *Aurila* gr. *philippi* (Reuss). Hypotype, Capo S. Marco, 1201-b, 2a) carapace LV; 2b) carapace DV, x 77.
Figs. 3a-c - *Aurila* sp. 1. Capo S. Marco, 1201-c, 3a) carapace ♀ LV; 3b) carapace RV; 3c) carapace DV, x 73.
Fig. 4 - *Aurila albicans* Ruggieri. Hypotype, Capo S. Marco, 1201-b, LV, x 77.
Fig. 5 - *Aurila impressa* Ruggieri. Hypotype, Capo S. Marco, 1201-b, carapace LV, x 84,5.
Fig. 6 - *Aurila* ex gr. *impressa* Ruggieri. Hypotype, Capo S. Marco, 1203-c, carapace LV, x 83,5.
Fig. 7 - *Bosquetina pectinata* (Bosquet). Hypotype, Capo S. Marco, 1203-c, carapace LV, x 67.
Figs. 8a-b - *Xestoleberis* gr. *communis* Müller. Hypotype, Capo S. Marco, 1203-c, 8a) carapace LV; 8b) carapace DV; x 124.
Fig. 9 - *Xestoleberis* gr. *dispar* Müller. Hypotype, Capo S. Marco, 1201-b, carapace LV, x 102,5.


1
2a
2b
3a
3b
3c
4
5
6
7
8a
8b
9

*Loxoconcha aspidis* Bonaduce *et al.*, 1985 — (Pl. 5, fig. 10). The species has been erected by Bonaduce *et al.* from the Sahelian of Tunisia.

*Loxoconcha* gr. *ovulata* (Costa, 1863) — (Pl. 5, fig. 9). This species is very similar to *L. tumida* (included in synonimy with Costa's species by Atherusch 1979) from Recent of Adriatic Sea. Some little differences are confined to the postero-ventral area.

*Paracypris* sp. — (Pl. 5, fig. 5). This species is characterized by the pointed posterior margin and the dorsal margin regularly falling down posteriorly.

*Xestoleberis* gr. *communis* Müller, 1894 — (Pl. 4, figs. 8a,b). This species is very similar to *X. communis* from Adriatic Sea.

*Xestoleberis* gr. *dispar* Müller, 1894 — (Pl. 4, fig. 9). This species is very similar to *X. dispar* from Adriatic Sea.

## ACKNOWLEDGEMENTS

The Authors are grateful to Prof. G. Ruggieri, University of Palermo, for critical discussion, and to Mr. Giorgio Dafnis, responsable of Electron Microscopy Laboratory of the Zoological Station of Naples, for his invaluable help on taking micrographs.

This work was supported by grant from Ministero della Pubblica Istruzione (M.P.I.).

## REFERENCES

ARUTA, L., 1969, Ostracodi del Saheliano (Miocene sup.) dei dintorni di Calatafimi (Sicilia sud-occidentale): Riv. Miner. Sicil., n. 100-102, pp. 3-17.

—, 1983, Gli Ostracodi del Saheliano (Miocene medio-superiore) di C. Pestavecchia (Bonfornello, Palermo): Boll. Soc. Paleont. Ital., v. 21 (1), 1982, pp. 113-132.

ASCOLI, P., 1968, Preliminary report on the Ostracoda of the type-Tortonian: Comm. Mediterranean Neogene Strat., Proc. IV, Bologna 1967, Giorn. Geol., v. XXXV, fasc. II, pp. 31-54.

BARDOVSKY, O.K., 1965, Accumulation and transformation of organic substance in marine sediments. Part. I-IV: Marine Geol., v. 3 (1-2), pp. 3-114.

BENSON, H.R., 1976, Miocene deep-sea Ostracodes of the Iberian Portal and the Balearic Basin: Mar. Micropal., v. 1, pp. 249-262.

—, 1984, Estimating greater paleodepths with Ostracodes, especially in past thermospheric ocean: Palaeogeogr., Palaeoclim., Palaeoecol., v. 48 (1), pp. 107-141.

BONADUCE, G., DANIELEPOL, D.L., 1985, To see and not be seen: the evolutionary problems of the Ostracoda Xestoleberididae: IX Intern. Symp. on Ostracoda, Shizuoka, Japan (in press).

—, RUGGIERI, G., RUSSO, A., BISMUTH, H., MASCELLARO, P. 1985, The marine Ostracode fauna of the Late Miocene of Tunisia: (in progressing).

BORRAGAN, J., 1966, Los Ostracodos del Miocene superior de facies marina de la Cuenca del Guadalquivar (Esp.): Proc. Third Session C.M.N.S. Bern 1964, pp. 270-279.

BRESTENSKA, E., CARBONNEL, G., 1981, In search of the Paleogene/Neogene boundary stratotype. Part 1. Potential boundary stratotype sections in Italy and Greece and comparison with results from deep-sea: Intern. Union Geol. Comm. on Strat., Pubbl. n. 5, (Cati ed.), Gior. Geol., v. XLIV, fasc. 1-II, pp. 106, 128, 137, 147, 175.

CHERCHI, A., Editor, 1985, Guide book: 19th European Micropaleontological Colloquium, Sardinia 1-10 October 1985.

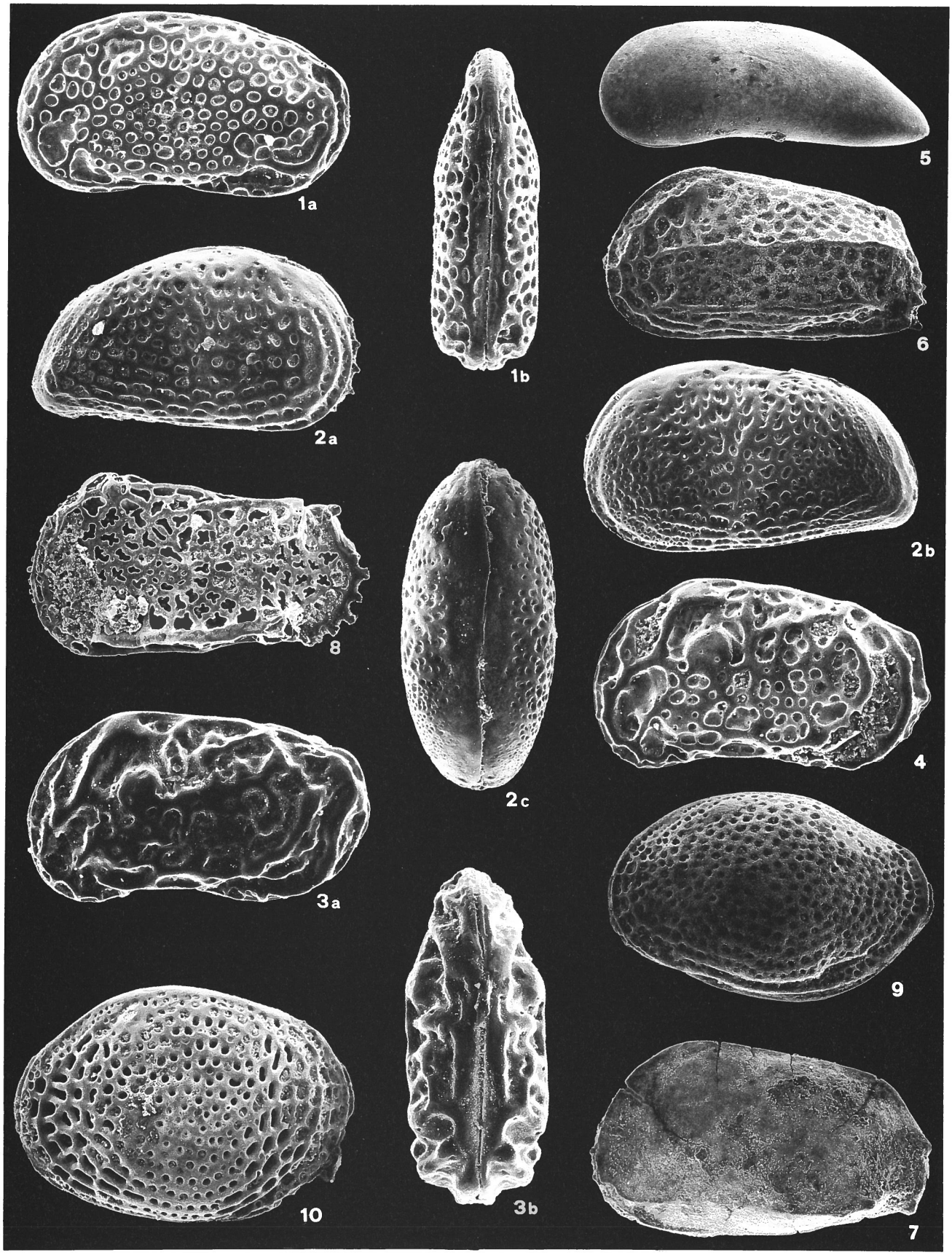
—, MONTADERT, L., 1982, Oligo-Miocene rift of Sardinia and the early history of the Western Mediterranean Basin: Nature, v. 298, n. 5876, pp. 736-739.

—, —, 1984, Il sistema di rifting Oligo-miocenico del Mediterraneo occidentale e sue conseguenze paleogeografiche sul terziario sardo: Mem. Soc. Geol. Ital., v. 24, 1982, pp. 387-400.

—, MARINI, A., MURRU, M., ROBBA, E., 1978, Stratigrafia e Paleoecologia del miocene superiore della penisola del

## EXPLANATION OF PLATE 5

Figs. 1a-b - *Callistocythere perfossa* Ciampo. Hypotype, Capo S. Marco, 1201-a, 1a) carapace LV; 1b) carapace DV; x 130.
Figs. 2a-c - *Cytheridea josephinae* Kollmann. Hypotype, Capo S. Marco, 1203-c, 2a) carapace RV; 2b) carapace LV; 2c) carapace ♀ DV; x 84,5.
Figs. 3a-b - *Callistocythere molesta* Bonaduce, Ruggieri, Russo, Bismuth & Mascellaro. Hypotype, Capo S. Marco, 1203-c, 3a( carapace LV; 3b) carapace DV; x 130.
Fig. 4 - *Callistocythere excanaliculata* Bonaduce, Ruggieri, Russo, Bismuth & Mascellaro. Hypotype, Capo S. Marco, 1201-a, carapace LV, x 119.
Fig. 5 - *Paracypris* sp. Capo S. Marco, 1203-c, carapace LV, x 50.
Fig. 6 - *Hiltermannicythere* sp. Capo S. Marco, 1202-c, carapace LV, x 84,5.
Fig. 7 - *Incongruellina* ex gr. *testudo* (Namias). Hypotype, Capo S. Marco, 1202-c, LV, x 83.
Fig. 8 - *Hermanites rectangularis* Ruggieri. Hypotype, Capo S. Marco, 1203-c, LV, x 83,5.
Fig. 9 - *Loxoconcha* gr. *ovulata* (Costa). Hypotype, Capo S. Marco, 1201-c, carapace LV, x 84,5.
Fig. 10 - *Loxoconcha aspidis* Bonaduce, Ruggieri, Russo, Bismuth & Mascellaro. Hypotype, Capo S. Marco, 1203-c, carapace LV, x 84,5.


1a
1b
5
6
2a
2b
8
2c
4
3a
9
3b
10
7

| Ostracodes \ Samples | Calcar nannofossil Zone (Martini,1985) | NN 1 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1201 | | | 1202 | | 1203 | | 1204 b | 1205 | | | 1206 | 1208 | | |
| | | a | b | c | b | c | b | c | | 4 | 6 | 9 | | a | b | b1 |
| *Acanthocythereis hystrix* (Reuss) | | | | 2 | | | | | | | | | | | | |
| *Aurila albicans* Ruggieri | | | 2 | | | | | | | | | | | | | |
| *Aurila* gr.*cicatricosa* (Reuss) | | | | | | | | | | | | | | | | 5 |
| *Aurila glabra* Bonaduce *et al.* | | | | | 2 | | | | | | | | | | | |
| *Aurila impressa* Ruggieri | | | | 6 | | | | 8 | | | | | | | 5 | 6 |
| *Aurila* ex gr. *impressa* Ruggieri | | | 4 | 8 | | | | | | | | | | | | |
| *Aurila* gr.*lancaeoformis* Uliczny | | | | 3 | 2 | | | 3 | | | | | | | | |
| *Aurila* gr.*philippi* (Reuss) | | | 6 | | | | | | | | | | | | | 7 |
| *Aurila punctata* (v.Münster) | | | | | 12 | | | | | | | | | | | |
| *Aurila* sp.1 | | 1 | | 3 | | 5 | | 15 | 5 | | | | | 2 | | 23 |
| *Aurila* sp.2 | | | 4 | | | 5 | 1 | | | | | | | | | |
| *Aurila* sp.3 | | | | 3 | | | | | 2 | | | | | | | |
| *Aurila* sp.4 | | | | 2 | | 2 | | | | | | | | | 2 | 2 |
| *Bosquetina pectinata* (Bosquet) | | | | | 2 | | | 2 | | | | | | | | |
| *Callistocythere excanaliculata* Bonaduce *et al.* | | 18 | | | | | | | 4 | | 5 | 13 | | | | |
| *Callistocythere molesta* Bonaduce *et al.* | | | | | | | | 3 | | | | | | | | |
| *Callistocythere perfossa* Ciampo | | 13 | | | 1 | 8 | | | | 5 | 3 | | | | | |
| *Callistocythere quadrangula* Ciampo | | | | | | | | | | | | | | | 5 | |
| *Callistocythere* sp.Ciampo 1983 | | | | | | 2 | | 2 | | 15 | | | | | | |
| *Carinocythereis galilea* Ruggieri | | | | | | | | | | | | | | | 1 | |
| *Cyprideis* sp. | | | | | | | | | | | 1 | | | | | |
| *Cytheridea josephinae* Kollmann | | 19 | 14 | | | | | 15 | 21 | | | | | | 3 | 1 |
| *Gabesella* sp. | | | | | | | | | | | | | | | 1 | |
| *Hermanites rectangularis* Ruggieri | | | | | | | | 1 | | | | | | | | |
| *Hiltermannicythere* sp. | | | | | 1 | 1 | 1 | | | | | | | | | |
| *Incongruellina* ex gr. *testudo* (Namias) | | | | | | 2 | 1 | | | | | | | | | |
| *Leptocythere* sp. | | | | | | | | | | | 10 | 8 | | | | |
| *Loxoconcha aspidis* Bonaduce *et al.* | | | | | | | | 2 | | | | | | | | 1 |
| *Loxoconcha* aff.*dertobrevis* Ruggieri | | | | | 1 | | | | | | | | | | | |
| *Loxoconcha* gr.*ovulata* (Costa) | | | 5 | 12 | 8 | | | | | | | | | | 5 | |
| *Macrocypris* sp. | | | | | | | 1 | | | | | | | | | |
| *Olimfalunia* sp. | | | | | | | | | | | | | | | 1 | |
| *Paracypris* sp. | | | | | | | 1 | | | | | | | | | |
| *Pontocythere* gr.*lithodomoides* (Bosquet) | | | | | | | | | | | | | | | 3 | 4 |
| *Ruggieria inermis* Aruta | | | | | | 1 | | | | | | | | | | 1 |
| *Xestoleberis* gr.*communis* Müller | | 19 | 9 | 5 | 5 | 10 | | 10 | 1 | | | | | | | 5 |
| *Xestoleberis* gr.*dispar* Müller | | | 1 | 2 | | | | | | | 1 | | | | | |
| *Xestoleberis* gr.*ventricosa* Müller | | | | | | | | | | | | | | | 2 | |

Tab. 5 - Distribution of Ostracodes in Capo S. Marco section.

Sinis (Sardegna occidentale): Riv. Ital. Paleont. Strat., v. 84 (4), pp. 973-1036.

CIAMPO, G., 1980, Ostracodi miocenici (Tortoniano-Messiniano) della regione di Ragusa: Boll. Soc. Paleont. Ital., v. 19 (1), pp. 5-20.

—, 1981, Ostracodi fossili (Oligocene superiore-Serravalliano) del Monte Cammarata (Sicilia centro-occidentale) e del Ragusano (Sicilia sud-orientale): Boll. Soc. Paleont. Ital., v. 20 (1), pp. 53-72.

—, 1984, Alcuni Ostracodi del Miocene superiore piemontese: Boll. Soc. Paleont. Ital., v. 22 (3), 1983, pp. 247-262.

—, 1985, Ostracodi del limite Tortoniano/Messiniano in alcune sezioni italiane: Boll. Soc. Paleont. Ital., v. 23 (3) 1984 (in press.).

DIECI, G., RUSSO, A., 1964, Ostracodi tortoniani dell'Appennino settentrionale (Tortona, Montegibbio, Castelvetro): Boll. Soc. Paleont. Ital., v. 3 (1), pp. 38-88.

OERTLI, H.J., 1961, Ostracodes du Langhien-type: Riv. Ital. Paleont. Strat., v. 67 (1), pp. 17-44.

—, 1971, The aspect of ostracode faunas. A possible new tool in petroleum sedimentology: Coll. on the Paleoecology of Ostracodes (Oertli Ed.), Bull. Centre Rech. Pau-SNPA, v. 5 suppl., pp. 137-151.

POKORNY, V., 1965, Some Palaeoecological Problems in Marine Ostracode Faunas, demonstred on the Upper Cretaceous Ostracodes of Bohemia, Czechoslovakia: Pubbl. Staz. Zool. Napoli, v. 55 suppl., pp. 462-479.

RUGGIERI, G., 1960, Ostracofauna miocenica del Ragusano: Riv. Miner. Sicil., n. 63, pp. 1-7.

—, 1962, Gli Ostracodi marini del Tortoniano (Miocene medio-superiore) di Enna nella Sicilia centrale: Palaeont. Ital., v. 56, mem. 2, pp. 1-68.

—, 1967, Due Ostracofaune del Miocene alloctono della Val Marecchia (Appennino settentrionale): Riv. Ital. Paleont. Strat., v. 73 (1), pp. 351-384.

—, 1976a, Contributo alla conoscenza del genere *Aurila* (Ostracoda, Podocopa) con particolare riguardo ai suoi rappresentanti nel Pleistocene italiano: Boll. Soc. Paleont. Ital., v. 14 (1), pp. 27-46.

—, 1976b, Ostracofauna tortoniana di Camporosso (Perticara, Appennino romagnolo): Boll. Soc. Paleont. Ital., v. 15 (2), pp. 175-187.

RUSSO, A., 1964, Ostracodi langhiani del Pescale (Appennino settentrionale modenese): Boll. Soc. Paleont. Ital., v. 3 (2), pp. 227-251.

—, 1968, Ostracodi tortoniani di Montebaranzone (Appennino settentrionale modenese): Boll. Soc. Paleont. Ital., v. 7 (1), pp. 6-56.

—, BOSSIO, A., 1976, Prima utilizzazione degli Ostracodi per la biostratigrafia e la paleoecologia del Miocene dell'arcipelago maltese: Boll. Soc. Paleont. Ital., v. 15, (2), pp. 215-227.

SISSINGH, W., 1972, Late cenozoic Ostracoda of the South Aegean Island Arc: Utrecht Micropaleont. Bull., v. 6, pp. 1-187.

*(manuscript received April 22, 1985*
*accepted May 2, 1985)*

Gioacchino BONADUCE
Stazione Zoologica
Villa Comunale, 80100 Napoli - Italia

Antonio RUSSO
Istituto di Paleontologia
Via Università 4, 41100 Modena - Italia.