Acta Palaeontologica Polonica
Vol. 33 No. 4 pp. 273—342; pls. 1—12 Warszawa, 1988

JANINA SZCZECHURA and EZZAT ABD-ELSHAFY

OSTRACODES AND FORAMINIFERA FROM THE ?MIDDLE MIOCENE OF THE WESTERN COAST OF THE GULF OF SUEZ, EGYPT

SZCZECHURA, J. and ABD-ELSEHAFY E.: Ostracodes and foraminifera from the ?Middle Miocene of the western coast of the Gulf of Suez, Egypt. Acta Palaeont. Polonica, 33, 4, 273—342, 1988 (issued 1989).

The microfauna described here come from the marine sediments of the Miocene Hommath Formation, from the west coast of the Gulf of Suez. Fifty five ostracod species have been distinguished including five new ones. The co-occurring foraminifera served as stratigraphical and ecological indicators. The age of the fauna has been determined as Middle Miocene though with hesitation. A similar assemblage of microfauna, especially ostracodes has been found in Miocene sediments from the Sirte Basin of Central Libya.

Key words: Ostracoda, Foraminiferida, Miocene, North Africa.

Janina Szczechura, Zakład Paleobiologii, Polska Akademia Nauk, Al. Żwirki i Wigury 93, 02-089 Warszawa, Poland; Ezzat Abd-Elshafy, Department of Geology, Faculty of Science, Zagazig University, Zagazig, Egypt. *Received: January, 1988.*

INTRODUCTION

The ostracodes from the Miocene of Africa, including those of North Africa, have been poorly known so far. The ones from Egypt have not been described at all. Unfortunately, the ostracode assemblage described here is rather poorly preserved and some species are very poorly represented, sometimes only by single individuals. Therefore, the study is based also on ostracodes coming from most likely synchronous sediments outside of Egypt, among others the microfauna from Central Libya (Sirte Basin) which has been described partly by J. Szczechura (Bismuth *et al.* 1978, Szczechura 1980). For the purposes of stratigraphy and interpretation of the environment the foraminifera co-occurring with the ostracodes in question, has been used.

The microfauna has been collected by Mohamed Abd-Elmonem, the geological setting of the samples has been presented by Ezzat Abd-Elshafy, the microfauna has been described by Janina Szczechura.

The size of samples subjected to washing was over 0.5 kg. The picking was carried out on about 5 g of the washed residue of each sample, in some cases all the washed residue was examined.

The material described in housed at the Institute of Paleobiology, Polish Academy of Sciences in Warsaw (abbrev. ZPAL).

Abbreviations used in the descriptions and explanations to the figured specimens (pls. 1—12): j — juvenile, a — adult, L — left, R — right, V — valve, C — carapace, M — male, F — female.

Acknowledgements. — Mr. Mohamed Abd-Elmonem (Zagazig University) has collected the studied material. Dr. Hector Bismuth (S.E.R.E.P.T., Tunis), Dr. Nuran Gökçen (Cukurova University), Dr. Dick van Harten (Free University, Amsterdam) and Dr. Ewa Łuczkowska (Academy of Mining and Metallurgy, Cracow) have kindly expressed their opinion on determination of the studied microfauna. Dr. W. A. van den Bold (Louisiana State University, Baton Rouge) has provided some comparative material of Miocene of Gabon, while Dr. Ewa Odrzywolska-Bieńkowa (Geological Institute, Warsaw) has kindly made available the sample from Pliocene of Algeria. The SEM photographs were taken at the Electron Microscopy Laboratory of the Nencki Institute of Experimental Biology, Warsaw. The figures concerning ostracodes were drawn, after the senior author's original sketches, by Mrs. D. Sławik (Institute of Paleobiology, Polish Academy of Sciences, Warsaw).

All these contributions are gratefully acknowledged.

GEOLOGICAL SETTING

The area which provided the here examined fauna is a part of the low tract extending to the north of Gabal Akheider. It is occupied essentially by Miocene sediments from place to place, almost obscured by more recent sediments and separated from the highly elevated Middle Eocene massif of Gabal Akheider by Wadi El-Bada valley (fig. 2).

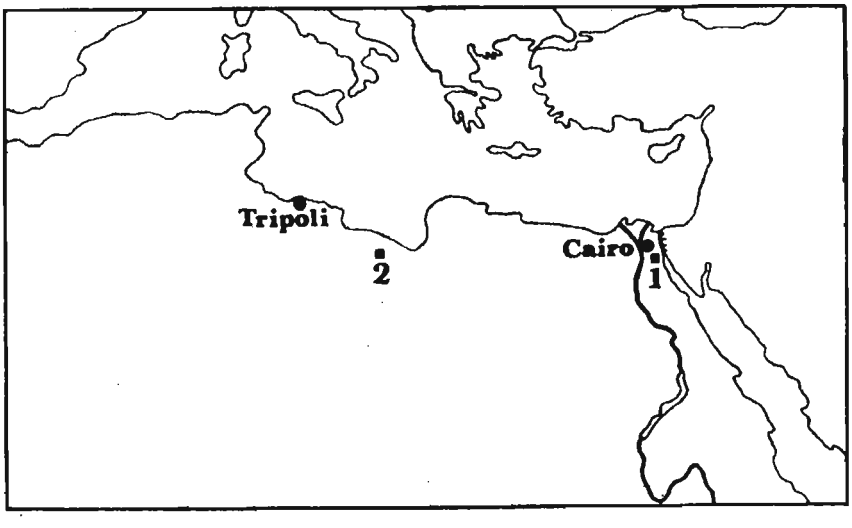


Fig. 1. Location of the North African sites discussed in the paper: *1* — western coast of the Gulf of Suez (Egypt), *2* — Sirte Basin (Libya).

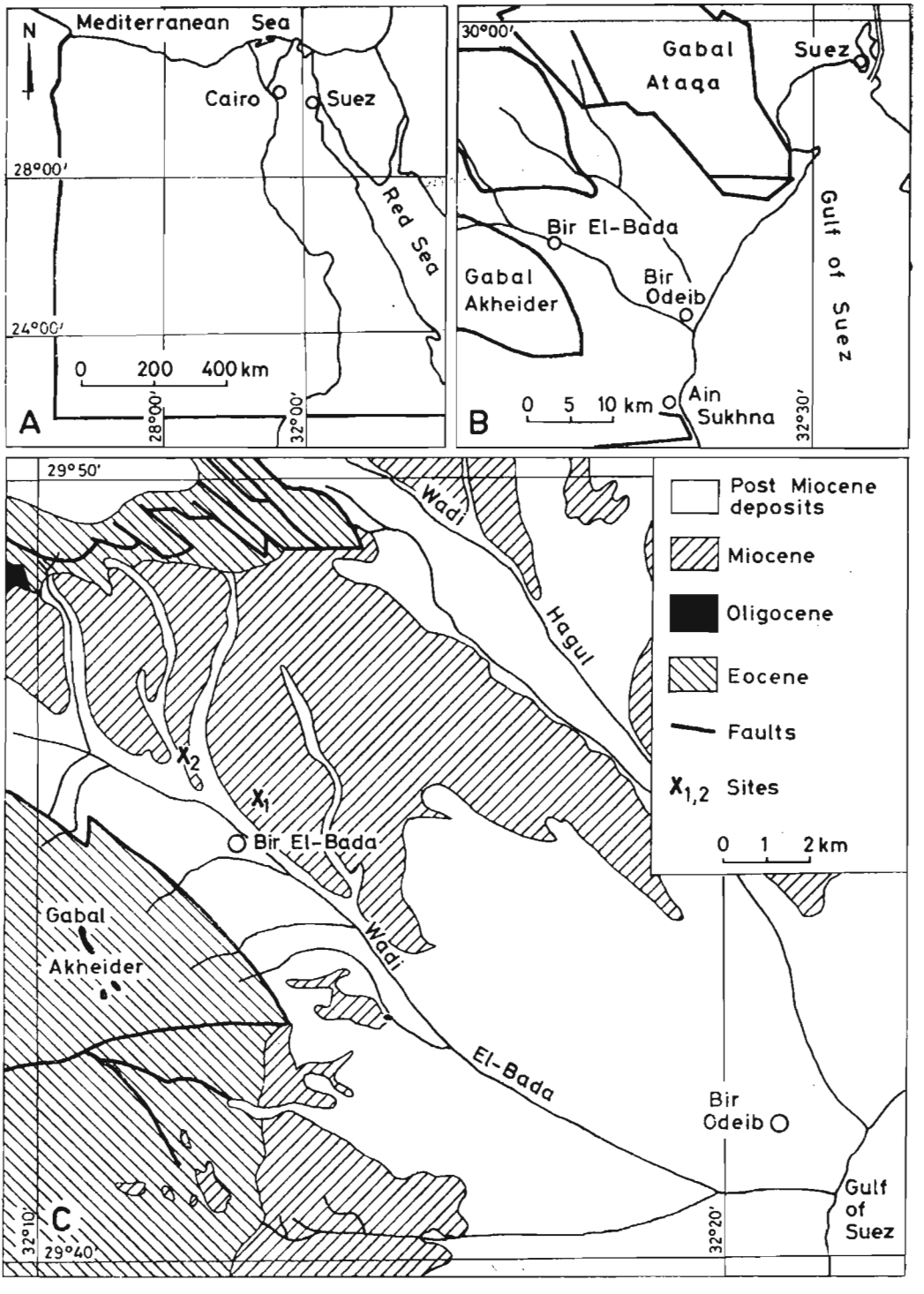


Fig. 2. Location of the studied sections x_1 and x_2 in western coast of the Gulf of Suez (Egypt): *A*, *B* — location maps, *C* — geologic map after Sadek, 1926, modified.

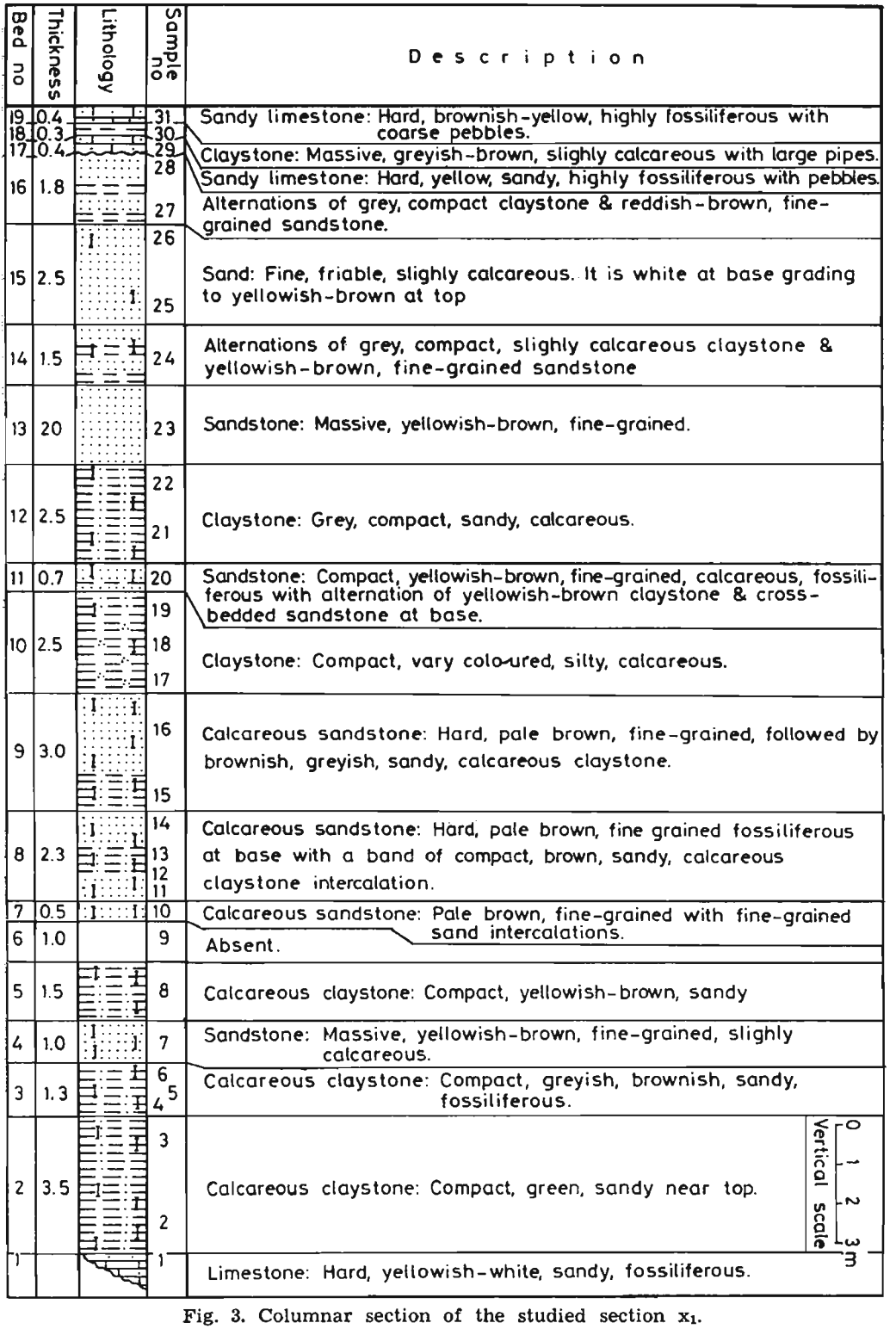


Fig. 3. Columnar section of the studied section x_1.

Two sections executed in Bir El-Bada area have been examined (figs. 2: x_1, x_2, 3, 4). The first section (x_1) lies to the north of Bir El-Bada, about 13 km from Bir Odeib on the western side of the Gulf of Suez. The section was sampled along the eastern cliff of a quarry (latitude 29° 45′ 57″ N, longitude 32° 13′ 7″ E) belonging to a cement plant. The second section (x_2) (latitude 29° 46′ 3″ N, longitude 32° 12′ 7″ E) lies 2 km to the north-west of the first section.

The first section, 28.7 m thick, is composed mainly of calcareous claystones and calcareous sandstones except its base which is a limestone bed and the uppermost part which contains two limestone bands (fig. 3). The second section, 4.5 m thick, contains a claystone bed followed by limestone (fig. 4).

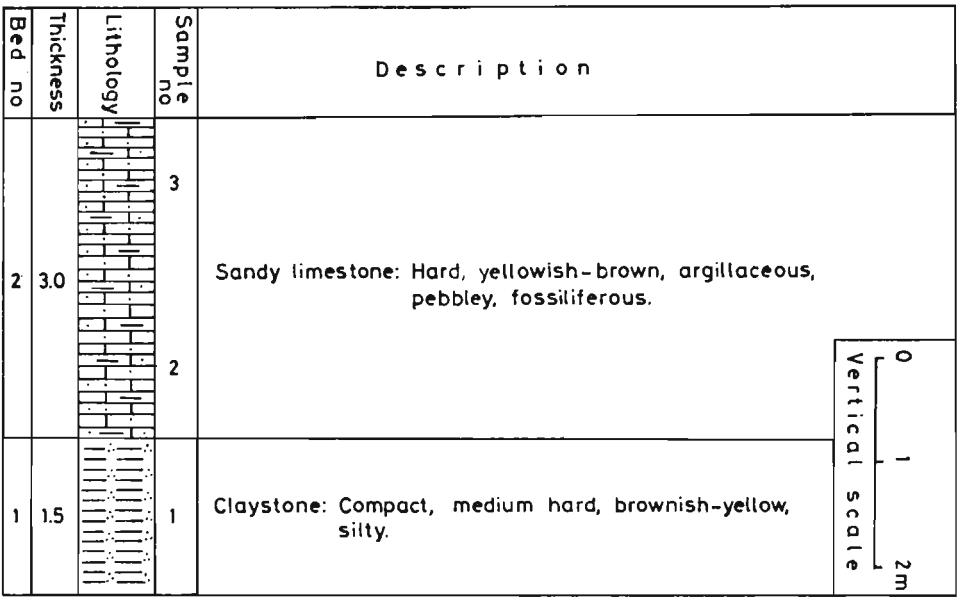


Fig. 4. Columnar section of the studied section x_2.

The microfaunal residue of the x_1 profile comes from the samples numbered: 1, 4, 5, 6, 7, 8, 10, 11, 12, 14, 29, 30, 31, however only the samples: 1, 4, 5, 6, 7, 8, 29, 30, 31 contain identifiable microfauna.

The microfauna of x_2 profile has been identified from the samples numbered: 1, 2, 3.

The microfauna from Libya taken for comparison comes from exposures in the northern part of Central Libya (Sirte Basin) (fig. 1) from the Marada Formation (El-Hawat 1980). The main part of the material was found in an outcrop situated between Marada Oasis and Dahra Oil Field, approx. coordinates 18° 47′ 00″ E and 29° 27′ 00″ N. There are exposed

conglomerates with concretions and fine yellowish, somewhat silty limestone with oysters on the weathered surfaces, and with fractures filled with salt. Conglomerates and limestones are 1,5 m thick and overlie calcareous siltstone with salt.

AGE OF THE STUDIED MICROFAUNA

Historical

The Miocene sediments of Egypt, just like in other parts of North Africa, were formed mainly in shallow seas. Their lateral and vertical diversity complicated by simultaneous tectonic activity allowed to separate provinces of characteristic types of sedimentation, tectonics and their own stratigraphy (cf. Youssef *et al.* 1971).

It is maintained (Salem 1976, Ali 1984) that Miocene sedimentation in Egypt took place in two separate basins, i.e. Western Gulf basin, comprising the north part of the Western Desert area, and Eastern Gulf basin, relatively deeper, comprising Cairo-Suez and Gulf of Suez regions — both within Eastern Desert. The two basins are separated by the present area of the Nile delta.

The existing stratigraphy of the Egyptian Miocene in each of the regions was based mainly on the lithology and sequence of strata and different authors interpreted their age in different ways. The study of foraminifera did not help in determining the exact age of the sediments either, especially in areas lacking planktic taxa.

The age of the sediments in question has been identified in different ways as well. Sadek (1926, 1959) in his division of the Miocene rocks in the Gulf of Suez referred the Miocene strata in the area considered to his middle unit (Middle Series). The unit is essentially clastic in character with limestone intercalations. On the basis of the microfauna he assigned it to the Middle Miocene (Vindobonian). Abdallach and Abd-El Hady (1966) introduced the Hommath Formation, comprising the middle unit (i.e. Middle Series composed mainly of sandstones and shales), to their classification of the exposed Miocene in the nearby Sadat area and referred it to Vindobonian. In 1971 these authors, on the basis of macrofauna and sedimentation conditions, accepted Middle Miocene age for the Hommath Formation. Youssef *et al.* (1971) introduced another informal classification and considered Hommath Formation to be equivalent to their Rock Unit IV, referring it to the Upper Miocene (Tortonian) basing on macrofaunal and foraminiferal elements. It is interesting that in the biostratigraphy of the Miocene sediments of SE part of Eastern Desert, Youssef *et al.* (*l.c.*) make use of the distribution of large foraminifera, among others *Borelis (B.) melo*. This species, according to them, is present in Upper part of their Rock Unit III, i.e. Sadat Formation, referred

to the Middle Miocene (Helvetian), and does not occur in the overlying sediments, i.e. Rock Unit IV (Hommath Formation).

Foraminifera

The microfauna studied here comes from sediments which continue with those of the Hommath Formation. Since *Borelis melo* is present here the age of this formation, wouldn't be Tortonian as was proposed by Youssef *et al.* (*l.c.*).

In the examined Miocene samples of Egypt and Lybia *Borelis melo* is very rare, most probably because it is by a facies controlled species (Adams *et al.* 1983, Hottinger 1983 and the senior author's observation), and thus is dependent on the local sedimentation conditions which do not always favour it.

Borelis melo (being sometimes wrongly determined as was stated by Adams *et al.* 1983) has been used as an indicator of the Middle Miocene in the Eastern Desert area (Youssef *et al.* 1971) and in the Western Desert area (Hassanein and El-Senussi 1983) in Egypt, as well as in some other North African countries e.g. Libya (Salem and Spreng 1980) and Tunisia (Bismuth, pers. information). In the latter country *B. melo* has been found recently in the Upper Miocene (Bonaduce *et al.* 1985). *B. melo* is mentioned (among other microfauna) from the Upper Miocene (Messinian) of Algeria (Guernet *et al.* 1984), the Upper Miocene (Tortonian) of Spain (Colom 1985) and Pliocene (Pontian) of Greece (Gramann 1969). It is also described from the Middle and Upper Miocene of Yugoslavia (Badenian and Sarmatian: Gagić 1981). According to Adams *et al.* (1983) the species appeared in the Mediterranean region as early as the Lower Miocene (Burdigalian). Thus, the importance of *B. melo* for the stratigraphy of the Mediterranean and Egypt Miocene sediments seems to be overestimated, especially when there is no other valuable stratigraphical marker. Innocenti and Pertusati (1984) also point to the fact that in estimating the age of Marada Formation (Sirte Basin), containing *B. melo* and falling within the Middle Miocene, the presence of this species in the Upper Miocene outside Libya has not been taken into account.

The Miocene sediments in question are often found to contain *Amphistegina* cf. *vulgaris*. It is very similar to *Amphistegina* common in Miocene sediments of Tethys and Paratethys, referred to *A. lessoni*. The true *A. lessoni*, however, like *A. radiata* (according to Larsen 1978), appears in the Mediterranean as late as in the Pleistocene, whereas the "*A. lessoni*" mentioned above is considered known from the Eocene to the Recent (Andreieff *et al.* 1974). Therefore, although it is being used, among others, in the biostratigraphy of the Egyptian Miocene, it seems to have only local, ecostratigraphical significance. According to Hassanein and El-Senussi (1983), besides *A. radiata*, it is characteristic of the Middle Miocene of the northern part of Western Desert.

Small benthic foraminifera, co-occurring with the large ones in the Egyptian sections examined here, do not seem to have any stratigraphical significance either. Only *Mississippina neagui* seems to be restricted (at least outside Egypt) to the Middle Miocene. It is known, however from only two places outside Egypt.

The foraminifera from the similar samples from Libya, except *Borelis melo*, are mainly small benthic forms just like in Egypt having no stratigraphical significance.

Ostracodes

X_1 and x_2 profiles contain similar ostracodes, i.e. have common species and therefore, they are considered synchronous, though in x_2 ostracodes are much less frequent and taxonomically less diversified.

The forms recognized here are mainly of doubtful systematic position or are new species, thus having no significance for age interpretation. No taxonomic doubts arise as to the following forms: *Pokornyella minor*, *Cytherella libyaensis*, *Keijella africana*, *Cnestocythere truncata*, *Incongruellina rotundata*, *Loculicytheretta libyca*, *Ruggieria tetraptera tetraptera*, *Chrysocythere cataphracta cataphracta*, *Hermanites haidingeri* and *Falsocythere maccagnoi*; most of them are significant for the biostratigraphy of Miocene sediments.

Pokornyella minor is considered a form occurring only in the Lower Miocene; *Loculicytheretta libyca* is known from the Lower Miocene of France and Middle Miocene of Tunisia, *Chrysocythere cataphracta cataphracta*, in the Mediterranean area, appears as late as in the Upper Miocene similarly as *Cytherella libyaensis* and *Keijella africana*, which occur in Libya in beds referred to the Late Miocene; *Falsocythere maccagnoi* is unknown from sediments older than the Pliocene ones. Moreover, almost all new species described by Coutelle and Yassini (1974) from the Lower Miocene of NE Algeria (i.e. *Buntonia* (*Quasibuntonia*) *bezorgniai*, *B.* (*Q.*) *vigneauxi* (both referred here to *Keijella*), and *Aurila soummamensis*) seem to occur in the samples of Egypt and/or Libya.

Therefore, on the basis of ostracodes, like in the case of foraminifera the age of the Egyptian fauna cannot be precisely determined. It seems reasonable, however, to date it although with reservation, as the Middle Miocene — i.e. the average of the ages indicated by the species mentioned.

The Libyan samples contain about 70 per cent of the ostracode species found in the samples from Egypt, including all discussed above significant for the Miocene biostratigraphy. The authors, therefore, think than both faunas are synchronous. In Libya, there are more species characteristic of the Lower and Middle Miocene, and this seems to confirm the fauna's Middle Miocene age rather than the Upper Miocene one. The species in question are *Ruggieria micheliniana* (Bosquet, 1852) and *Paleocosta ocel-*

lata Ciampo, 1971. Their absence in Egypt, if we assume the similar age of the fauna, may be due to different environmental conditions. A detailed study of Libyan species not mentioned here may provide us with more data.

For the examined samples from Egypt and Libya the following species are considered most characteristic: *Neomonoceratina ruggierii* sp. n., *N. keiji* sp. n., *Hemicyprideis aegyptica* sp. n., *Miocyprideis* cf. *italiana*, *Cytherella libyaensis* sp. n., *Cytherelloidea sissinghi* sp. n., *Loculicytheretta libyca*, *Keijella* cf. *fusa*, *Chrysocythere cataphracta cataphracta*, *Cistacythereis* cf. *caelatura* and *Incongruellina rotundata*.

ENVIRONMENTAL INTERPRETATION

Variable lithology of the sediments with microfauna in the sections examined (figs. 3, 4) indicates shallow water and turbulent conditions of sedimentation. According to Youssef *et al.* (1971 l.c.: 125) in the Gulf of Suez region "... the Miocene sediments were laid down in a basin particularly complicated by syn-deposital fault movements".

Also the composition of the microfauna acquired from the samples, generally very similar in both sections as well as its preservation state indicate a shallow water, pericoastal, rough, but normal marine environment.

Foraminifera

Foraminifera in the individual samples (figs. 3, 4) are scarce, poorly diversified taxonomically and rather poorly preserved; they are often broken, abraded, often preserved only as moulds. Because it is difficult to extract them from the rock, as well as due to their small diversity the species spectrum of foraminifera is probably accidental. Their upper neritic character is indicated by lack of plankton, and by the presence of some *Elphidium*, *Ammonia* (*A. beccarii*), *Eponides* (*E. repandus*), *Mississippina* (*M. neagui*), *Textularia*, *Pararotalia* (*P.* cf. *armata*), *Borelis* (*B. melo*), *Amphistegina* (*A.* cf. *vulgaris*) and miliolids; *Hanzawaia boueana* is rather an ubiquitous form. *Pararotalia*, *Amphistegina* and *Borelis* prefer very warm, and normal marine, non-turbid, reefal environment (Boltowskoy and Wright 1976, Murray 1976).

Evident dominance of one species (*A. beccarii*) in almost all samples, just as the low frequency of foraminifera in the samples confirms unfavourable conditions for their development. As *Ammonia beccarii*, occuring here, belongs to the type *parkinsoniana*, its turbulent environment is very probable (Hageman 1979, Liebau 1981).

Very small differences in the species composition of the individual samples suggest that the environmental conditions were constant during formation of the examined sequences of strata. An exception is the sample number 29 (claystone), in the upper part of the x_1 profile, which contains only *Ammonia* ex gr. *beccarii*, relatively numerous but very fine and thin-shelled. This suggests a short-lasted lowering of salinity and/or an exceptional activity of the tidal currents which may have washed out and accumulated small suspended forms (Broekman 1974) transported from rather restricted conditions.

The samples from the Sirte Basin, slightly differing from one another in species composition of foraminifera, also contain exclusively shallow water and mostly phytophilous reefal forms. These represent the following genera: *Elphidium*, *Nonion*, *Rosalina*, *Triloculina*, *?Quinqueloculina*, *Ammonia* (*beccarii* and *parkinsoniana*), *Pararotalia* (*P.* cf. *armata*), *Neoconcrbina* (*N. terquemi*), *Discorbis* (div. sp.), *Bolivina*, *Hanzawaia* (*H. boueana*), *Eponides* (*E. repandus*), *?Verneuilina*, *Textularia*, polimorphinids, *Amphistegina* (*non A.* cf. *vulgaris*), *Calcarina*, *Heterostegina*, *Borelis* (*B. melo*) (the last three extremely rare) etc. Unrecognizable globigerinids are very fine and scarce (one sample). Generally greater diversity and density of foraminifera in the Sirte Basin samples seem to indicate more favourable environmental conditions (quieter and at least periodically in contact with open sea) than near the Gulf of Suez.

El-Hawat and Salem (1987) describe the Middle Miocene sediments of the Sirte Basin as "open shelf reefal facies associations", in contrast with the Upper Miocene — "shoals and evaporating restricted lagoonal associations".

Ostracodes

The ostracodes discussed in the present paper come mainly from x_1 section, where — especially in some of the samples (cf. p. 277) — they are relatively numerous and often well preserved. The presence of the same, similarly preserved taxa in both sections x_1 and x_2 suggests similar environmental conditions.

The absence of ostracodes in the sample 29, x_1 section, where foraminifera are exceptionally abundant (see above), indicates a short-lasted but dramatic change of environmental conditions.

The taxonomic compositions of the assemblages in individual samples differ only slightly (Table 1). They vary mainly in quantities of the individual taxa. It must be taken into account, however, that in the samples examined ostracodes are generally scarce, and larger samples would probably show a different picture.

The preservation state and composition of the material show that ostracodes do not represent a paleobiocenosis. The material generally lacks

juvenile individuals. Moreover, numerous species are represented by a single individual or just a few ones. The evident domination of a few species in the assemblages, especially in x_1 profile, as well as their general low frequency suggest unfavourable (rather peculiar) conditions for the development of ostracodes. Adult and complete carapaces (Table 1) clearly dominate, probably as a result of the drastic selective sorting due to the high energy currents, and/or rapid sedimentation (Whatley 1983, Broekman 1974, van Harten 1986). It cannot also be excluded that the present preservation state of the ostracodes (including their population structure) is an effect of diagenetic process which destroyed ostracode remnants, first of all, isolated valves, especially those small and thin, i.e. representing juvenile individuals. The presence of numerous moulds confirms this assumption.

A shallow-water (inner-neritic), warm-water and pericoastal environment of the ostracodes is confirmed by the presence of the following genera: *Neomonoceratina*, *Loculicytheretta*, *Cytheretta*, *Paracytheridea*, *Falsocythereis*, *Xestoleberis*, *Cnestocythere*, *Semicytherura*, *Loxoconcha*, *Aurila*, *Hermanites*, *Falunia*, *Hemicyprideis*, *Pokornyella*, *Cushmanidea*, *Paradoxostoma* and *Protocytheretta*. Coarsely ornamented *Cytherella* also seems to be characteristic of the shallow-water environment. Representatives of some of the genera mentioned are known, moreover, as phytophilous forms (Morkhoven 1963, Carbonnel 1969, Bonaduce *et al.* 1975, Peypouquet 1977, 1980, Bismuth *et al.* 1978, Yassini 1979, Carbonel 1980).

In almost all samples, especially from x_1 section, (Table 1) representatives of three to four species dominate, i.e. *Keijella* cf. *fusa*, *Ruggieria tetraptera tetraptera*, *Incongruellina rotundata* and *Chrysocythere cataphracta cataphracta*. Unfortunately, none of these species lives today to show its environmental preference. Occurrence of these species (or genera) in the past shows that: *Ruggieria tetraptera tetraptera* may occur on the entire shelf (McKenzie *et al.* 1979, Nascimento 1983, Yassini 1979*a*), according to Carbonel *et al.* (1981), however, *Ruggieria* prefers the circalitoral conditions; *Incongruellina* prefers the outer shelf (Yassini 1979*a*, Morkhoven 1963), but is known also from the shallow water (infralittoral) environment (Sissingh 1976); *Keijella*, whose environment is exceptionally poorly known, is present in fossil ostracode assemblages characteristic of rather shallow-water environment (Doruk 1979); in Kuwait Bay Recent *Keijella* is most numerous at the depth of 22 to 94 metres (Al-Abdul Razzaq *et al.* 1983); species of *Chrysocythere*, according to Carbonel and Cirac (1978) may exist on the entire shelf, but below the wave action; sometimes they prefer the circalittoral environment (Carbonel *et al.* 1984).

As the assemblages discussed are dominated by the four ostracode species which may come from the lower part of the shelf, it is doubtful if these assemblages are autochthonic.

Recent *Chrysocythere* species distribution along the Senegalese coast (Farmer 1983) has proved that they prefer deeper-water conditions (the outer shelf) with seasonal upwellings. This has led Farmer and Carbonel (1984) to assume, that this genus could have lived in similar conditions in the past and therefore may confirm the existence of upwellings in paleoenvironment. Upwellings lead to the mixing of deep-water and shallow-water faunas. According to Llano (1981) they may transport faunas from deeper zones of a sedimentation basin towards its coastal parts. Could the microfauna of the Egyptian Miocene be, therefore, of such origin?

In the Libyan samples, especially in the most prolific ones, the density of ostracodes is much greater than in the samples from Egypt. The Libyan samples contain both adult and juvenile individuals, separate valves, as well as, complete carapace, the latter dominating over the former. Moreover, there occur sets of a number of valves of various taxa compiled over one another undoubtfuly in a mechanical way; they are in general badly preserved. Ostracode assemblages usually exhibit a high frequency of some species. The dominating forms are the shallow-water ones, especially: *Miocyprideis*, *Neocyprideis*, *Loculicytheretta*, *Neomonoceratina*, *Paijenborchellina*, *Aurila*, *Loxoconcha* and *?Mediocypris*. It seems that the ostracodes from the Sirte Basin lived in more quiet and shallow-water conditions than those from the Gulf of Suez region. They were, however, exposed to, at least, small waving or turbulence. The presence of the representatives of *Paleocosta*, *Kangarina* and *Krithe* suggests contact with open sea.

In the samples from the Gulf of Suez region and Sirte Basin occur strongly pitted (even reticulate) specimens belonging to *Miocyprideis* and *Cytherella*, particularly the second genus is considered a deep-water one. The ornamentation of the *Cyprideis* valve (and probably *Miocyprideis*), according to Carbonel (1982) depends on the salinity of environment. Strongly ornamented forms occur in the environment of growing salinity. Perhaps *Cytherella* responds to chemical features of its environment in a similar way?

PALEOGEOGRAPHICAL CONCLUSIONS

Foraminifera

The main part of foraminiferal species recognized seems to have no significance for the Miocene paleogeography. Exceptions here are *Mississipina neagui* and *Borelis melo*, which, especially in the Middle Miocene, are known not only from South Europe and North Africa, but also from the northern border of the Paratethys and suggest connections

between these areas, probably through South-East Europe. *Amphistegina*, present in the Egyptian samples and described here as *A.* cf. *vulgaris* (cf. p. 323), may have a similar significance. *Borelis melo* is also known from the older Miocene of the peri-Indo-West Pacific area (Adams *et al.* 1983), suggesting that favourable conditions for its development and propagation — i.e. warm and shallow seas — existed in the area of the Middle East as far as the North-West part of the Indian Ocean.

Ostracodes

Among the ostracode genera from the Miocene of North Egypt and, to a smaller degree, Central Libya, dominate cosmopolitan genera, of wide geographical distribution; some of them e.g. "*Hermanites*", *Protocytheretta*, *Cnestocythere*, *Falunia*, *Xestoleberis* and *Loxoconcha*, are represented by species known from the Miocene of not only South Europe but also Paratethys. Only *Chrysocythere*, *Cistacythereis*, *Falsocythereis*, *Keijella*, *Loculicytheretta*, *Paijenborchellina* and *Ruggieria* occur (in the Miocene and later) mainly in the Mediterranean region; also *Neomonoceratina* is largely diversified and common, first of all, in this area. Almost all of the genera mentioned occur in the Miocene of both sides of the Mediterranean Sea (including Turkey) and in SE Atlantic border (Gabon). Moreover, *Chrysocythere* and *Ruggieria* representatives are mentioned from the Neogen of Ethiopia (Gramann 1971) and *Ruggieria* is recorded from Miocene of Burma (Gramann 1975). These genera, however, are represented there by completely different species and this means that the migration of ostracodes between these areas was very rare as propagation barriers must have existed. We should remember, however, that ostracodes are organisms exceptionally sensitive to environmental changes and their generally benthic way of life, reproduction and ontogeny do not favour a wide geographical distribution. Due to this ostracodes usually have narrower distribution than the co-occurring foraminifera.

According to Khalaf (1983) the Middle Miocene ostracodes of N. Iraq resemble both the Mediterranean and Indopacific bioprovinces. He maintains that: "... northern Iraq, and NS-SW Iran represent and intermediate Zone between Tethyan Mediterranean and Tethyan Indopacific" (l.c. p. 427).

The ostracode microfauna contains about 70 per cent common species in the studied presumably Middle Miocene sediments from the Eastern Desert area and the Sirte Basin. This resemblence is surprising against the results of the studies on the Miocene echinoids of Egypt (Ali, 1984); they show rather faint resemblance to the echinoids of the same age from Libya.

Distribution of the "Mediterranean" ostracode genera shows that North Africa with its West coast was the "cradle" of many of them, particularly, *Chrysocythere*, *Falsocythere*, *Cistacythereis*, *Ruggieria*, *Keijella*, *Incongruellina* and *Loculicytheretta*, and that they reached South Europe *via* the Middle-East (Turkey?).

DESCRIPTIONS

Subclass **Ostracoda** Latreille, 1806

Systematics after Hartmann and Puri 1974.

Order **Podocopida** G. W. Müller, 1894
Suborder **Platycopa** Sars, 1866
Family **Cytherellidae** Sars, 1866
Genus *Cytherelloidea* Alexander, 1929
Cytherelloidea sissinghi Szczechura sp. n.
(pl. 2: 8—10, 13)

Holotype: ZPAL XXXI/1; pl. 2: 8.

Type horizon: Hommath Formation (?Middle Miocene).

Type locality: outcrop situated north of Bir El Bada, north of Gabal Akheider, western side of the Gulf of Suez.

Derivation of the name: *sissinghi* — in honour of the famous ostracodologist dr. W. Sissingh.

Material. — Two adult carapaces from the Hommath Formation, western side of the Gulf of Suez (Egypt), and numerous specimens from the Marada Formation, Sirte Basin (Libya).

Diagnosis. — *Cytherelloidea* with admarginal ridge-like inflation along the free margin, best developed at the posterior end. Foveolate ornamentation of the lateral sides, except the muscle field area, is limited outwards by the admarginal ridge-like inflation. Weak net-like ornamentation occurs along the posterior margin.

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/1 holotype, aC	O.XXXI/15 aC
Length	0.72	0.73
Height	0.39	0.42
Width	0.29	0.29

Description. — Carapace much compressed laterally, somewhat enlarging posteriorly, subrectangular in lateral outline, with broadly rounded posterior and anterior margins. Distinct ridge-like inflation runs along the free margin, disappearing below the middle part of the dorsal margin; it is especially well developed along the posterior margin. Lateral sides with foveolate ornamentation absent in the muscle field area and limited externally by the ridge-like inflation. Most admarginal

area smooth, however, a weak net-like ornamentation may occur along the posterior margin.

Variability. — It concerns mostly the size of specimens and their ornamentation which is variably developed (or preserved) on lateral sides of carapaces.

Remarks. — *Cytherelloidea sissinghi* sp. n. seems to resemble most *C. cretensis* Sissingh (1972*a*) described from the Upper Miocene of Crete, differing from it mostly in ornamentation, i.e. in the absence of the gross ornamentation outside the ridge-like inflation. Moreover in *C. sissinghi* there are no distinct depressions bordering internally the elevated morphological relief which is typical of *C. cretensis*.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Genus *Cytherella* Jones, 1849

Cytherella libyaensis El-Waer, 1988

(pl. 2: 11, 14, 15, ?12)

1988. *Cytherella libyaensis* El-Waer: 45, pl. 1: 1—3.

Material. — Four adult carapaces, rather well preserved, from the Hommath Formation, western side of the Gulf of Suez (Egypt), and numerous specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/16 aFC	O.XXXI/19 aMC
Length	0.78	0.65
Height	0.47	0.35
Width	0.34	0.23

Description. — Carapace compressed laterally, gently enlarging towards the posterior end when seen dorsally, subovate in lateral outline, highest posteriorly at 2/3 of the length. Posterior margin more broadly rounded than the anterior one. Dorsal and ventral margins almost straight, indistinctly tending to coincide anteriorly. Valve surface, except the most admarginal area, coarsely pitted or foveolate; pits to a small extent diminish their size in distal parts of carapace. Muscle scars field marked by less distinct ornamentation and small deepening. The species seems to be sexually dimorphic: in comparison with the above described, probably female forms, males are more compressed laterally and truncated posterodorsally, having ornamentation distinctly disappearing close to the valve margin. The here suggested sexual dimorphism of that species markedly differs from that presented by El-Waer (1988); larger material seems to be necessary to explain it.

Variability. — It concerns mostly the size and ornamentation of specimens; they are more or less distinctly ornamented, pitted or foveolated, probably because of the different state of their preservation.

Remarks. — Specimens referred to *Cytherella libyaensis* resemble, mostly in their ornamentation, representatives of *Cytherella alvearium*, the species described from the Adriatic Sea by Bonaduce *et al.* (1975) being, however, in contrast to that species, higher posteriorly than anteriorly.

Occurrence. — Al Khmus Formation (Late Miocene), NW Libya, Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin, (Libya).

Cytherella sp.
(pl. 2: 2, 7)

Material. — Two adult carapaces from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/11	O.XXXI/12
	aFC	aMC
Length	0.73	0.65
Height	0.52	0.39
Width	0.36	0.26

Remarks. — The collected specimens, referred to *Cytherella* sp., appear to be sexually differentiated representatives of one species; its taxonomic position, however, is difficult to determine. It resembles *Cytherella inaequalis*, a species described by Moyes (1965) from the Lower Miocene of SW France (especially its female representative), but, is higher and more truncated posterodorsally. In comparison with *C. terquemi* Sissingh (1972*a*), from Pliocene of the Aegean islands, the female representative (the only comparable with *C. terquemi*) of the species from Africa seems to be higher posteriorly and more narrowly rounded anteriorly, in lateral side.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Suborder **Podocopida** Sars, 1866
Superfamily **Bairdiacea** Sars, 1888
Family **Bairdiidae** Sars, 1888
Genus *Bairdia* McCoy, 1844
Bairdia cf. *triangulata* Edwards, 1944
(pl. 5: 14)

Material. — Two adult carapaces, 7 juvenile carapaces and 2 adult valves from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/61
	aRV
Length	0.91
Height	0.47

Remarks. — Specimens assigned to *Bairdia* cf. *triangulata* differ enough in shape and size to suppose they represent more than one species. The scarcity of the material, however, does not allow us to separate them. Specimen figured on pl. 5: 14 appear very similar to that recorded by Moyes (1965) from the Oligocene and Miocene of SW France and named as *Bairdoppilata triangulata*. It differs, however, in being somewhat more elongated and more pointed posteriorly.

Bairdoppilata triangulata was established by Edwards 1944, for species from the Miocene of North America.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Superfamily **Cytheracea** Baird, 1850
Family **Cytheridae** Baird, 1850
Subfamily **Cytherinae** Baird, 1850
Tribe **Schizocytherini** Mandelstam, 1960
Genus *Cnestocythere* Triebel, 1950
Cnestocythere truncata (Reuss, 1849)
(pl. 5: 11, 12)

1849. *Cypridina truncata* Reuss: Catalogue of Ostracoda, suppl. 4, 1966.
1962. *Cnestocythere truncata* (Reuss); Ruggieri, 54, pl. 6: 10, 11.
1963. *Cnestrocythere truncata* (Reuss); Morkhoven, 124, fig. 183a—c.
1965. *Cnestocythere truncata* (Reuss); Moyes, 25, pl. 3: 6.
1978. *Cnestocythere truncata* (Reuss); Brestenská and Jiřiček, pl. 1: 13.
1986. *Cnestocythere truncata* (Reuss); Szczechura and Pisera, pl. 1: 1.

Material. — One adult, complete carapace and 4 adult valves, rather badly preserved, from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/58	O.XXXI/59
	aLV	aRV
Length	0.57	0.57
Height	0.34	0.39

Remarks. — Specimens referred to *Cnestocythere truncata* seem to fall within variation of that species, described by Reuss, 1849, from the Middle Miocene of the Central Paratethys (Vienna Basin).

Occurrence. — *Cnestocythere truncata* is known from the entire Miocene, from the Central Paratethys and the Aquitanian Basin as well as from the Mediterranean area up to now only of its northern border. It occurs in the Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Family **Cytheridae** Baird, 1850
Subfamily **Cytherinae** Baird, 1850
Tribe **Paijenborchellini** Deroo, 1960
Genus *Neomonoceratina* Kingma, 1948
Neomonoceratina keiji Szczechura sp. n.
(pl. 8: 2—7, 10, 11)

Holotype: ZPAL O.XXXI/103; pl. 8: 6.

Type horizon: Marada Formation, ?Middle Miocene.

Type locality: outcrop in the northern part of Sirte Basin (Central Libya), between Marada Oasis and Dahra Field.

Derivation of name: *keiji* — in honour of the known ostracodologist dr. A. J. Keij.

Material. — One adult, male carapace from the Hommath Formation, western side of the Gulf of Suez (Egypt), and numerous specimens from the Marada Formation, Sirte Basin (Libya).

Diagnosis. — Carapace typical of *Neomonoceratina*, moderately and rather equally inflated laterally, with a weakly marked main ribs. A faint rib runs downwards from the eye tubercle and parallels the anterior margin. Another rib occurs in the posterodorsal part of the carapace parallelly to the margin. Of the two ribs on the ventral side the internal one is longer. Intercostal areas, mostly in the upper part of carapace, indistinctly and obliquely ribbed.

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/103 holotype, aFC	O.XXXI/106 aMC
Length	0.57	0.70
Height	0.36	0.52
Width	0.31	0.34

Description. — Carapace subovate in lateral view, narrowly rounded anteriorly, while provided with a short subdorsal, caudal process posteriorly; anterior and posterior margins slightly thickened. Dorsal and ventral margins somewhat coinciding posteriorly; the latter being a little concave at the middle. Eye tubercle weakly marked, with a faint rib crossing it, then running downwards and disappearing above the middle rib. Anterior as well as the posterior cardinal angles poorly developed. Lateral inflation, equal and moderate, in its lower part is bounded by a faint lateroventral rib, sharply ended posteriorly. A similar but longer rib occurs between the former rib and the ventral margin. Median rib long, extending from the anterior margin up to the posterior part of the carapace, and continuing over the sulcus. Another, bent rib runs closely to the posterodorsal margin. In front of the upper part of sulcus there is a small, tubercle-like valve inflation. The surface of carapace, especially its lower part, almost smooth; intercostate areas of the upper part of carapace generally faintly and obliquely ribbed.

Duplicature moderately wide, without vestibulum. Hinge margin amphidont/ /schizodont, with a median part of the left valve containing an anteromedian tooth situated lower than the bar. Muscle scars invisible.

Distinct sexual dimorphism is expressed in size, shape and ornamentation of carapaces. Males, longer and more inflated posteriorly than females, have additional ornamentation, i.e. faint ribs tending to be parallel to the valve margin, in the posterior part of carapace.

Variability. — It concerns mostly the details of ornamentation, as well as, the size of specimens. Differences may result from the different state of preservation of specimens.

Remarks. — Specimens assigned to *Neomonoceratina keiji* are similar to those described by Ishizaki and Kato, 1976 (see Catalogue of Ostracoda), from the Quaternary of Japan as *N. delicata*. They are, however, more equally inflated and somewhat differ in the details of ornamentation. In comparison with representatives of *Paijenborchella galerita* (kindly sent to the author by dr. W. A. van den Bold), described from Miocene of Gabon, specimens from N. Africa have ornamentation much more distinct and differing in pattern

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Neomonoceratina ruggieri Szczechura sp. n.

(pl. 8: 1, ?8, 9, 12—15)

Holotype: ZPAL O.XXXI/94; pl. 8: 12.

Type horizon: Hommath Formation (?Middle Miocene).

Type locality: outcrop situated north of Bir El Bada, north of Gabal Akheider, western side of the Gulf of Suez.

Derivation of the name: *ruggieri* — in honour of the known ostracodologist Prof. Giuliano Ruggieri.

Material. — Eighteen adult carapaces, 1 juvenile carapace and 2 adult valves from the Hommath Formation, western side of the Gulf of Suez (Egypt), and numerous specimens from the Marada Formation, Sirte Basin (Libya).

Diagnosis. — *Neomonoceratina* with reticulate and spiny valves; spines best developed posterodorsally and posteriorly. Middle rib crosses the entire valve inflation, being sometimes interrupted over the sulcus. Lateroventral rib protrudes posteriorly in a distinct but short spine, while anteriorly disappears near the valve margin. Ventral rib well developed, shorter than the lateroventral one.

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/94 holotype, aFC	O.XXXI/95 aMC
Length	0.52	0.60
Height	0.36	0.34
Width	0.26	0.26

Description. — Carapace triangularly ovate in lateral view, broadly and rather obliquely rounded anteriorly, while provided with a short, subdorsal caudal process posteriorly. Anterior margin bordered by the frill-like list. Dorsal and ventral margin somewhat coincide posteriorly; the latter being slightly concave at the middle. Eye tubercle well developed, with distinct, crest-like protuberance in front. Anterior and posterior cardinal angles well pronounced. Lateral inflation divided by subcentral, vertical sulcus. The entire surface of the carapace reticulated and spiny. Spines are especially well developed at the posterodorsal and posterior parts of the carapace; a spur-like spine occurs just behind the midlength of dorsal margin; it is especially well pronounced on the right valve. Median rib crosses the entire valve inflation, in some specimens disappearing over the sulcus; it is extending from the anterior margin up to the posterior part of the carapace, where it passes into spines below the posterior cardinal angle. Of the two parallel ribs developed on ventral side, the external one, i.e. lateroventral rib is longer and posteriorly protrudes as a short spine, whereas anteriorly it desappears near the anterior margin.

Duplicature moderately wide, without vestibulum. Hinge margin amphidont/ /schizodont, with median element of the left valve containing an anteromedian tooth lying below the bar. Muscle scar pattern invisible.

Distinct sexual dimorphism is expressed in different size, shape and ornamentation of carapaces representing males and females; males are longer, more inflated posteriorly and less expressively ornamented.

Variability. — It concerns mostly the size and ornamentation of specimens; lateral spines are of different size and shape and may differ in distribution. In some specimens (pl. 8: 8) in front and below the posterior cardinal angle there occurs a triangular crest rather than a spur-like spine. These specimens may represent a separate species.

Remarks. — Specimens referred to *Neomonoceratina ruggieri* seem close to a Recent Pacific species *N. entomon* (Brady, 1980) as figured by McKenzie (1986).

They, however, differ from it, firstly, in being more spiny posteriorly, and secondly, in having two distinct ribs on ventral side. In comparison with *Paijenborchella bastianoi* Bonaduce *et al* (1980), a Recent species from the Red Sea, the specimens examined here have shorter and not upturned caudal process, and have no anterior rib parallel to the anterior margin; the differences concern also the arrangement of their lateral spines. In comparison with *Paijenborchella* (*Eopaijenborchella*) *laskarevi* Krstić et Pietrzeniuk (1972), conspecific with *Neomonoceratina mouliana* Sissingh, 1972 (Sissingh 1974), the specimens referred to *N. ruggierii* are less ovate in lateral outline, more spiny, more distinctly ribbed and their caudal process is shorter.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1 and x_2, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Family **Leptocytheridae** Hanai, 1957
Genus *Leptocythere* Sars, 1925
?*Leptocythere* sp.
(pl. 5: 10)

Material. — One complete, probably adult carapace, somewhat damaged from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/57 ?aC
Length	0.47
Height	0.23
Width	0.23

Remarks. — In general external appearance the specimen resembles the representatives of *Leptocythere*, *Tanella*, *Sylvestra* or *Mediocytherideis*. Its internal features, however, are unknown and it is impossible to decide upon its proper generic assignement. General shape and the type of ornamentation of the specimen from N. Africa resembles, to some extent, those of *Leptocythere arenicola* Triebel 1964, the species known, among others, from the Gulf of Aquaba (Bonaduce *et al.* 1976); representatives of both compared species are provided with the posterolateral rib bounding the valve inflation, dense lateral pitting and ribs close and parallel to the anterior margin. There are small differences in the lateral outline, as well as, the details of ornamentation.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1.

Family **Cytherideidae** Sars, 1925
Subfamily **Cytherideinae** Sars, 1925
Genus *Miocyprideis* Kollmann, 1960
Miocyprideis cf. *italiana* Moos, 1962
(pl. 4: 1—11)

Material. — Eighteen adult carapaces, 1 juvenile carapace and 10 adult valves from the Hommath Formation, western side of the Gulf of Suez (Egypt), and numerous specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No. ZPAL	O.XXXI/24 aC	O.XXXI/30 aRV	O.XXXI/28 aLV
Length	0.68	0.60	0.65
Height	0.42	0.39	0.39
Width	0.26	—	—

Remarks. — Specimens referred to *Miocyprideis* cf. *italiana*, vary considerably in their size, shape and ornamentation. Their characteristic feature (in most specimens) is gross and dense pitting extending over the entire, or almost the entire valve surface, and angulate outline in dorsal view. Their ornamentation seem to be similar to that in *Miocyprideis italiana* Moos (1962), a species described from the Pliocene of Italy, then recognized by Carbonnel and Magné (1977) in the sediments of the same age in Spain. A similar species (according to its ornamentation) referred by Guardia *et al.* (1974) to *Miocyprideis* sp. is recorded from the Upper Miocene (Messinian) of Algeria.

Since it is known that the carapace ornamentation of this group of ostracodes depends greately on environment (Carbonnel 1980, Bodergat 1983) their taxonomy (based on that feature) may be questioned.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

?Miocyprideis sp.

(pl. 2: 1, 3—6)

Material. — Eight adult specimens, including valves and carapaces, from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No. ZPAL	O.XXXI/10 aRV	O.XXXI/9 aC
Length	0.65	0.65
Height	0.23	0.34
Width	—	0.31

Remarks. — Specimens referred to *?Miocyprideis* sp. are markedly varying in size, shape and ornamentation. Some of them seem close to *Miocyprideis* cf. *italiana* Moos (p. 292), although the latter are rather wedge-like in dorsal view, have ornamentation covering the entire valve surface, and almost parallel dorsal and ventral margins. Most characteristic specimens of this form (pl. 2: 1, 6) have parallel and somewhat arcuate dorsal and ventral margins, truncate posterior margin, and a honey-comb like ornamentation extending over the entire valve surface; more or less distinct valve thickening appears along and close to the posterior margin.

Hinge margin (pl. 2: 4) weakly visible, consists of ?denticulate median furrow and terminal protuberances in the right valve, and opposite elements in the left valve. Duplicature moderately wide, widest along the anterior margin, without vestibulum; inner margin subparallel to the valve margin.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Genus *Hemicyprideis* Malz et Triebel, 1970
Hemicyprideis aegyptica Szczechura sp. n.
(pl. 4: 12—15)

Holotype: ZPAL O.XXXI/33; pl. 4: 14.

Type horizon: Hommath Formation (?Middle Miocene).

Type locality: outcrop north of Bir El Bada, north of Gabal Akheider, western side of the Gulf of Suez.

Derivation of the name: Lat. *aegyptica* — occuring in Egypt.

Material. — Two adult carapaces, 4 adult valves and 6 juvenile valves from the Hommath Formation, western side of the Gulf of Suez (Egypt) and a few specimens from the Marada Formation, Sirte Basin (Libya).

Diagnosis. — Kidney-shaped species of *Hemicyprideis* with a weak median sulcus and faint folds-like ribs subparallel and close to the anterior margin, extending as tiny ribs along the ventral margin.

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/33 holotype, aC	O.XXXI/34 aLV
Length	1.00	0.88
Height	0.52	0.52
Width	0.65	—

Description. — Carapace kidney-shaped, highest in front of middlelength, widest posteroventrally. Slight depression occurs posterodorsally along the contact line. Both valves of similar size and shape. Dorsal margin broadly and almost evenly rounded, ventral margin gently sinuate. Anterior and posterior margins rather narrowly and somewhat obliquely rounded. Weak median sulcus occurs in the upper part of both valves. Faint, fold-like irregular ribs, running closely and subparallely to the anterior margin, extend on the ventral side where they are more narrow, i.e. rib-like, and parallel to the valve margin; along the anterior margin tiny dents occur. The entire valve surface similar to that of orange-skin. Variation concerning length: height: width ratio may be a result of the sexual dimorphism.

Duplicature moderately wide, wider anteriorly, without vestibulum. Hinge margin weakly visible, seems to be, however, typical of the genus, i.e. consits of terminally enlarging furrow in the left valve. Other internal features invisible.

Remarks. — Specimens referred to *Hemicyprideis aegyptica* sp. n. resemble mostly those assigned to *H. miocenica* (Lienenklaus, 1905), as figured by Malz and Triebel (1970), having however more sloping antero- and posterodorsal margins, sinuate ventral margin and slightly different ornamentation. In comparison with *H. intercedens* Malz (1978), specimens from Egypt and Libya have more arched dorsal margin and sinuate ventral margin, and less delicate ornamentation. Both species (compared to *H. aegyptica* sp. n.) occur in the Tertiary of the Mainz Basin (Western Germany).

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1 and x_2, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Family **Cushmanideidae** Puri, 1973
Genus *Pontocythere* Dubovsky, 1939
?*Pontocythere* sp.
(pl. 9: 14—16)

Material. — One adult carapace, 4 adult valves and 6 juvenile valves, rather poorly preserved, from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/124 aFC	O.XXXI/123 aMLV
Length	0.83	0.91
Height	0.39	0.41
Width	0.31	—

Remarks. — General shape of carapace as well as the type of its hinge margin (i.e. in the left valve consisting of the ?smooth median list, posteriorly ended by ?smooth distinct socket, while anteriorly passing into the antislip-bar-like element, underlying anterior furrow), are like those in *Pontocythere* representatives, broadly known from Eocene up to Recent. Similar feature may be found, however, in *Cushmanidea* Blake, 1933. The differences between these genera are not clear (excluding soft part in living forms); they concern the details of the hinge margin and marginal pore canals i.e. elements not well visible in the here studied material.

Specimens included into ?*Pontocythere* sp. are distinctly elongated, with length: height ratio about 3:1, especially in males, with almost parallel dorsal and ventral margins (the latter being somewhat incised in middle), and very similar lateral outline of the anterior and posterior margins; the anterior margin is only slightly more obliquely rounded than the posterior one. Valve surface rather faintly and densely pitted with weak ribs in the anterior end and on the ventral side; ribs are parallel to the valve margin. The shape of carapace as well as the type of ornamentation seem to be unknown in the so far known species of that group of ostracodes.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Family **Krithidae** Mandelstam, 1960

Genus *Krithe* Brady, Crosskey et Robertson, 1874

Krithe sp.

(pl. 8: 16)

Material. — Three complete carapaces, most probably adult ones, somewhat damaged, from the Hommath Formation, western side of the Gulf of Suez (Egypt), and few specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/107 aC
Length	0.68
Height	0.34
Width	0.29

Remarks. — The number of specimens and the state of their preservation do not allow a more precise determination of that species. Shape, and especially length: height ratio of the carapaces are close to those in *Krithe citae* Oertli (1961), described from the Langhian stratotype; specimens from N. Africa are less pointed postero-ventrally.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Family **Trachyleberididae** Sylvester-Bradley, 1948
Subfamily **Trachyleberidinae** Sylvester-Bradley, 1948
Tribe **Costaini** Hartmann, 1974
Genus *Falunia* Grekoff et Moyes, 1956
Falunia ex gr. *plicatula* (Reuss, 1850)
(pl. 3: 13—15)

Material. — Five complete carapaces, of which only one seems a juvenile form, 1 adult valve and 2 juvenile valves from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/46 aMC	O.XXXI/47 aFLV
Length	0.88	0.72
Height	0.39	0.39
Width	0.39	—

Remarks. — Of the so far known species representing *Falunia*, the form from Egypt resembles most *F. plicatula*, described by Reuss, 1850, and later recognized by numerous authors (e.g. Keij (1957), Berger and Moyes (1964), Moyes (1965), Bassiouni (1970), Sissingh (1971), Brestenská and Jiříček (1978), Uffenorde (1981)). In comparison with representatives of that species, especially from the Middle Miocene of the Central Paratethys (where from this species was described), specimens from Egypt have less distinctly developed median and lateroventral ribs. Within *F. plicatula*, however, there is large variation concerning the mentioned morphological features of the carapace (cf. Berger and Moyes 1964). Discriminated subspecies of *F. plicatula* are neglected here and are referred to *F. plicatula* group.

Occurrence. — *F. plicatula* is known from Oligocene up to (?) Recent, mostly of Europe. *Falunia* ex gr. *plicatula* is present in the Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Genus *Cistacythereis* Uliczny, 1969
Cistacythereis cf. *caelatura* Uliczny, 1969
(pl. 1: 2; pl. 3: 10—12)

Material. — Fourteen adult carapaces, 4 adult valves and 1 juvenile valve from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/43 aC	O.XXXI/2 aLV
Length	0.75	0.72
Height	0.39	0.39
Width	0.36	—

Remarks. — Due to considerable variability of the form (mainly variable ornamentation pattern, especially in posteroventral part of valve) it may be easily compared with *Cistacythereis caelatura* described by Uliczny, 1969. The species, showing similar polymorphism, was next recognized by Sissingh (1972*a*), Coutelle and Yassini (1974) and Bassiouni (1979). Specimens tentatively referred to that species described by Carbonnel and Magné (1977), Yassini (1979*a*) and Carbonel and Ballesio (1982) somewhat differ in general valve outline as well as the details of the external morphology, and may represent other taxa. In comparison with typically developed *Cistacythereis caelatura* from Pliocene of Algeria (received from Dr. E. Odrzywolska-Bieńkowa) and identical as those figured by Bonaduce and Pugliese (1975) from beach sands of Tripoli (Libya)), the specimens examined here have their lateral ribs less pronounced and never joined together posteriorly.

Occurrence. — *Cistacythereis caelatura* Uliczny is recorded from the Lower Miocene (Burdigalian) up to Recent of the Mediterranean (both sides) area only. It is known, however, mainly from the Pliocene; Uliczny (1969) recognized it as an index form for lowermost Pliocene, i.e. *Cistacythereis caelatura — Aurila cruciata minor* ostracode zone. *Cistacythereis caelatura* described by Coutelle and Yassini (1974) from Algeria is an exception here. However, these authors do not seem to be sure whether the microfauna described comes from Lower (Burdigalian) or Middle Miocene (Vindobonian). *Cistacythereis* cf. *caelatura* occurs in the Hommath Formation (?Middle Miocene) western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Genus *Chrysocythere* Ruggieri, 1962

Chrysocythere cataphracta cataphracta Ruggieri, 1962

(pl. 10: 10—13)

1962. *Chrysocythere cataphracta* Ruggieri: 26, pl. 2: 11—13.
1966. *Chrysocythere cataphracta* Ruggieri; van den Bold: 161, pl. 1: 6, pl. 5: 1.
1972*b*. *Chrysocythere cataphracta* Ruggieri; Sissingh, 89, pl. 1: 5.
1973. *Chrysocythere cataphracta* Ruggieri; Sylvester-Bradley and Ruggieri, in Stereo-Atlas 1 (1): 4: 31—34.
non 1982. *Chrysocythere cataphracta* Ruggieri; Aruta, 116, pl. 3: 1—3.

Material. — Fifty one adult carapaces, 5 juvenile carapaces, 25 adult valves and 7 juvenile valves, in most cases well preserved, from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/137 aMC	O.XXXI/134 aFRV	O.XXXI/135 aFLV
Length	0.88	0.78	0.80
Height	0.42	0.41	0.41
Width	0.42	—	—

Remarks. — In comparison with the holotype of *Chrysocythere cataphracta*, as figured by Sylvester-Bradley and Ruggieri (1973), specimens from Egypt and Libya generally lack anterodorsal platelike rib in the left valve; this element is also absent in specimen referred to that species, presented by Sissingh (1972*b*). On the other hand specimens from Africa (studied here) sometimes have posterodorsal ear-like extension, not observed in specimen shown by Sylvester-Bradley and Ruggieri (*l.c.*).

Occurrence. — The entire Miocene of Gabon, Upper Miocene of Sicily and

northern Algeria, Upper Miocene sediments of the shelf of Libya (van Hinte *et al.* 1980), Hommath Formation (?Middle Miocene, western side of the Gulf of Suez (Egypt), section x_1, Marada Formation (?Middle Miocene), Sirte Basin (Libya), Pliocene of Morocco (Farmer 1983). *Chrysocythere cataphracta* n. ssp. is described by Bassiouni (1980) from the Middle Miocene of Turkey.

Tribe **Pterygocythereidini** Puri, 1957
Genus *Incongruellina* Ruggieri, 1958
Incongruellina rotundata (Ruggieri, 1962)
(pl. 10: 7—9)

1962. *Ruggieria rotundata* Ruggieri: 46, pl. 4: 14, 15.
?1966. *Ruggieria rotundata* Ruggieri; van den Bold: 166, pl. 1: 2, pl. 6: 2.
1974. *Ruggieria rotundata* (Ruggieri); Coutelle and Yassini, 92, pl. 1: 7.
1985. *Incongruellina rotundata* (Ruggieri); Gökçen, 47, pl. 3, 1—6.

Material. — One hundred twenty seven adult, complete carapaces, 2 juvenile carapaces and 6 adult valves, in many cases well preserved, from Egypt, and some specimens from Libya.

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/133 aC	O.XXXI/132 aC
Length	0.75	0.65
Height	0.41	0.39
Width	0.39	0.41

Remarks. — Specimens referred to *Incongruellina rotundata* markedly vary in size, mostly length: height ratio, and lateral outlines being probably the result of their sexual dimorphism. Moreover in specimens from Egypt the lateroventral ridge gently disappears posteriorly, near the posterior end and is not supported by a short spine, which is typical of topotypes of that species. At the same time, however, some specimens from Libya have more or less distinct spine at the prolongation of the posteroventral ridge; they manifest similar variability as those referred to *I. rotundata* by Gökçen (1985).

Specimens referred to *Ruggieria* (*recte Incongruellina*) *rotundata* by van den Bold (1966) seem to fall within variation of that species.

Occurrence. — Lower Miocene of Gabon, Turkey, and NE Algeria, Upper Miocene of Sicily, Hommath Formation (?Middle Miocene) of western side of the Gulf of Suez (Egypt), sections x_1 and x_2, and Marada Formation (?Middle Miocen) of Sirte Basin (Libya).

Subfamily **Campylocytherinae** Puri, 1960
Tribe **Leguminocytherini** Howe, 1961
Genus *Keijella* Ruggieri, 1967
Keijella cf. *fusa* (van den Bold, 1966)
(pl. 9: 1—8)

Material. — About one hundred of adult carapaces, 20 adult valves, 11 juvenile carapaces and 8 juvenile valves, all from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/113 aFC	O.XXXI/112 aMC
Length	0.78	0.83
Height	0.41	0.39
Width	0.41	0.39

Remarks. — In comparison with specimens described by van den Bold (1966) as *Thalmannia*? fusa from the Lower Miocene of Gabon, the specimens considered here appear to be less ornamented in their anterior area. They are distinctly sexually dimorphic. Remarks concerning generic assignement of that form are as those on *K. africana* El-Waer (p. 00). It is worth to be noticed, that *Thalmannia*? *fusa* was compared by van den Bold (1966) to *Cythere hodgei* (*recte hodgi*) Brady, 1866. According to van den Bold (l.c.) species from Gabon differs from *C. hodgi* by lack of the posteroventral spine. In 1967 *C. hodgi* has become a type species of *Keijella*, a new genus erected by Ruggieri.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), sections x_1 and x_2, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Keijella africana El-Waer, 1988

(pl. 9: 9—13)

1988. *Keijella africana* El-Waer: 50, pl. 1: 10, 11.

Material. — Fifteen adult carapaces and 2 adult valves from the Hommath Formation, western side of the Gulf of Suez (Egypt) and few specimens from the Marada Formation, Sirte Basin (Libya).

Dimension (in mm):

Specimen No.	ZPAL O.XXXI/118 aMC	O.XXXI/119 AFC	O.XXXI/122 aFLV
Length	0.88	0.78	0.78
Height	0.39	0.41	0.34
Width	0.36	0.39	—

Remarks. — Specimens referred to *Keijella africana* seem to be related to those described by Coutelle and Yassini (1974), from the Lower Miocene of NE Algeria, as *Buntonia* (*Quasibuntonia*) *vigneauxi*. In contrast with the latter species, unfortunately only rather schematically drawn, the species from Egypt and Libya seems to have a little different ornamentation; its lateral, tiny ribs, better developed in right valve, are upturned and joined posteriorly. However, in Libyan specimens, worse preserved than those from Egypt, these elements of ornamentation in the posterior part of carapace are weakly developed or absent. The form exhibits distinct sexual dimorphism.

Specimens of the species referred here to *Keijella*, i.e. *K. africana* and *K.* cf. *fusa*, lack the posteroventral spine, which is one of the diagnostic features of the genus; this feature seems to be, however, an unstable feature of this taxon.

Occurrence. — Al Khums Formation (Late Miocene), NW Libya, Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1 and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Genus *Ruggieria* Keij, 1957
Ruggieria tetraptera tetraptera (Sequenza, 1880)
(pl. 10: 1—4)

1962. *Ruggieria tetraptera tetraptera* (Sequenza); Ruggieri, 47, pl. 5: 11—13.
1963. *Ruggieria tetraptera tetraptera* (Sequenza); Ruggieri, 11, figs. 7—9, pl. 1: 1.
1964. *Ruggieria Tetraptera tetraptera* (Sequenza); Dieci and Russo, 68, pl. 11: 6.
1965. *Ruggieria tetraptera tetraptera* (Sequenza); Moyes, 95, pl. 10: 14.
non 1966. *Ruggieria tetraptera tetraptera* (Sequenza); van den Bold, 166, pl. 1: 1, pl. 6: 1.
1966. *Ruggieria* cf. *tetraptera* (Sequenza); Bassiouni, 639, pl. 40: 10.
1971a. *Ruggieria tetraptera tetraptera* (Sequenza); Ciampo, pl. 4: 1—4.
1972b. *Ruggieria* (*R.*) *tetraptera tetraptera* (Sequenza); Sissingh, 90, pl. 1: 7.
1979a. *Ruggieria tetraptera* (Sequenza); Yassini, 104, pl. 7: 8, 9.
1982. *Ruggieria tetraptera* (Sequenza); Aruta, 118, pl. 5: 13.
1984. *Ruggieria tetraptera* (Sequenza); Malz and Jellinek, pl. 5: 42, 43.
1987. *Ruggieria tetraptera* (Sequenza); Aranki, 66, pl. 6: 11—15, pl. 6: 11.

Material. — Thirty eight adult carapaces, 2 juvenile carapaces and adult valves, in most cases well preserved, from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/127 aMC	O.XXXI/129 aFC
Length	0.75	0.70
Height	0.39	0.31
Width	0.36	0.36

Remarks. — The studied specimens referred to *Ruggieria tetraptera tetraptera* somewhat differ in size, especially in length: height ratio, as well as, in the external morphology of the valves; lateroventral and median ridges are not always well developed.

Occurrence. — *Ruggieria tetraptera* has been so far largely known from the entire (but mostly the upper part) Miocene up to Early Pleistocene, of both sides of the Mediterranean region, including Upper Miocene of Libya (El Waer *in press*) and "Pliocene" of Egypt, as well as, from Pleistocene of south Aegean islands. According to McKenzie *et al.* (1979) it occurs in Oligocene and Miocene of the Aquitanian Basin. Found in the Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation, Sirte Basin (Libya).

Tribe **Campylocytherini** Howe, 1961
Genus *Acuticythereis* Edwards, 1944
?*Acuticythereis* sp.
(pl. 11: 10)

Material. — One complete adult carapace from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/141 aC
Length	0.73
Height	0.41
Width	0.39

Remarks. — The scarcity and state of preservation of the material make its more exact determination impossible. Externally the specimen, especially in its shape and pattern of ornamentation resembles *Acuticythereis* Edwards, 1944 a genus embracing species known so far from the Middle Miocene — Holocene of the western hemisphere; the specimen from Egypt however, is more truncated in its posterior end. The form may belong to descendants of *Anticythereis* van den Bold, 1946, a genus including, among others, African Paleogene species.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1.

Family **Hemicytheridae** Puri, 1953
Subfamily **Hemicytherinae** Puri, 1953
Tribe **Hemicytherini** Puri, 1953
Genus *Hemicythere* Sars, 1925
Hemicythere ex gr. *notata* (Reuss, 1850)
(pl. 1: 4; pl. 10: 14)

Material. — One adult right valve badly preserved and 1 juvenile valve from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/4 aRV
Length	0.80
Height	0.47

Remarks. — Specimen referred to *Hemicythere* ex gr. *notata* (Reuss) seems to fall within this group of taxa and especially appears to be close to *H. notata costulata*, subspecies of Carbonnel (1969), from the Lower Miocene of France. In comparison with specimen of the latter subspecies the individual from Egypt is covered, over its entire surface, by tiny ribs tending to be parallel to the dorsal and ventral margins. Inner side as presented on pl. 1: 4.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1.

Genus *Hemicytheria* Pokorný, 1955
?*Hemicytheria* sp.
(pl. 1: 1; pl. 10: 6)

Material. — One adult right valve from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/5 aRV
Length	0.83
Height	0.42

Remarks. — Specimen, referred to that form is difficult to determine even at the generic level. Its general, lateral outline, distinct eye tubercle and the inner side details, including hinge margin and muscle scars pattern (but excluding the shape of duplicature), are similar, to a large extent, to those in *Hemicytheria*, a genus established by Pokorný, 1955 (by some authors, including Pokorný, described later as a subgenus of *Heterocythereis*) for species from Pliocene of Europe. It may also be compared with a weakly ridged species, described by Stancheva (1971), and including into her new subgenus of *Hemicytheria* i.e. *Getocytheria*; representatives of that subgenus are described by Stancheva (*l.c.*) from Meotian of Bulgaria (of the low salinity environment), and are characterised, among others, by lack of vestibulum, as it is the case in specimen from Africa. Specimen from Egypt, cannot be assigned, however, to any of the species described by the author mentioned.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1.

Tribe **Aurilini** Puri, 1973
Genus *Aurila* Pokorný, 1955
Aurila ex gr. *convexa* (Baird, 1850)
(pl. 6: 9, 10)

Material. — Nine adult carapaces, 7 adult valves and 10 juvenile valves from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/71 aC	O.XXXI/72 aLV
Length	0.68	0.65
Height	0.47	0.44
Width	0.31	—

Remarks. — Specimens referred to *Aurila* ex gr. *convexa* seem to fall within variability of that species, being recorded from Miocene up to Recent of Europe (including its nothern areas), as well as, from north Africa. *Aurila convexa* is known as polimorphic and politypic species, and thus somewhat variably described by various authors. In comparison with *A. convexa* presented by Doruk (1973) the specimens from Miocene of Africa are less coarsely ornamented; faint ribs separating ornamental pits, typical of the true representatives of this species, are poorly developed.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Aurila cf. *fastigata* Uliczny, 1969
(pl. 6: 3—6)

Material. — Twenty one adult carapaces, 13 adult valves and 6 juvenile valves, in most cases well preserved, from the Hommath Formation, western side of the

Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/65 aFC	O.XXXI/67 aFLV
Length	0.67	0.62
Height	0.44	0.42
Width	0.39	—

Remarks. — Specimens of *Aurila* characterised by the conspicuous lateroventral inflation, coarse pitting covering almost the entire valve surface and tending to be arranged in rows parallel to the valve margin at the anterior and posterior ends, and distinct sexual dimorphism; females are less elongated and higher, being at the same time laterally more inflated, than males. Similar features may be found in *Aurila fastigata* Uliczny, 1969, especially as that figured by Yassini (1979*a*), from Pliocene of Algeria. Our specimens, however have rather irregularly (instaed arcuately) distributed pits over the lateral side of the valve.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Aurila cf. *soummamensis* Coutelle et Yassini, 1974

(pl. 6: 11, 12)

Material. — Three adult carapace, 11 adult valve and 6 juvenile valves from Egypt, and some specimens from Libya.

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/73 aC	O.XXXI/74 aRV
Length	0.78	0.75
Height	0.52	0.44
Width	0.39	—

Remarks. — Characteristic features of the specimens of that species are almost triangular lateral outline, distinct lateral inflation, flattened ventral side, and rather smooth valve surface; faint pitting covering almost the entire valve surface is poorly visible. Maximum height nearly in the middle of carapace length; height: lengh ratio (of ?male) only a little less than 1:2. Anterior margin obliquely rounded, somewhat pointed. Left valve larger than the right one, overlapping the latter one mostly along the dorsal margin. Sexual dimorphism expressed in different length:height:width ratio of specimens referred to that species.

Description of that species may be easily compared with that of *Aurila soummamensis* Coutelle and Yassini (1974), from the Lower Miocene of NE Algeria which are, however, only schematically drawn. In comparison with specimens assigned to that species, from the beds of the same age of Turkey by Bassiouni (1979) (and presented on SEM micrographs), specimens from Africa are more triangular in side view, having at the same time less rounded anterior margin.

Occurrence. — Hommath Formation (?Middle Miocene) western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Aurila cf. *ulicznyi* Sissingh, 1972
(pl. 6: 13)

Material. — One juvenile valve, from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Remarks. — General lateral outline and the details of the external morphology, especially posteroventral and central valve inflation, allows to compare this specimen with those of *Aurila* cf. *ulicznyi*, described by Sissingh (1972*a*) from Pliocene and Pleistocene of Greece, known also from Pliocene of Algeria (Yassini 1979*a*). The suggested relationship of the compared specimens needs, however, larger material to be verified.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1.

Aurila sp.
(pl. 6: 7, 8)

Material. — One adult carapace and 2 adult valves from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimens No. ZPAL	O.XXXI/70	O.XXXI/69
	aC	aRV
Length	0.65	0.57
Height	0.39	0.31
Width	0.29	—

Remarks. — The specimens referred to *Aurila* sp. are distinctly compressed laterally and have lateroventral ridge. Their surface is pitted and reticulate; the latter feature is better developed at the distal parts of valves. Some similarity, especially in the pattern of ornamentation, exists between the representatives of that form and that described by Uliczny 1969, from Pliocene of Algeria, as *A. lanceaeformis*, and later recognized, among others by Ciampo (1976), from Pleistocene of Italy. In comparison with specimens figured by Ciampo (*l.c.*) specimens from Africa are less uniformly ornamented, moreover their left valves are rather triangular than subovate in side view.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation, Sirte Basin (Libya).

Genus *Pokornyella* Oertli, 1956
Pokornyella minor (Moyes, 1965)
(pl. 6: 1, 2)

1965. *Hemicythere deformis minor* Moyes: 99, pl. 13: 1—4.
1977. *Pokornyella minor* (Moyes); Ruggieri *et al.*, pl. 1: 2.
1979. *Pokornyella deformis minor* (Moyes); Bassiouni: 110, pl. 19: 18—21.
1983. *Pokornyella minor* (Moyes); Nascimento, pl. 3: 6.
1985. *Hemicythere deformis minor* Moyes; Gökçen: 47, pl. 3: 11—21.

Material. — Three adult carapaces and 9 adult valves from the Hommath Formation, western side of the Gulf of Suez (Egypt) and some specimens, mostly adult carapaces, from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/63 aC	O.XXXI/64 aRV
Length	0.75	0.70
Height	0.52	0.44
Width	0.44	—

Remarks. — Size and ornamentation of lateral sides of specimens referred to *Pokornyella minor* from Africa, seem to be identical to those in topotype of that species, as shown by Ruggieri *et al.* (1977). Details of ornamentation of the ventral sides of the compared specimens appear, however, to be slightly different.

Occurrence. — So far *Pokornyella minor* (Moyes) is known only from the Oligocene and Lower Miocene of the Aquitanian Basin, Lower Miocene of Turkey and Portugal. Found in the Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Subfamily uncertain

Genus *Falsocythere* Ruggieri, 1972

Falsocythere maccagnoi (Ciampo, 1971)

(pl. 11: 8)

1971b. ?*Occultocythereis maccagnoi* Ciampo: 27, pl. 2: 7—9, pl. 3: 1.
1975. *Falsocythere maccagnoi* (Ciampo); Bonaduce *et al.*, 51, pl. 26: 6—9.
1979*a*. *Falsocythere maccagnoi* (Ciampo); Yassini, pl. 2: 22.
1980. *Falsocythere maccagnoi* (Ciampo); Bonaduce *et al.*, pl. 4: 5, 6.

Material. — One adult complete carapace from the Hommath Formation, western side of the Gulf of Suez (Egypt) and some specimens, mostly adult carapaces, from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/139 aC
Length	0.57
Height	0.34
Width	0.29

Remarks. — In comparison with the holotype and other so far known representatives of that species, the specimens here studied are generally rather smooth i.e. not pitted; this feature however seems to result from the preservation state of the material.

Occurrence. — Pliocene of northern Algeria, Pleistocene and Recent of eastern region of the Mediterranean Sea (Sissingh 1976), Pleistocene and Recent of the Tyrrhenian Sea, Recent of the Adriatic, and Red Sea, Hommath Formation (?Middle Miocene), western side of the Gulf of Suez, Egypt, section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Subfamily **Thaerocytherinae** Hazel, 1967
Tribe **Thaerocytherini** Hazel, 1967
Genus *Hermanites* Puri, 1955
"Hermanites" haidingeri (Reuss, 1850)
(pl. 10: 5)

1957. *Cythereis haidingeri* (Rss.); Tollmann, pl. 5: 11.
1965. *Hermanites haidingeri* (Reuss); Moyes: 84, pl. 10: 12.
1977. *Cletocythereis? haidingeri* (Reuss); Carbonell and Magné, 350, pl. 1: 27.
1978. *Hermanites haidingeri* (Reuss); Brestenská and Jiřiček, pl. 6: 16.
1979a. *Hermanites haidingeri* (Reuss); Yassini: 99, pl. 5: 11.
1987. *Hermanites haidingeri* (Reuss); Aranki, pl. 9: 7—9.

Material. — Two adult complete carapaces from the Hommath Formation, western side of the Gulf of Suez (Egypt) and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/130
	aC
Length	0.57
Height	0.34
Width	0.29

Remarks. — *"Hermanites" haidingeri* representatives (being referred by different authors to different genera) are divided into some subspecies. Assignement of the studied specimens to the subspecies level is, however, neglected here, because of the scarcity of the material. Thus the above synonymy seems far from complete.

Occurrence. — Species broadly known from the Early Oligocene to the Early Pleistocene on the large area, including both sides of the Miditerranean basins, Aquitanian Basin and Paratethys. Present in the Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Family **Cytherettidae** Triebel, 1952
Genus *Cytheretta* G. W. Müller, 1894
Cytheretta cf. *rhenana rhenana* Triebel, 1952
(pl. 1: 3; pl. 3: 1, 2)

Material. — Four adult carapaces and 1 adult valve from the Hommath Formation, western side of the Gulf of Suez (Egypt) and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/35	O.XXXI/3
	aC	aRV
Length	1.10	0.91
Height	0.60	0.49
Width	0.49	—

Remarks. — In comparison with *Cytheretta rhenana rhenana* Triebel, known from the Oligocene and Miocene of Europe (Moyes 1965), the specimens from Miocene of N. Africa are less elongated having, at the same time, a little different outline of the posterior part and greater inflation of the posteroventral area of their

valve. Their inner side with inner margin almost parallel to the outer margin (pl. 1: 3) is not typical of *Cytheretta*.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene). Sirte Basin (Libya).

Cytheretta sp.

(pl. 3: 6, 7)

Material. — Three adult valve, well preserved, from the Hommath Formation, western side of the Gulf of Suez (Egypt), and a few specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/39	O./XXXI/40
	aRV	aLV
Length	0.91	0.91
Height	0.47	0.52

Remarks. — In its external morphology and ornamentation the form resembles *Cytheretta* sp. from the Middle Miocene of Australia, described and figured by Whatley and Downing (1983). The left valve of the discussed form, however, is more truncated and weakly dentate anteriorly, with lateral ribs slightly differing in arrangement from those in the left valve (the only figured one) of the Australian form. In contrast to typical *Cytheretta*, the specimens referred to *C.* sp. from Africa, when seen from inside, have inner margin almost parallel to the valve margin.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Genus *Protocytheretta* Puri, 1958

Protocytheretta ?schoelleri (Keij, 1955)

(pl. 3: 3—5)

Material. — Three complete adult carapaces from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/36
	aC
Length	0.65
Height	0.34
Width	0.26

Remarks. — The specimens, in their general appearance and ornamentation, seem to be identical to those referred to *Protocytheretta schoelleri* described by Keij, 1955 (Catalogue of Ostracoda) and recognized by others authors under diverse generic names, i.e. *Cytheretta*, *Flexus* or *Paracytheretta* (see Oertli (1956), Moyes (1965), Carbonnel (1969), Keen (1972). At the same time they are similar in these features to *Protocytheretta obtusa* erected by Ruggieri (1962) and recorded by other authors: Dieci and Russo (1964), Sissingh (1972*a*), Aranki (1987). According to Ruggieri (1962) *P. schoelleri* and *P. obtusa* differ slightly in the details of their valve ornamentation (which seem to be the result of different states of preservation or may be considered as intraspecific variability) as well as the details of inner sides of their valves. Specimens from Egypt, however, represent only closed carapaces and thus their

inner features cannot be observed and their proper taxonomic identification is impossible. It is probable that *Costa*? sp. described from the Upper Miocene of Algeria by Guernet *et al.* (1984) should be referred to the discussed group of species.

Occurrence. — *Protocytheretta schoelleri* (Keij) is known from the Eocene up to Middle Miocene of Tethys (including southern as well as central areas of Europe). It is found also in the Lower Miocene of the Central Paratethys (Jiřiček 1983).

In the Middle Miocene of the Central Paratethys (Poland), the senior author, however has found specimens well corresponding in their external as well as internal features, to those described as *P. obtusa* rather than *P. schoelleri* (Szczechura, in preparation). *P. obtusa* has been known so far from Middle Miocene and Pliocene of the Mediterranean region only. *Protocytheretta ?schoelleri* occurs in the Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1.

Genus *Loculicytheretta* Ruggieri, 1954
Loculicytheretta libyca Szczechura, 1976
(pl. 7: 15)

1976. *Loculicytheretta libyca* Szczechura; Oertli, fig. 2.
1978. *Loculicytheretta libyca* Szczechura; Bismuth *et al.*, 235, pl. 2: 36—42.

Material. — One adult carapace from the Hommath Formation, western side of the Gulf of Suez (Egypt), and numerous carapaces, mostly adult ones, from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/91 aC
Length	0.80
Height	0.47
Width	0.36

Occurrence. — Lower Miocene of SW France, Middle Miocene of Tunisia, Hommath Formation (?Middle Miocene) of western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle of Miocene), Sirte Basin (Libya). *Loculicytheretta libyca* was described from Sirte Basin from sediments (Marada Formation) referred to the Upper Miocene; this age is, however, questioned here.

Family **Loxoconchidae** Sars, 1925
Genus *Loxoconcha* Sars, 1866
Loxoconcha cf. *rhomboidea* (Fischer, 1855)
(pl. 7: 1, 2)

Material. — Fifteen adult carapaces and 3 adult valves from the Hommath Formation, western side of the Gulf of Suez (Egypt) and numerous specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/76 aFC	O.XXXI/78 aMC
Length	0.52	0.57
Height	0.36	0.36
Width	0.23	0.26

Remarks. — Distinct variability concerning shape and size of specimens referred to *Loxoconcha* cf. *rhomboidea*, may result from the sexual dimorphism. It cannot be excluded, however, that the examined specimens represent more than one species. Their state of preservation does not allow to answer this question.

Some of the specimens seem to be close to *Loxoconcha rhomboidea* which is, however, differently characterized by different authors. In comparison with the specimens figured by Athersuch and Whittaker (1976) in Stereo-Atlas, the specimens from N. Africa are more elongated anteriorly and have narrower posteroventral margin border. *Loxoconcha rhomboidea* has large geographical distribution, and is known from the Upper Miocene up to Recent; it was recorded by Bassiouni (1965) from "Pleistocene" of Egypt.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Loxoconcha cf. *tumida* Brady, 1869
(pl. 7: 4, 5)

Material. — Twelve poorly preserved adult carapaces from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimens No.	ZPAL O.XXXI/80 aC	O.XXXI/81 aC
Length	0.49	0.55
Height	0.34	0.39
Width	0.26	0.31

Remarks. — The state of preservation of specimens does not allow to compare them easily with the species of *Loxoconcha* known so far. Many species of that genus with very similar carapace shape and type of ornamentation have been described. In this respect specimens from N. Africa seem to be nearest to *L. tumida* Brady, 1869, *L. ovulata* (Costa, 1863) (according to Ascoli (1965) both species are conspecific), or *L. punctatella* (Reuss, 1850). All these species are of rather large geographical and stratigraphical extension, and appear in Miocene.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation, Sirte Basin (Libya).

Loxoconcha sp. 1
(pl. 7: 11, 12)

Material. — Two adult and 1 juvenile rather well preserved carapaces from the Hommath Formation, western side of the Gulf of Suez (Egypt), and few badly preserved specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/87 aC
Length	0.49
Height	0.31
Width	0.29

Remarks. — Specimens of that form are rather gently and evenly inflated i.e. flatly-swollen when seen ventrally, with a weakly developed and somewhat pointed distally protuberance in the posteroventral area. Lateral and ventral sides reticulate; a faint rib runs along the entire free margin and borders the valve inflation. Median, oblique rib indistinctly marked. The specimens seem to resemble none of the so far known species.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Loxoconcha sp. 2

(pl. 7: 3)

Material. — One adult, complete carapace from the Hommath Formation, western side of the Gulf of Suez (Egypt), and a few badly preserved specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/78
	aC
Length	0.65
Height	0.42
Width	0.34

Remarks. — Carapace considerably and evenly laterally inflated, ovate in side view, and weakly ornamented; regular and fine pitting disappears at the valve margins. Admarginal, compressed areas very narrow. It seems to be close to the specimen referred by Moyes (1965) to *Loxoconcha diversapunctata*, known from the Miocene and Pliocene strata of the Aquitanian Basin. The difference mainly concerns the valve outline; the specimen from N. Africa are more rounded when seen laterally.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

?*Loxoconcha* sp.

(pl. 7: 6)

Material. — Two, probably adult, carapaces from the Hommath Formation, western side of the Gulf of Suez (Egypt) and few carapaces from the Marada Formation, Sirte Basin (Libya); almost all of them badly preserved.

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/82
	?aC
Length	0.47
Height	0.26
Width	0.20

Remarks. — Specimens, included into ?*Loxoconcha* sp., slightly differ in size and ornamentation; differences in ornamentation may be the result of their different preservation state. The specimens are characterised by the conspicuous lateral compression and well developed ribs covering lateral sides of carapace. The main rib starts at the posterior cardinal angle, then runs closely to the posterior

valve margin. In its lower part is directed, somewhat obliquely, towards the anterior margin, branching above and below; in the anteroventral part of carapace it makes a distinct loop. Much similarity exists between the shape and the type of ornamentation of the specimens from Africa and specimens described by Ruggieri (1976), from the Upper Miocene of southern Italy, as *Loxoconcha cristatissima*; difference concerns mostly the arrangement of lateral ribs. Better preserved material is necessary to give more precise determination of the specimens from Africa.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Family **Paracytherideidae** Puri, 1957
Genus *Paracytheridea* G. W. Müller, 1894
Paracytheridea sp.
(pl. 5: 15)

Material. — One adult, damaged valve from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/62 aRV
Length	0.60
Heigth	0.39

Remarks. — The scarcity and state of preservation of the specimen do not allow to determine its precise taxonomic position.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1.

Family **Cytheruridae** G. W. Müller, 1894
Subfamily **Cytherurinae** G. W. Müller, 1894
Genus *Paijenborchellina* Kuznetsova (*in*: Mandelstam *et al.* 1957)
"*Paijenborchellina*" ?*libyca* Szczechura, 1980

Material. — One juvenile valve from the Hommath Formation, western side of the Gulf of Suez (Egypt). Numerous specimens belonging to "*Paijenborchellina*" *libyca* occur in samples from the Marada Formation, Sirte Basin (Libya).

Remarks. — A general shape and ornamentation of the specimen let us include it (tentatively) into "*Paijenborchellina*" *libyca*.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1. "*Paijenborchellina*" *libyca* was described (Szczechura 1980) from the Marada Formation, Sirte Basin, from sediments referred to the Upper Miocene. The age of these sediments is questioned here; they seem to be older, probably Middle Miocene.

"*Paijenborchelina*" sp.
(pl. 7: 14)

Material. — Two juvenile badly preserved carapaces from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Remarks. — The state of preservation and ontogenetic development of the specimen, surely not belonging to the coexisting *Paijenborchellina ?libyca*, do not allow to include it into the so far known species of *Paijenborchellina*.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1.

Genus *Semicytherura* Wagner, 1957
Semicytherura cf. *braccata braccata* Carbonnel, 1969
(pl. 5: 4, 5)

Material. — Five adult carapaces and 2 adult valves, not well preserved, from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/51
	aC
Length	0.52
Height	0.26
Width	0.26

Remarks. — The collected specimens, referred to *Semicytherura* cf. *braccata braccata* slightly differ, mainly in the posteroventral area. They seem to resemble the representatives of *Semicytherura braccata braccata*, described by Carbonnel (1969), from the Upper Miocene of France (Rhone Basin). In the specimens from Africa, however, the middle, rib, which is a diagnostic feature of species from France, is rather indistinctly developed. In comparison with *S. decussata*, described by Ruggieri (1976), from the Pleistocene of Sicilia, the species investigated here has more upturned caudal process, no anterodorsal valve incision, and differs, to some extent, in ornamentation.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Semicytherura cf. *incongruens* (G. W. Müller, 1894)
(pl. 5: 1—3)

Material. — Six adult carapaces from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/49
	aC
Length	0.44
Height	0.26
Width	0.23

Remarks. — Variation within that form, concerning mainly the size and shape of carapaces, may be the result of the sexual dimorphism. Close similarity seems to exist between the representatives of this form and those representing *Semicytherura incongruens*, the species described from the Gulf of Naples by G. W. Müller, 1894, and later recognized by numerous authors, mostly as a subfossil form (known from Pliocene up to Recent of the Mediterranean region). In comparison with the

species mentioned, the form from N. Africa is ornamented almost over the entire valve surface, i.e. except the most distal areas. It is densely and faintly ribbed longitudinally and reticulate, instead of being nearly smooth in the upper part of the carapace, and distinctly ribbed close to the ventral side (as is shown by Doruk (1974) in Stereo-Atlas).

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Semicytherura cf. *inversa* (Sequenza, 1880)
(pl. 5: 8)

Material. — Two adult, rather well preserved carapaces from the Hommath Formation, western side of the Gulf of Suez (Egypt), and a few specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/55
	aC
Length	0.49
Height	0.29
Width	0.29

Remarks. — The shape, as well as, ornamentation of carapaces assigned to *Semicytherura* cf. *inversa* are close to those in *Cytherura* (*recte Semicytherura*) *inversa*, the species described by Sequenza, 1880, and later recognized by different authors e.g. Bonaduce *et al.* (1975), Aranki (1987) from sediments from Miocene up to Recent mostly of the Mediterranean area. The specimens from N. Africa are also very similar to the representatives of *S. cribriformis*, described as Recent species from the Gulf of Naple, by G. W. Müller, 1894, and found later by other authors e.g. Bonaduce *et al.* (1975), Aranki (1987). In comparison with them the Egyptian specimens differ only slightly, mainly in the details of ornamentation. According to Moyes (1965), *S. cribriformis* is conspecific with *S. inversa*.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

?*Semicytherura* sp. 1
(pl. 5: 6)

Material. — Four complete, ?adult carapaces from the Hommath Formation, western side of the Gulf of Suez (Egypt), and few specimens from the Marada Formation, Sirte Basin (Libya), in most cases badly preserved.

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/53
	?aC
Length	0.41
Height	0.26
Width	0.23

Remarks. — Representatives of that form are markedly and irregularly inflated laterally, especially posterodorsally, and flattened on ventral side. Distinct latero-ventral ridge extends from the posterior end, where it bounds below and behind

the posterodorsal inflation, then obliquely runs towards the anterior margin. A distinct depression is developed in front of the posterodorsal valve inflation. The valve faintly reticulate. Close similarity exists between this form and the one named here as *?Semicytherura* sp. 2. The two differ, however, in the shape of carapaces, as well as, the details of their morphology.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

?Semicytherura sp. 2

(pl. 5: 9)

Material. — One complete, ?adult carapace from the Hommath Formation, western side of the Gulf of Suez (Egypt). Perhaps present also in the Marada Formation, Sirte Basin (Libya) (a few badly preserved specimens).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/56
	?aC
Length	0.44
Height	0.18
Width	0.18

Remarks. — The specimen is distinctly flattened ventrally and markedly inflated laterally, especially posteroventrally, where it forms a weak, wing-like ridge. Lateral side slightly and obliquely depressed in front of the posterodorsal inflation. Almost the entire valve surface tiny reticulated. The specimen seems to represent a species unknown so far.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1. Probably present in the Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Genus *Eucytherura* G. W. Müller, 1894
Eucytherura cf. *poliphylla* Ruggieri, 1962

(pl. 7: 7—10)

Material. — Six adult carapaces and 2 adult valves, in most cases poorly preserved, from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/84
	aC
Length	0.52
Height	0.31
Width	0.29

Remarks. — In comparison with the specimens described and drown by Ruggieri (1962), from the Upper Miocene of Sicilia, as *Eucytherura poliphylla*, the individuals from Africa seem to be first of all less coarsely ornamented, and, at the same time, more rounded posteriorly. They are never dentate along the anterior margin. It is probable that they represent males and females.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Subfamily **Cytheropterinae** Hanai, 1957
Genus *Cytheropteron* Sars, 1866
Cytheropteron sp.
(pl. 5: 7)

Material. — One adult, right, badly preserved valve from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/54
	aRV
Length	0.55
Height	0.36

Remarks. — Close similarity exists between the specimen from Egypt, referred to *Cytheropteron* sp., and the representative of *C. latissimum* (Norman 1865), as figured by Yassini (1979a), from Pliocene of NW Algeria. In comparison with the latter one, the specimen from Africa is less compressed laterally, has not rib-like thickening along the dorsal margin and in the posterior part of carapace, and is reticulate, instead of being smooth, posteriorly.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1.

Family **Xestoleberididae** Sars, 1928
Genus *Xestoleberis* Sars, 1866
Xestoleberis sp.
(pl. 5: 13)

Material. — Fourteen carapaces, probably adult ones, from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/60
	?aC
Length	0.55
Height	0.36
Width	0.31

Remarks. — The specimens referred to *Xestoleberis* sp. differ somewhat in size and shape and it cannot be excluded, that they belong to different (more than one) species. The specimen presented on pl. 5: 13 seems to be close (among others) to those assigned to *X. reymenti* Ruggieri (1967), the species described from the Upper Miocene of northern Apennines, known also from the Middle and Upper Miocene of Greece (Sissingh 1972*a*), as well as to *X. glabrescens* (Reuss, 1850) the species broadly known, also from the Central Paratethys, from Oligocene and Miocene.

Occurrence — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Family **Paradoxostomatidae** Brady et Norman, 1889
Genus *Paradoxostoma* Fischer, 1855
?Paradoxostoma sp.
(pl. 8: 18)

Material. — One complete carapace, probably adult one, from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/109
	?aC
Length	0.65
Height	0.26
Width	0.10

Remarks. — General shape of the specimen is like that of *Paradoxostoma*. Since its internal features are unknown, it is difficult to preclude its another generic assignement. It is also difficult to decide on the species assignement of the specimen.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1.

Genus *Cytherois* G. W. Müller, 1884
?Cytherois sp.
(pl. 11: 9)

Material. — One complete carapace, probably adult one, from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/140
	?aC
Length	0.83
Height	0.39
Width	0.26

Remarks. — Specimen much elongated, slim, with anterior margin more rounded than the posterior one, highest at the middle of its length. Dorsal margin arched in the right valve, while angulate in the highest part, in the left valve. Ventral margin gently incised. Left valve larger than the right one and overlapping the latter one, especially along the dorsal margin. Valve surface smooth. Inner side unknown. The external features are similar to those in some *Cytherois* as well as *Cytheroma* representatives. A proper generic affiliation of specimen is impossible as its inner features are unknown.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1.

Superfamily **Cypridacea** Baird, 1845
Family **Pontocyprididae** G. W. Müller, 1894
Genus *Propontocypris* Sylvester-Bradley, 1947
?Propontocypris sp.
(pl. 8: 17)

Material. — Seven complete carapaces, probably of diverse ontogenetic stages, from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some carapaces from the Marada Formation, Sirte Basin (Libya).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/108
	?aC
Length	0.80
Height	0.39
Width	0.29

Remarks. — Specimens attributed to *?Propontocypris* sp. differ slightly in shape and size and probably represent different stages of one or more than one species. Since they represent only closed carapaces it is difficult to determine their position more accurately; externally they are close to *Propontocypris* representatives.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1 and x_2, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Family, genus and species undetermined 1
(pl. 11: 6)

Material. — One complete carapace, most probably adult one, from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/142
	aC
Length	0.80
Height	0.49
Width	0.39

Remarks. — Carapace large, much elongated, distinctly and almost evenly inflated, especially posterodentrally, subovate in lateral view. Dorsal margin arched, more sloping anteriorly than posteriorly, highest anteriorly in one third of the valve length. Both ends of carapace narrowly rounded and somewhat truncated in their upper parts. Left valve larger than the right one, overlapping the latter one over almost the entire margin. Valve surface without ornamentation but slightly and rarely pitted. Internal features unknown. The scarcity and the state of preservation of the material makes more precise determination impossible.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1.

Family, genus and species undetermined 2
(pl. 10: 15)

Material. — One adult, complete carapace from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Dimensions (in mm):

Specimen No.	ZPAL O.XXXI/138 aC
Length	0.78
Height	0.41
Width	0.44

Remarks. — The specimen, although very distinctive according to its shape and morphology, is difficult to classify even at the generic level. Its shape, morphology and the type of ornamentation seem to be close to those in *Forbescythere* Keen, 1976, a genus known so far only from the Early Eocene of western (mostly northern area) Europe, and considered homeomorphic with *Hammatocythere* Keen, 1972, a genus of larger stratigraphical and geographical range, known among others, from Oligocene of SW France (Aquitanian Basin). Considering differences between these two genera, as indicated by Keen (1976), the specimen from Egypt seems to be more similar to *Forbescythere* (especially *F. forbesi*), in large and evenly rounded, non denticulate, anterior margin, only weakly developed median rib, and lack of the central tubercle. In contrast to *Forbescythere*, the specimen from Africa, however, has neither characteristic rib in front of the eye tubercle nor well marked longitudinal lateral ribs. The last features like the general appearance of carapace, are like those in *Lankacythere* Bhatia and Kumar, 1979, especially *L.* sp., a species described by Bonaduce *et al.* (1983) from the Red Sea.

The specimen from Egypt differs from *L.* sp. in lateral outline (having less angulate anterodorsal area) and in ornamentation (mostly lack of dents along the anterior margin). *Forbescythere* and *Lankacythere* seem worthy of a more detailed comparison.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1.

Order **Foraminiferida** Eichwald, 1830

Systematics after Loeblich and Tappan 1964.

Suborder **Textulariina** Delage et Hérouard, 1896
Superfamily **Lituolacea** de Blainville, 1825
Family **Textulariidae** Ehrenberg, 1838
Subfamily **Textulariinae** Ehrenberg, 1838
Genus *Textularia* Defrance *in* de Blainville, 1824
Textularia sp. 1
(pl. 12: 11)

Material. — Nineteen specimens, in most cases well preserved, from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Remarks. — Specimens differ somewhat in size, outline in horizontal cross section (i.e. ovate or lens — like) and width of the youngest chambers. They are similar to those referred to *Textularia pseudogramen* Chapman and Parr, 1937, described as a Recent form from Australian and Antarctica coasts, recorded also from Miocene and Recent seas of the Mediterranean region. The specimens from N. Africa, however, tend to diminish the width of their last chambers. The specimens

studied are also similar to specimens assigned to *T. rugosa* d'Orbigny, 1852, known from the Miocene of France, from which they seem to be thicker; it cannot be excluded that specimens from the studied sections represent several species.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1 and x_2, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Textularia sp. 2
(pl. 12: 12)

Material. — Two well preserved specimens from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Remarks. — The general shape of the tests, as well as, the shape and arrangement of chambers resemble those in representatives of *Textularia deltoidea* Reuss, 1850, a species known from the Tertiary of Germany and the Mediterranean region. The specimens from N. Africa, however, have shallow longitudinal furrow in the middle of the upper part of the test.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Suborder **Miliolina** Delage et Hérouard, 1896
Superfamily **Miliolacea** Ehrenberg, 1839
Family **Nubeculariidae** Jones, 1875
Subfamily **Spiroloculininae** Wiesner, 1920
Genus *Spiroloculina* d'Orbigny, 1826
Spiroloculina sp.
(pl. 12: 16)

Material. — Two specimens, moulds only, from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Remarks. — Specimens almost round in outline, with a small number of chambers on one side (2—3) and acute periphery. Due to the preservation state of the specimen the form cannot be determined more precisely.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1.

Family **Miliolidae** Ehrenberg, 1839
Subfamily **Quinqueloculinae** Cushman, 1917
Genus *Quinqueloculina* d'Orbigny, 1826
?*Quinqueloculina* sp. 1
(pl. 12: 15)

Material. — Eight poorly preserved specimens (mostly as moulds, some crushed), from the Hommath Formation, western side of the Gulf of Suez (Egypt), and numerous specimens from the Marada Formation, Sirte Basin (Libya).

Remarks. — Characteristic features of the specimens are elongated and compressed tests consisting of not numerous chambers arranged as in *Quinqueloculina*. They differ slightly in size, shape and arrangement of chambers. They have been tentatively assigned to *Quinqueloculina* on the basis of their external appearance; they may represent more than one species.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1 and x_2, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

?*Quinqueloculina* sp. 2
(pl. 12: 17)

Material. — Four poorly preserved specimens, mostly as moulds, from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Remarks. — Specimens are varying a little in size and general appearance; they have broadly rounded outline and distinctly inflated chambers arranged in quinqueloculine pattern. More and better preserved representatives are necessary to determine the form precisely.

Occurrence. — Hommath Formation (?Midlde Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Genus *Pyrgo* Defrance, 1824
Pyrgo sp.
(pl. 12: 18)

Material. — Nine poorly preserved specimens, mostly as moulds, from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Remarks. — Specimens referred to *Pyrgo* sp. differ in size, the details of the apertural region, and shape i.e. in broadly to narrowly rounded outline and variable inflation. Certainly there are several species within the recognized representatives of *Pyrgo*. The state of their preservation allows, however, to determine their generic assignement only.

Occurrence. — Hommath Formation (?Middle Miocene) western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Family **Alveolinidae** Ehrenberg, 1839
Genus *Borelis* de Montfort, 1808
Borelis melo (Fichtel et Moll, 1798)
(pl. 11: 2)

1798. *Nautilus melo* Fichtel et Moll; Catalogue of Foraminifera.
1981. *Borelis melo* (Fichtel et Moll); Gagić, figs 2, 3, 4.
1983. *Neoalveolona melo* (Fichtel et Moll); Hassanein and Senussi, pl. 5: 1, 2.
1987. *Borelis melo* (Fichtel et Moll); Szczechura and Pisera, pl. 2: 7—9.

Material. — Three rather poorly preserved specimens from the Hommath Formation, western side of the Gulf of Suez (Egypt), and a few specimens from the Marada Formation, Sirte Basin (Libya).

Occurrence. — Species known in the entire Miocene of Europe, especially its southern area, Middle and Upper Miocene of northern Africa, older Miocene of Middle East, ?Pliocene of Egypt and Greece; found in the Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Suborder **Rotaliina** Delage et Hérouard, 1896
Superfamily **Rotaliacea** Ehrenberg, 1839
Family **Rotaliidae** Ehrenberg, 1839
Subfamily **Rotaliinae** Ehrenberg, 1939
Genus *Ammonia* Brünnich, 1772
Ammonia ex gr. *beccarii* (Linné, 1758) forma "*parkinsoniana*" (d'Orbigny, 1839)

(pl. 12: 13, 14)

1758. *Nautilus beccarii* Linné; Catalogue of Foraminifera, suppl. 1, 1955.
1971. *Ammonia beccarii* (Linné); Murray: 151, pl. 62: 1—7.
1978. *Ammonia parkinsoniana*; Liebau, text.-fig. 2, D, E. F.
1981. *Ammonia* gr. *beccarii* type C; Carbonnel and Pujos, pl. 1: 6.
1985. *Ammonia parkinsoniana* (d'Orbigny); Kohl: 81, pl. 28: 4.

Material. — About one hundred and forty specimens from the Hommath Formation, western side of the Gulf of Suez (Egypt), and numerous specimens from the Marada Formation, Sirte Basin (Libya).

Remarks. — Specimens differ in size and ornamental details. All specimens with more or less distinct umbilical knob. There are numerous dwarfed specimens and some as moulds only. *Ammonia beccarii* seems to represent a very polymorphic and polytypic species, referred, however, to different species or subspecies instaed of forms or morphotypes. Some authors found close dependance of species (or subspecies) of that genus on environment. According to Liebau (1978), who studied the distribution of *Ammonia* representatives in northern part of the Ebro delta (Spanish Mediterranean coast), *A. parkinsoniana* lived in high energy (turbulence zone) environment.

Occurrence. — *Ammonia beccarii* is recorded from all continents, from Paleogene up to Recent. Found in the Hommath Formation, western side of the Gulf of Suez (Egypt), section x_1 and x_2, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Genus *Pararotalia* Y. Le Calvez, 1949
Pararotalia cf. *armata* (d'Orbigny, 1826)

(pl. 12: 1, 2)

Material. — Three well preserved specimens from the Hommath Formation, western side of the Gulf of Suez (Egypt), and numerous specimens from the Marada Formation, Sirte Basin (Libya).

Remarks. — Specimens are differing a little in the size and details of external morphology. They seem very close to *Pararotalia armata*, species known from the Tertiary of southern Europe; however, they have no marginal spines typical of the latter species. They are also very similar (at least) to *Pararotalia stellata* (Reuss 1856) and *P. serrata* (Ten Dam and Reinhold 1941), both occuring in the younger Tertiary of Europe and appearing to be conspecific (see specimens referred to *P. stellata* from the Middle Miocene of Poland, as figured by Szczechura and Pisera (1986), and specimens assigned to *P. serrata* from the Neogene of England, as figured by Hughes and Jenkins in Jenkins (1981) and from the Quaternary of that country, as presented by Funnel in Jenkins (1981)). *Pararotalia* representatives are generally very polymorphic and greatly changing during their ontogenetic development. Comparative studies, including the mentioned aspects of the species, are necessary to determine the taxonomy of the specimens from N. Africa.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1 and x_2, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Family **Elphidiidae** Galloway, 1933
Subfamily **Elphidiinae** Galloway, 1933
Genus *Elphidium* de Montfort, 1808
Elphidium cf. *minutum* (Reuss, 1864)
(pl. 12: 3)

Material. — Two rather poorly preserved specimens from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Remarks. — Small size (less than 0.400 mm), general shape and details of morphology of specimens make them similar to those referred to *Elphidium minutum*, a species known from the Tertiary (Oligocene and Miocene) of Europe. Close similarity mostly in the general shape and the external morphology, is shown also by the specimens from Egypt and those assigned to *E. incertum* (Williamson, 1858), recorded from Tertiary up to Recent. More and better preserved material is necessary to prove the taxonomic position of that form.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1.

Elphidium ex gr. *flexuosum* (d'Orbigny, 1846)
(pl. 12: 4)

Material. — Thirteen in most cases poorly preserved specimens from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Remarks. — Specimens are differing a little in size and morphological details. They seem to be closest to those referred to *Elphidium flexuosum* (e.g. as figured by Andreieff *et al.* 1974, pl. 6: 1), known from the Tertiary of Europe.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Elphidium sp.
(pl. 12: 7)

Material. — One damaged specimen from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Remarks. — The specimen is similar, especially in its ornamentation, to those referred to *Elphidium complanatum* (d'Orbigny 1839) (e.g. as figured by van der Zwaan 1982, pl. 9: 3, 4), from the Miocene of the Mediterranean region. It is, however more inflated (except the umbilical area) and has more chambers. The thickening of its sutures does not attain the periphery of the test. In comparison with *E. crispum* (Linné 1758) the specimen from Egypt has less chambers and not elevated umbilical area.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1.

Superfamily **Orbitoidacea** Schwager, 1876
Family **Eponididae** Hofker, 1951
Genus *Eponides* de Montfort, 1808
Eponides repandus (Fichtel et Moll, 1798)
(pl. 11: 1)

1798. *Nautilus repandus* Fichtel and Moll; Catalogue of Foraminifera, suppl. 2, 1951.
1971. *Eponides repandus* (Fichtel and Moll); Murray: 173, pl. 72: 1—4.
1974. *Eponides repandus* (Fichtel and Moll); Andreieff *et al.*, pl. 7: 12.
1982. *Eponides repandus* (Fichtel and Moll); Szczechura, pl. 14: 3, 4.

Material. — Two rather poorly preserved specimens from the Hommath Formation, western side of the Gulf of Suez (Egypt), and few specimens from the Marada Formation, Sirte Basin (Libya).

Occurrence. — Species known from Oligocene up to Recent, from different parts of Europe and Africa. Found in Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Family **Amphisteginidae** Cushman, 1927
Genus *Amphistegina* d'Orbigny, 1826
Amphistegina cf. *vulgaris* d'Orbigny, 1826
(pl. 11: 3, 4; pl. 12: 5, 6)

Material. — Forty six in most cases poorly preserved specimens from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Remarks. — Specimens differ in size, axial diameter (thickness) and ornamentation. Better preserved specimens allow to see up to 14 chambers in the final whorl, strongly sickleform — angulate in earlier part of the test — dorsal septa, and lack of additional septa on spiral side. Rich ornamentation consists of papilae generally extending far from the aperture, sometimes covering the entire ventral side. Specimens are moderately to highly biconvex, sometimes with high umbo on ventral side.

Remarks. — Almost identical specimens (i.e. having the same number and arrangement of chambers in the last whorl and similar ornamentation) from the Middle Miocene (Badenian) of Poland were assigned to *Amphistegina* cf. *vulgaris* d'Orbigny (cf. Szczechura and Pisera 1986). At the same time similar forms (according to their shape, number of chambers and ornamentation) are described and figured by Larsen (1978) as *A. aucklandica* Karrer, 1865 and *A. bohdanowiczi* Bieda, 1936, both known, among others, from the entire Miocene of Europe and treated by Larsen (*l.c.*) as probable synonymous species with *A. vulgaris*. The specimens from Egypt seem to be close also to those present in younger Tertiary of Europe and named by different authors as *A. lessoni* d'Orbigny. According to Larsen (1977), however, the latter species appears for the first time in Pleistocene. In comparison with the neotype of *A. lessoni* (Larsen 1977) the specimens referred here to *A. vulgaris* differ in having more chambers in the last whorl, the lack of additional septa and more intensive ornamentation.

Occurrence. — Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1 and x_2.

Superfamily **Cassidulinacea** d'Orbigny, 1839
Family **Anomalinidae** Cushman, 1927
Subfamily Anomalininae Cushman, 1927
Genus *Hanzawaia* Asano, 1944
Hanzawaia boueana (d'Orbigny 1846)
(pl. 12: 8—10)

1846. *Truncatulina boueana* d'Orbigny; Catalogue of Foraminifera, suppl. 2, 1958.
1970. *Hanzawaia producta* (Terquem); Le Calvez: 201, pl. 44: 9.
1974. *Hanzawaia americana* (Cushman); Andreieff *et al.*, pl. 12: 4, 5.
1978. *Hanzawaia* cf. *bolivarensis* (Garrett); Magné, pl. 83: 3—5.
1980. *Cibicides boueanus* (d'Orbigny); Bremer *et al.*: 23, pl. 3: 1, 2.
1982. *Hanzawaia boueana* (d'Orbigny); Zwaan van der: 151, pl. 10: 1.
1982. *Hanzawaia boueana* (d'Orbigny); Szczechura, pl. 12: 11, 12; pl. 16: 4, 5.
1984. *Hanzawaia boueana* (d'Orbigny); Mostafawi: 339, pl. 6: 24, 25.

Material. — About fifty in most cases well preserved specimens from the Hommath Formation, western side of the Gulf of Suez (Egypt), and some specimens from the Marada Formation, Sirte Basin (Libya).

Remarks. — Specimens considerably differ in size, details of the external morphology and ornamentation. The species broadly known under different names (see Szczechura 1982).

Occurrence. — Species known from Paleogene up to Recent from all continents. Found in the Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1 and x_2, and Marada Formation (?Middle Miocene), Sirte Basin (Libya).

Superfamily **Robertinacea** Reuss, 1850
Family **Ceratobuliminidae** Cushman, 1927
Genus *Mississippina* Howe, 1930
Mississippina neagui Popescu, 1968
(pl. 11: 5, 7)

1968. *Mississippina neagui* Popescu: 109, figs. 1—3.

Material. — Three damaged specimens from the Hommath Formation, western side of the Gulf of Suez (Egypt).

Remarks. — In comparison with representatives of that species from Romania, as described by Popescu (1968), the studied here specimens have more chambers i.e. up to 10.

Occurrence. — Middle Miocene of Romania (Transylvanian Basin) and Austria (Vienna Basin) (up to now not recorded from the latter area), and Hommath Formation (?Middle Miocene), western side of the Gulf of Suez (Egypt), section x_1 and x_2.

REFERENCES

ABDALLAH, A. M. and ABD-EL HADY, F. M. 1966. Geology of the Sadat area, Gulf of Suez. — *J. Geol., U. A. R.*, **10**, 1, 1—24.

— and — 1971. Microfacies of the Eocene and Miocene rocks at the south-eastern corner of Gebel Ataqa, Gulf of Suez, U. A. R. — *Bull. Fac. Sci. Cairo University*, **1969**, 13, 345—358.

ADAMS, C. G., GENTRY, A. W. and WHYBROW, P. J. 1983. Dating the terminal Tethyan event. — *Bull. Utrecht Micropaleont.*, **30**, 239—253.

AL-ABDUL RAZZAQ, S., SHUBLAQ, W., AL-SHEIKH, Z. and KITTANEH, W. 1983. Ecology and distribution of ostracods in Kuwait Bay. — *J. micropaleont.*, **2**, 39—45.

ALI, M. S. 1984. The Miocene echinoids of Egypt, a summary their paleogeographical significance. International Colloque on Mediterranean Neogene Marine Megafaunal Palaeoenvironments and Biostratigraphy, Athens 1984. — *Ann. Geol. Pays Hellen*, **32**, 157—170.

ANDREIEFF, P., ANGLADA, R., AUBERT, J., BLONDEAU, A., BURDON, M., CARALP, M., LE CALVEZ, Y., LORENZ, C., MAGNÉ, J., POIGNANT, A. and PUJOL, C. 1974. Étude biostratigraphique des gisements d'Escornebeou (Aquitaine meridionale, France). — *Docum. Lab. Géol. Fac. Sci. Lyon*, **59**, 31—55.

ARANKI, J. F. 1987. Marine Lower Pliocene Ostracoda of southern Spain with notes on the Recent fauna. — *Bull. Geol. Inst. Univ. Uppsala, N. S.*, **13**, 1—144.

ARUTA, L. 1982. Gli Ostracodi del Saheliano (Miocene mediosuperiore) di C. Pestavecchia (Bonfornello, Palermo). — *Boll. Soc. Paleont. Italiana*, **21**, 1, 113—132.

ATHERSUCH, J. and WHITTAKER, J. E. 1976. On *Loxoconcha rhomboidea* (Fischer). — Stereo-Atlas of Ostracod Shells, **3**, 2, 81—90, Leicester.

BASSIOUNI, M. A. 1965. Ostracoden aus dem "Pliozan" von Kom el Shelul, Paraden--Plateau, Gizeh (Ägypten). — *Geol. Jb.*, **82**, 631—654.

— 1970. *Falunia* (*Hiltermanicythere*), a new subgenus from the gulf of Naples, and related fossil forms. — *Rev. Espan. Micropaleont.*, **2**, 2, 117—130.

— 1979. Brackische und marine Ostrakoden (Cytherideinae. Hemicytherinae, Trachyleberidinae) aus dem Oligozän und Neogen der Türkei (Känozoikum und Braunkohlen der Türkei. 22). — *Geol. Jb.*, B, **31**, 3—195.

BELLINI, E. 1969. Biostratigraphy of the "Al Jaghbub (Giarabub) Formation" in eastern Cyrenaica (Libya). 3rd African Micropaleontological Colloque, Cairo, 1969, 165—184.

BERGER, C. and MOYES, J. 1964. Étude d'une population de *Falunia plicatula* (Reuss) *s.l.* dans un falun du Miocène inférieur bordelais. — *Act. Soc. Linn. Bordeaux*, **101**, 2, 51—58.

BHATIA, S. B. and KUMAR, S. 1979. Recent Ostracoda from off Karwar, west coast of India. — *In:* N. Krstić (ed.), Proc. the 7th International Symposium on Ostracodes; Taxonomy, Biostratigraphy and Distribution of Ostracodes, Belgrade 1979, 173—178.

BISMUTH, H., KEIJ, A. J., OERTLI, H. and SZCZECHURA, J. 1978. The genus *Loculicytheretta*. — *Bull. Centr. Rech. Expl.-Prod. ELF — Aquitaine*, **2**, 2, 227—263.

BODERGAT, A. M. 1983. Les Ostracodes, témoins de leur environment: approche chimique et écologie en milieu lagunaire et oceanique. — *Docum. Lab. Géol. Fac. Sci. Lyon*, **88**, 1—264.

BOLD, van den W. A. 1966. Les Ostracodes du Néogène du Gabon. — *Rev. Inst. Fr. Pétr.*, **21**, 2, 155—188.

BOLTOWSKOY, E. and WRIGHT, R. 1976. Recent Foraminifera. 1—515. W. Junk, Hague.

BONADUCE, G. and PUGLIESE, N. 1975. Ostracoda from Libya. — *Publ. Staz. Zool. Napoli*, **39**, 129—135.

— , CIAMPO, G. and MASOLI, M. 1975. Distribution of Ostracoda in the Adriatic Sea. — *Ibidem*, **40** Suppl., 1—304.

— , MASOLI, M. and PUGLIESE, N. 1976. Benthic ostracoda from the Gulf of Aqaba. — *Ibidem*, **40**, 372—428.

— , — , MINICHELLI, G. and PUGLIESE, N. 1980. Some new benthic ostracod species from the Gulf of Aqaba (Red Sea). — *Boll. Soc. Palaeont. Italiana*, **19**, 1, 143—178.

— , CILIBERTO, B. and MINICHELLI, G. 1983. The Red Sea benthic ostracodes and their geographical distribution. In: R. F. Maddocks (ed.), Proc. the 8th International Symposium on Ostracoda; Applications of Ostracoda, Univ. Houston Geosc., 472—491.

— , RUGGIERI, G. and RUSSO, A. 1984. The genus *Tenedocythere* (Ostracoda, Podocopida) of the Mediterranean Miocene to Recent, especially from Italy. — *Boll. Soc. Paleont. Italiana*, **23**, 3, 515—543.

— , BISMUTH, H., RUGGIERI, G., RUSSO, A. and MASCELLARO, P. (in press) The marine ostracod fauna of the Late Miocene of Tunisia. 9th International Symposium on Ostracoda, Shizuoka, Japan, 1985.

BREMER, M. L., BRISKIN, M. and BERGGREN, W. A. 1980. Quantitative paleobathymetry and paleoecology of the late Pliocene — early Pleistocene foraminifera of the Castella (Calabria, Italy). — *J. Foram. Res.*, **10**, 1, 1—30.

BRESTENSKÁ, E. and JIŘIČEK, R. 1978. Ostrakoden des Badenien der Zentralen Paratethys. *In:* E. Brestenská (ed.), Chronostratigraphie und Neostratotypen, Miozän M_4, Badenian, 405—439, VEDA, Bratislava.

BROEKMAN, J. A. 1974. Sedimentation and paleontology of Pliocene lagoon-shallow marine deposits on the Island of Rhodos (Greece). — *Bull. Utrecht Micropaleont.*, **8**, 2, 142.

CARBONEL, P. 1980. Les ostracodes et leur intéret dans la définition des écosystèmes estuariens et de platforme continentale. Essais d'application à des domaines anciens. — *Mém. Inst. Géol. Bassin d'Aquitaine*, **11**, 1—350.

— 1982. Les Ostracodes, traceurs des variations hydrologiques dans des systèmes

de transition eaux douces — eaux salées. — *Mém. Soc. géol. France, N. S.*, **144**, 117—128.

— and CIRAC, P. 1978. Essai d'interprétation paléogeographique de la région des Zemmours (Maroc Nord-occidental) à la fin du Miocène et au cours du Pliocène. — *Bull. Inst. Géol. Bassin d'Aquitaine*, **24**, 49—69.

— , PEYPOUQUET, J. P. and CIRAC, P. 1981. Les Ostracodes et l'évolution de la partie occidentale du sillon sud-rifain à la fin du Néogène. — *Cah. Micropaléont.*, **3**, 71—80.

— , PINSON, J., RIFFAULT, A. PEYPOUQUET, J. P. and TASTET, J. P. 1984. Les Ostracodes du plateau continental sénégalais: témoins des environments actuels et quaternaires. — *Bull. A. S. E. Q. U. A.*, Dakar, 15—42.

CARBONNEL, G. 1969. Les ostracodes du Miocène rhodanien: Systématique, biostratigraphie écologique, paléobiologie. — *Docum. Lab. Geol. Fac. Sci. Lyon*, **32**, 1—2, 1—228.

— and BALLESIO, R. 1982. Les ostracodes Pliocènes du Sud-Est de la France. — *Ibidem*, **85**, 5—112.

— and MAGNÉ, J. 1977. Microfaunes (Ostracodes et Foraminifères) du Pliocène de l'Ampurdan (Espagne). — *Rev. Espan. Micropaleont.*, **9**, 3, 347—359.

— and PUJOS, M. 1982. Comportements des microfaunes bentiques en milieu lagunaire: les Foraminifères et les Ostracodes du lac de Tunis. 1er Congrès National des Sciences de la Terre de Tunis, Tunis, 1981, 79—86.

Catalogue of Foraminifera. *In*: The Ellis and Messina Catalogues of Micropaleontology, Micropaleontology Press, The American Museum of Natural History, New York.

Catalogue of Ostracoda. *Ibidem.*

CIAMPO, G. 1971*a*. Gli Ostracodi Plio-pleistocenici dei dintorni di Calvello (Potenza). — *Boll. Soc. Natur. Napoli*, **80**, 44, 3—23.

— 1971*b*. Gli ostracodi delle argile pleistoceniche del Mar Piccolo (Taranto). — *Ibidem*, **80**, 37, 3—41.

— 1976. Ostracodi Pleistocenici di Cala Bianca (Marina di Camerota, Salerno). — *Bol. Soc. Palaeont. Italiana*, **15**, 1, 3—23.

COLOM, G. 1985. Estratigrafia y Paleontologia del Andaluciense y del Plioceno de Mallorca (Baleares). — *Bol. Geol. Minero*, **96**, 3, 3—70.

COUTELLE, A. and YASSINI, I. 1974. Ostracodes du Miocène de la Vallée de la Soummam Algerie Nord-Orientale. — *Rev. Espan. Micropaleont.*, **6**, 1, 85—99.

DIECI, G. and RUSSO, A. 1964. Ostracodi tortoniani dell Appennino settentrionale (Tortona, Montegibbio, Castelvetro). — *Boll. Soc. Paleont. Italiana*, **3**, 1, 38—88.

DORUK, N. 1973. On *Mutilus convexus* (Baird). Stereo-Atlas of Ostracod Shells, 1, 2, 129—136.

— 1974. On *Semicytherura incongruens* (G. W. Müller). — *Ibidem*, **2**, 2, 105—122.

— 1979. Neogene and Quaternary Ostracoda of Adana and Antakya basins. — *In*: N. Kristić (ed.), Proc. of the 7th International Symposium on Ostracodes; Taxonomy, Biostratigraphy and Distribution of Ostracodes, Belgrade 1979, 165—172.

EL-HAWAT, A. S. 1980. Carbonate — terrigenous cyclic sedimentation and paleogeography of the Marada Formation (Middle Miocene), Sirte Basin. *In*: M. J. Salem and M. T. Busrewil (eds.), Proc. of the Symposium on Geology of Libya, 1978, 2, 449—462.

— and SALEM, M. J. 1987. A case study of the stratigraphic subdivision of Ar-

-Rajmah Formation and its implication on the Miocene of northern Libya. — Proc. of the 8th RCMNS Congress, Budapest 1985. — *Ann Inst. Geol. Publ. Hung.*, **70**, 173—192.

EL-WAER, A. A. 1988. Late Miocene Ostracoda from NW Libya. — *J. Micropaleont.*, **7**, 1, 45—52.

FARMER, M. 1983. Les Ostracodes marquers de la circulation des eaux sur les plateaux continentaux: Le genre *Chrysocythere* et les upwellings saisonniers du Senegal (unpublished Doctorat Thèses).

— and CARBONEL, P. (1984). Le genre *Chrysocythere* (Ostracoda), traceur de l'upwelling cotier du Senegal. 10-e Reunion Annuelle des Sciences de la Terre, Bordeaux 1984, 216, Soc. Géol. Fr. Edit., Paris.

GAGIĆ, N. 1981. Representatives of the genus *Borelis* in the Badenian and Lower Sarmation of Yugoslavia. Carpatho-Balkan Geological Association, the 12th Congress, Bucharest, 169—181.

GÖKÇEN, N. (1985). Les Ostracodes burdigaliens de la région de Kale-Yenisehir (Denizli) sud-ouest de l'Anatolie (Turquie). The Burdigalian ostracods from the area S. W. Anatolia (Turkey). — *Rev. micropaléont.*, **28**, 1, 41—57.

GRAMANN, F. 1969. Das Neogen im Strimon-Becken (Grechisch-Ostmazedonien), Teil II, Ostracoden und Formaniferen aus dem Neogen des Strimon-Beckens. — *Geol. Jb.*, **87**, 485—528.

— 1971. Ostracoda aus Neogene und Quartär der Danakil-Senke (Nordost--Athiopien). — *Beih. Geol. Jb.*, **106**, 109—142.

— 1975. Ostracoda from the Tertiary Sediments of Burma with reference to living species. — *Geol. Jb., B.* **14**, 1—46.

GUARDIA, P., MAGNÉ, J. and MOYES, J. 1974. Aperçu sur le Neogène autochtone de l'Ouest oranais (Algérie occidentale). — *Mém. B. R. G. M., Orléans*, **78**, 691—703.

GUERNET, C., POIGNANT, A. and SAINT-MARTIN, J. P. 1984. Contribution à l'étude de la microfaune des récifs messiniens d'Oranie occidentale (Algérie). — *Geobios*, **17**, 2, 155—161.

HAGEMAN, J. 1979. Benthic foraminiferal assemblages from Plio-Pleistocene open bay to lagoonal sediments of the western Peloponnesus (Greece). — *Bull. Utrecht Micropaleont.*, **20**, 5—108.

HARTEN, van D. 1986. Ostracode options in sea-level studies. *In*: O. van de Plassche (ed.), Sea-level Research: a manual for the collection and evaluation of data, 489—501.

HARTMANN, G. and PURI, H. S. 1974. Summary of neontological and paleontological classification of Ostracoda. — *Mitt. Hamburg. Zool. Mus. Inst.* **70**, 7—73.

HASSANEIN, A. M. and EL-SENUSSI, M. Y. 1983. Foraminiferal fauna and biostratigraphic zonation of the Upper Tertiary rocks of West Matruh area, North Western Desert, Egypt. — *Sci. Engin. Bull., Cairo University*, **3**, 245—264.

HINTE van, J. E., COLIN, J. P. and LEHMANN, R. 1980. Micropaleontologic Record of the Messinian Event at Esso Libya Inc. Well B1-NC35A on the Pelagian Platform. *In*: M. J. Salem and M. T. Busrewill (eds.), Proc. of the Symposium on Geology of Libya, 1978, 2, 205—240.

HOTTINGER, L. 1983. Processes determining the distribution of larger foraminifera in space and time. — *Bull. Utrecht Micropaleont.*, **30**, 239—253.

INNOCENTI, F. and PORTUSATI, P. 1984. Geological Map of Libya, 1:250.000. Sheet Aquylah (NH34-5), Explanatory Booklet. Industrial Research Centre, 41—47, Tripoli.

HUGHES, M. and JENKINS, D. G. 1981. Neogene. *In*: D. G. Jenkins and J. W. Mur-

ray (eds.), Stratigraphical Atlas of Fossil Foraminifera. The British Micropaleontological Society Series, 268—285, Ellis Horwood Lt. Publishers, Chichester.

JIŘIČEK, R. 1983. Redefinition of the Oligocene and Neogene ostracod zonation of the Paratethys. *In*: A. Thon (ed.), A memorial volume dedicated to the 18th European Colloquy on Micropaleontology, Miscellanea Micropalaoentologica, 195—236, Hodonin.

KEEN, M. C. 1972. Mid-Tertiary Cytherettinae of North-West Europe. — *Bull. Brit. Mus. (Nat. Hist.)*, **21**, 6, 261—349.

— 1976. A Evolutionary Study of Two Homeomorphic Tertiary Cytherid Ostracod genera. — *In*: G. Hartmann (ed.), Proc. of the 5th International Symposium on Evolution of Post-Paleozoic Ostracoda. — Abh. Verh. naturwiss. Ver. Hamburg, NF, 18/19 (Suppl.), 319—323.

KEIJ, A. J. 1957. Eocène and Oligocene Ostracoda of Belgium. — *Mém. Inst. Roy. Sci. Nat. Belgique*, **136**, 3—210.

KHALAF, S. K. 1983. The regional faunal relationships of the Middle Miocene Ostracoda from N. Iraq, and their paleogeographical significance. *In*: K. G. McKenzie (ed.), Shallow Tethys 2, Proc. of the International Symposium on Shallow Tethys 2, Wagga Wagga 1986, 427—433, A. A. Balkema, Rotterdam—Boston.

KOHL, B. 1985. Early Pliocene benthic foraminifers from the Salina Basin, south-eastern Mexico. — *Bull. American Paleont.*, **88**, 322, 5—173.

KRISTIĆ, N. and PIETRZENIUK, E. 1972. *Paijenborchella* (*Eopaijenborchella*) *laskarevi*, eine neue Ostracoden-art aus dem Oberen Torton des Pannonischen Beckens. — *Geologie*, **21**, 1, 100—109.

LARSEN, A. R. (1977). A neotype of *Amphistegina lessoni* d'Orbigny, 1826. — *J. Foram. Res.*, **7**, 4, 273—277.

— 1978. Phylogenetic and paleogeographic trends in the foraminiferal genus *Amphistegina*. — *Rev. Esp. Micropaleont.*, **10**, 2, 217—243.

LE CALVEZ, Y. 1910. Contribution à l'étude des foraminifères paleogénes du Bassin de Paris. — *Cah. paléont., C. N. R. S.*, 9—326.

LIEBAU, A. 1978. Abrieb-geschützte Foraminiferen. — *N. Jb. Geol. Paläont. Abh.*, **157**, 1/2, 119—133.

LLANO, M. 1981. Les Ostracodes temoins et traceurs des phenomènes hydrologiques sur les plateaux continentaux; la platforme continentale atlantique marocaine. — *Bull. Inst. Géol. Bassin d'Aquitaine*, **30**, 125—160.

MAGNÉ, J. 1978. Études microstratigraphiques sur le Néogène de la Mediterranée nord-occidentale. Les bassins néogènes catalans. Editions du C. N. R. S., 13—255. Toulouse.

MALZ, H. 1978. Neue *Hemicyprideis*-Arten (Ostracoda; Tertiär) aus dem Mainzer Becken und seinem Randgebieten. — *Senckenberg. lethaea*, **59**, 1/3, 71—91.

— and TRIEBEL, E. 1970. Ostracoden aus dem Sannois und jüngeren Schichten des Mainzer Beckens, 2: *Hemicyprideis* n.g. — *Ibidem*, **51**, 1, 1—47.

— and JELLINEK, T. 1984. Marine Plio-Pleistözan — Ostracoden von SE-Lakonien. — *Senckenberg. biol.*, **65**, 1/2, 113—167.

MCKENZIE, K. G. 1986. A comparative study of collections from the SW Pacific (Saipan to Tonga), with the descriptions of *Gambiella caudata* (Brady, 1890) and a new species of *Pterobairdia* (Ostracoda). — *J. Micropaleont.*, **5**, 1, 91—108.

— , DUCASSE, O., DUFOUR, E. and PEYPOUQUET, J. P. 1979. Monographie bibliographique, stratigraphique et paléoecologique sur les Ostracodes

cénozoique du Bassin d'Aquitaine et du Golfe de Gascogne. — *Bull. Inst. Géol. Bassin d'Aquitaine*, no spec., 1—195.

MORKHOVEN, F. P. C. M. 1963. Post-Palaeozoic Ostracoda: Their Morphology, Taxonomy and Economic use, pt. 2, Elsevier Publishing Company, Amsterdam—London—New York, 1—478.

MOOS, B. 1962. Ein Vertreter der Gattung *Miocyprideis* Kollmann 1960 (Ostrac.) aus dem italienischen Pliozän. — *Geol. Jb.*, **80**, 221—228.

MOSTAFAWI, N. 1984. Bentische Foraminiferen aus dem Plio-Pleistozän der Insel Kos (Griechenland) (Benthic Foraminifera from the Plio-Pleistocene of the Island of Kos (Greece)). — *N. Jb. Geol. Paläont. Abh.*, **167**, 3, 304—346.

MOYES, J. 1965. Les Ostracodes du Miocène aquitaine: Essai de paléoécologie stratigraphique et de paleogéographie, 1—338, E. Drouillard, Bordeaux.

MURRAY, J. W. 1971. An Atlas of British Recent Foraminiferids, 1—244. Heinemann Educational Books, London.

— 1976. Comparative studies of living and dead benthic foraminiferal distribution. *In*: R. H. Hedley and C. G. Adams (eds.), Foraminifera, **2**, 45—109. Academic Press, London—New York—San Francisco.

NASCIMENTO, A. 1983. The Ostracoda fauna of the Portuguese Neogene and its relationship to those from the Atlantic and Mediterranean basins. *In*: R. F. Maddocks (ed.), Proc. the 8th International Symposium on Ostracoda; Applications of Ostracoda, Univ. Houston Geosc., 429—436.

OERTLI, H. J. 1956. Ostrakoden aus der oligozänen und miozänen Molasse der Schweiz. — *Schweiz. Palaeont. Abh.*, **74**, 3—119.

— 1961. Ostracodes du Langhian Type. — *Riv. Ital. Paleont. Strat.*, **21**, 17—34.

— 1976. The evolution of *Loculicytheretta* in the Eocene. *In*: G. Hartmann (ed.), Proc. of the 5th International Symposium on Evolution of Post-Paleozoic Ostracoda, Hamburg 1974. — *Abh. Verh. naturwiss. Ver. Hamburg*, NF 18/19 (Suppl.), 7—9, 153—161.

PEYPOUQUET, J.-P. 1977. Les Ostracodes et la connaissance des paléomilieux profonds. Application au Cénozoique de l'Atlantique nord-oriental. — Thése de doctorat d'état et sciences, Bordeaux, 1-443.

— 1980. Les relations Ostracodes-profondeur. Principles applicables pendant le Cénozoique. — *Bull. Inst. Géol. Bassin d'Aquitaine*, **28**, 13—28.

POPESCU, Gh. 1968. *Mississippina neagui* n. sp. des dépôts tortoniens du couloir de Mureş. — *Rev. Roumaine de Géol., Geoph., Géogr. ser Géologie*, **12**, 1, 109—112.

RUGGIERI, G. 1962. Gli Ostracodi marini del Tortoniano (Miocene medio superiore) di Enna, nella Sicilia centrale. — *Palaeont. Italiana*, **56**, 1—69.

— 1963. Neotipi di Ostracodi Tortoniani di Benestare (Calabria). — *Boll. Soc. Paleont. Italiana*, **2**, 1, 3—15.

— 1967. Due Ostracofaune del Miocene alloctono della Val Marecchia (Appennino settentrionale). — *Riv. Ital. Paleont.*, **73**, 1, 351—384.

— 1976. La Ostracofauna pleistocenica della falesia di Cinisi (Sicilia). — *Boll. Soc. Paleont. Italiana*, **15**, 1, 85—105.

— RUSSO, A. and BOSSIO, A. 1977. *Pokornyella italica* (Ostracoda, Podocopida) nuova specie del Miocene superiore mediterraneo. — *Ibidem*, **16**, 1, 129—136.

SADEK, H. 1926. The geography and geology of the district between Gabal Ataqa and Gabal el Galala of Bahariya (Gulf of Suez). — *Geol. Surv., Cairo*, 1—120.

— 1959. The Miocene in the Gulf of Suez region (Egypt). — *Ibidem*, 1—118.

SALEM, M. J. 1976. Evolution of Eocene-Miocene sedimentation patterns in parts of northern Egypt. — *Bull. Amer. Assoc. Petrol. Geol.*, **60**, 34—64.

— and SPRENG, A. C. 1980. Middle Miocene Stratigraphy, Al Khums Area, Northwestern Libya. *In*: M. J. Salem and M. T. Busrewill (eds.), Proc. of the Symposium on Geology of Libya, 1978, **2**, 97—116.

SISSINGH, W. 1971. Tricostate Trachyleberidinae (Ostracoda) from the deep southeastern Adriatic Sea. — *Proc. Kon. Ned. Akad. Wetensch.*, ser. B **74**, 2, 195—205.

— 1972*a*. Late Cenozoic Ostracoda of the south Aegean islands arc. — *Bull. Utrecht Micropaleont.*, **6**, 9—187.

— 1972*b*. Ostracodes from the Sahelian near Carnot, N. Algeria. — *Proc. Kon. Ned. Akad. Wetensch.*, ser. B. **75**, 1, 84—95.

— 1974. The Miocene Ostracoda from the Hipparion bearing beds of Kastellios Hill, central Crete. — *Ibidem*, **77**, 2, 119—128.

— 1976. Tentative Middle Miocene to Holocene ostracode biostratigraphy of the Central and Eastern Mediterranean Basin. I. — *Ibidem*, **79**, 4, 271—299.

STANCHEVA, M. 1971. *Hemicytheria* (*Getocytheria*) subgen. n. and its representatives in North-Western Bulgaria. — *Bull. Geol. Inst.*, ser. Paleont., **20**, 45—62.

SZCZECHURA, J. 1980. *"Paijenborchellina" libyca* sp. n. from the Upper Miocene of Libya. — *Acta Palaeont. Polonica*, **25**, 2, 225—232.

— 1982. Middle Miocene foraminiferal biochronology and ecology of SE Poland. — *Ibidem*, **27**, 1—4, 3—44.

— and PISERA, A. 1986. The biostratigraphic position of Lithothamnian Limestones from Chomentów (Korytnica Basin and Węglin (Roztocze Region). — *Geologia*, **12**, 3, 45—62.

SYLVESTER-BRADLEY, P. C. and RUGGIERI, G. 1973. On *Chrysocythere cataphracta*. Stereo-Atlas of Ostracod shells, **1**, 4, 31—34.

TOLLMANN, A. 1957. Die mikrofauna des Burdigal von Eggenburg (Niederösterreich). — *Sitzung Österr. Akad., Mat.-nat., Kl. Abt.* 1, 166, 3, 4, 165—213.

UFFENORDE, H. 1981. Ostracoden aus dem Oberoligozän und Miozän des unteren Elbe-Gebietes (Niedersachsen und Hamburg, NW-deutsches Tertiärbecken). — *Palaeontographica*, A, **172**, 4—6, 103—198.

WHATLEY, R. 1983. The application of Ostracoda to palaeoenvironmental analysis. *In*: R. F. Maddocks (ed.), Proc. the 8th International Symposium on Ostracoda; Applications of Ostracoda, Univ. Houston Geosc., 51—77.

— and DOWNING, S. 1983. Middle Miocene Ostracoda from Victoria, Australia. — *Rev. Espan. Micropaleont.*, **15**, 3, 347—407.

YASSINI, I. 1979*a*. Repartition des Ostracodes dans une série marin régressive d'age Pliocene dans la région d'Alger, Algérie. — *Rev. micropaleont.*, **22**, 2, 89—124.

— 1979*b*. The littoral System Ostracodes from the Bay of Bou-Ismail, Algiers, Algeria. — *Rev. Espan. Micropaleont.*, **11**, 3, 353—416.

YOUSSEF, M. I., BASSIOUNI, M. A. and CHERIF, O. H. 1971. Some stratigraphic and tectonic aspects of the Miocene in the North-eastern part of the Eastern Desert (Egypt) (with a special reference to the Sadat area, southwest of Suez). — *Publ. Inst. Desert Egypte*, **52**, 119—155.

ZWAAN van der, G. J. 1982. Paleoecology of Late Miocene Mediterranean foraminifera. — *Bull. Utrecht Micropaleont.*, **25**, 1—202.

JANINA SZCZECHURA i EZZAT ABD-ELSHAFY

MAŁŻORACZKI I OTWORNICE ZE ?ŚRODKOWEGO MIOCENU ZACHODNIEGO BRZEGU ZATOKI SUEZKIEJ

Streszczenie

Przedmiotem pracy są małżoraczki z osadów mioceńskich występujących na zachód Zatoki Suezkiej (Egipt). Dla określenia ich wieku i środowiska wykorzystano towarzyszące im otwornice. Do celów porównawczych użyto też mikrofauny ze zbiorów pierwszej autorki częściowo przez nią już opisanej (Bismuth *et al.* 1978, Szczechura 1980). Fauna ta pochodzi z mioceńskiej Formacji Marada z Basenu Syrty (Libia) (fig. 1).

Próbki z Egiptu pochodzą z dwóch odsłonięć (x_1 i x_2) z rejonu Gabal Akheider (fig. 2, 3, 4), z osadów uchodzących za południowo-zachodnie przedłużenie Formacji Hommath. Formację tę zaliczano do środkowego bądź górnego miocenu. Opisano 56 taksonów małżoraczków (Tabela 1, pls. 1—12), w tym 4 nowe gatunki: *Cytherelloidea sissinghi, Neomonoceratina ruggierii, N. keiji* i *Hemicyprideis aegyptiaca.*

Małżoraczki nie pozwalają jednoznacznie określić wieku osadów. Jednakże spotykana tu *Pokornyella minor*, znana dotąd z oligocenu i dolnego miocenu i *Loculicytheretta libyca* obecna jedynie w osadach dolnego i środkowego miocenu, obok gatunków występujących wyłącznie w osadach dolnego i środkowego miocenu i/albo pliocenu tj. *Cytherella libyaensis, Chrysocythere cataphracta cataphracta, Keijella africana* i *Falsocythere maccagnoi*, pozwalają sądzić, że reprezentowany jest tu środkowy miocen. Także otwornice sugerują środkowomioceński wiek osadów; *Mississippina neagui* znana jest dotąd tylko z tego poziomu, a *Borelis melo* przekracza jego dolną i górną granicę, prawdopodobnie bardzo nieznacznie. Wśród małżoraczków równowiekowych osadów z miocenu Libii obecna jest *Ruggieria micheliniana* (Bosquet), charakterystyczna dla dolnego miocenu Europy i Azji (Turcji) i *Paleocosta ocellata* Ciampo opisana ze środkowego miocenu Europy. Gatunki te dodatkowo przemawiają za przynależnością badanych tutaj osadów do raczej starszego niż młodszego miocenu.

Bardziej jednoznacznie, zarówno małżoraczki jak i otwornice, zdają się określać warunki środowiska; wskazują one na wody normalnie zasolone, tropikalne, płytkie (litoralne) i raczej niespokojne, będące być może pod wpływem upwellingów. Jest jednak bardzo prawdopodobne, że posiadane próbki mikrofaunistyczne są dalece zmodyfikowane w stosunku do biocenozy, a tym samym z rezerwą należy przyjmować sugerowaną przez nie interpretację środowiska.

Z rozprzestrzenienia opracowanych małżoraczków wynika, że znaczna większość gatunków ograniczona jest do obszaru śródziemnomorskiego, a tylko nieliczne rodzaje (*Cistacythereis, Chrysocythere, Keijella, Falsocythere, Paijenborchellina* i *Loculicytheretta*) ograniczone są do tego obszaru, bądź przekraczają go w kierunku południowo-wschodnim i południowo-zachodnim. Te ostatnie zdają się wywodzić

w większości z Afryki północnej, a następnie migrować do Europy południowej przypuszczalnie przez Bliski Wschód.

Na uwagę zasługuje znaczne podobieństwo mikrofauny miocenu Egiptu i Libii; ponad 70% wspólnych gatunków małżoraczków sugeruje zarówno podobne środowisko jak i podobny wiek osadów.

EXPLANATION OF PLATES 1—12

Plate 1

1. ?*Hemicytheria* sp., aRV, internal view; ZPAL O.XXXI/5.
2. *Cistacythereis* cf. *caelatura* Uliczny, aLV, internal view; ZPAL O.XXXI/2.
3. *Cytheretta* cf. *rhenana rhenana* Triebel, aRV, internal view; ZPAL O.XXXI/3.
4. *Hemicythere* ex gr. *notata* (Reuss), aRV, internal view; ZPAL O.XXXI/4.

All scales correspond to 0.1 mm

Plate 2

?Miocyprideis sp.

1. aRV, lateral view; ZPAL O.XXXI/6, ×50.
3. aC, dorsal view; ZPAL O.XXXI/7, ×50.
4. aRV, internal view showing hinge margin; ZPAL O.XXXI/8, ×110.
5. aC, left lateral view; ZPAL O.XXXI/9, ×50.
6. aRV, lateral view; ZPAL O.XXXI/10, ×50.

Cytherella sp.

2. aFC, a — dorsal view, b — left lateral view; ZPAL O.XXXI/11, ×32; ×40.
7. aMC, left lateral view; ZPAL O.XXXI/12, ×43.

Cytherelloidea sissinghi sp. n.

8. aC, left lateral view, holotype; ZPAL O.XXXI/1, ×40.
9. aC, right lateral view; ZPAL O.XXXI/13, ×40.
10. aC, right lateral view; ZPAL O.XXXI/14, ×40.
13. aC, dorsal view; ZPAL O.XXXI/15, ×36.

Cytherella libyaensis El-Waer

11. aFC, left lateral view ZPAL O.XXXI/16, ×40.
14. aFC, right lateral view; ZPAL O.XXXI/17, ×40.
15. aFC, dorsal view; ZPAL O.XXXI/18, ×35.

Cytherella ?libyaensis El-Waer

12. aMC, a — dorsal view, b — left lateral view; ZPAL O.XXXI/19, ×40; ×50.
1—9, 11, 12, 14 — western coast of the Gulf of Suez (Egypt), section x_1; 10, 13, 15 — Sirte Basin (Libya)

Plate 3

Cytheretta cf. *rhenana rhenana* Triebel

1. aRV, lateral view; ZPAL O.XXXI/3, ×32.
2. aC, right lateral view; ZPAL O.XXXI/35, ×32.

Protocytheretta ?schoelleri (Keij)

3. aC, left lateral view; ZPAL O.XXXI/36, ×43.
4. aC, right lateral view; ZPAL O.XXXI/37, ×43.
5. aC, right lateral view; ZPAL O.XXXI/38, ×43.

Cytheretta sp.

6. aRV, lateral view; ZPAL O.XXXI/39, ×32.
7. aLV, lateral view; ZPAL O.XXXI/40, ×32.

Cistacythereis cf. *caelatura* Uliczny

8. aRV, lateral view; ZPAL O.XXXI/41, ×45.
9. aC, dorsal view; ZPAL O.XXXI/42, ×33.
10. aLV, lateral view; ZPAL O.XXXI/2, ×40.
11. aC, left lateral view; ZPAL O.XXXI/43, ×45.
12. jLV, lateral view; ZPAL O.XXXI/44, ×45.

Falunia ex gr. *plicatula* (Reuss)

13. jC, right lateral view; ZPAL O.XXXI/45, ×40.
14. aMC, left lateral view; ZPAL O.XXXI/46, ×40.
15. aFLV, lateral view; ZPAL O.XXXI/47, ×40.

All specimens from the western coast of the Gulf of Suez (Egypt), section x_1.

Plate 4

Miocyprideis cf. *italiana* Moos

1. aLV, internal view showing hinge margin; ZPAL O.XXXI/20, ×44.
2. aRV, internal view showing hinge margin; ZPAL O.XXXI/21, ×44.
3. aC, right lateral view; ZPAL O.XXXI/22, ×44.
4. aC, right lateral view; ZPAL O.XXXI/23, ×44.

5. aC, right lateral view; ZPAL O.XXXI/24, ×44.
6. aRV, lateral view; ZPAL O.XXXI/25, ×44.
7. aC, dorsal view; ZPAL O.XXXI/26, ×40.
8. aC, dorsal view; ZPAL O.XXXI/27, ×40.
9. aLV, lateral view; ZPAL O.XXXI/28, ×44.
10. aC, right lateral view; ZPAL O.XXXI/29, ×40.
11. aRV, lateral view; ZPAL O.XXXI/30, ×50.

Hemicyprideis aegyptiaca sp. n.

12. aC, dorsal view; ZPAL O.XXXI/31, ×26.
13. aC, right lateral view; ZPAL O.XXXI/32, ×38.
14. aC, left lateral view, holotype; ZPAL O.XXXI/33, ×32.
15. aLV, lateral view, ZPAL O.XXXI/34, ×38.

1—5, 9, 11, 12 — western coast of the Gulf of Suez (Egypt), section x_1; 6—8, 10 — Sirte Basin (Libya).

Plate 5

Semicytherura cf. *incongruens* G. W. Müller

1. aC, right lateral view; ZPAL O.XXXI/48, ×65.
2. aC, right lateral view; ZPAL O.XXXI/49, ×65.
3. aC, left lateral view; ZPAL O.XXXI/50, ×65.

Semicytherura cf. *braccata braccata* Carbonnel

4. aC, right lateral view; ZPAL O.XXXI/51, ×60.
5. aRV, lateral view; ZPAL O.XXXI/52, ×60.

?*Semicytherura* sp. 1

6. aC, left lateral view; ZPAL O.XXXI/53, ×68.

Cytheroptreon sp.

7. aRV, lateral view; ZPAL O.XXXI/54, ×55.

Semicytherura cf. *inversa* (Sequenza)

8. aC, left lateral view; ZPAL O.XXXI/55, ×65.

?*Semicytherura* sp. 2

9. aC, left lateral view; ZPAL O.XXXI/56, ×54.

?*Leptocythere* sp.

10. ?aC, right lateral view; ZPAL O.XXXI/57, ×72.

Cnestocythere truncata (Reuss)

11. aLV, lateral view; ZPAL O.XXXI/58, ×50.
12. aRV, lateral view; ZPAL O.XXXI/59, ×50.

Xestoleberis sp.

13. aC, right lateral view; ZPAL O.XXXI/60, ×43.

Bairdia cf. *triangulata* Edwards

14. aRV, lateral view; ZPAL O.XXXI/61, ×35.

Paracytheridea sp.

15. aRV, lateral view; ZPAL O.XXXI/62, ×50.

All specimens from the western coast of the Gulf of Suez (Egypt), section x_1.

Plate 6

Pokornyella minor (Moyes)

1. aRV, lateral view; ZPAL O.XXXI/64, ×40.
2. aC, a — right lateral view, b — ventral view; ZPAL O.XXXI/63, ×37. ×34.

Aurila cf. *fastigata* Uliczny

3. aFC, right lateral view; ZPAL O.XXXI/65, ×50.
4. aFC, dorsal view; ZPAL O.XXXI/66, ×47.
5. aFLV, lateral view; ZPAL O.XXXI/67, ×50.
6. aMRV, lateral view; ZPAL O.XXXI/68, ×50.

Aurila sp.

7. aRV, lateral view; ZPAL O.XXXI/69, ×52.
8. aC, left lateral view; ZPAL O.XXXI/70. ×52.

Aurila ex gr. *convexa* (Baird)

9. aC, a — right lateral view, b — left lateral view; ZPAL O.XXXI/71. ×47, ×41.
10. aLV, lateral view; ZPAL O.XXXI/72, ×46.

Aurila cf. *soummamensis* Coutelle et Yassini

11. aC, right lateral view; ZPAL O.XXXI/73, ×44.
12. aRV, lateral view; ZPAL O.XXXI/74, ×40.

Aurila cf. *ulicznyi* Sissingh

13. jLV, lateral view; ZPAL O.XXXI/75, ×45.
All specimens from the western coast of the Gulf of Suez, (Egypt), section x_1.

Plate 7

Loxoconcha cf. *rhomboidea* (Fischer)

1. aFC, right lateral view; ZPAL O.XXXI/76, ×61.
2. aMC, left lateral view; ZPAL O.XXXI/78, ×59.

Loxoconcha sp. 2

3. aC, left view; ZPAL O.XXXI/79, ×46.

Loxoconcha cf. *tumida* Brady

4. aC, right lateral view; ZPAL O.XXXI/80, ×53.
5. aC, left lateral view; ZPAL O.XXXI/81, ×50.

?*Loxoconcha* sp.

6. aC, left lateral view; ZPAL O.XXXI/82, ×63.

Eucytherura cf. *poliphylla* Ruggieri

7. aC, oblique left lateral view; ZPAL O.XXXI/83, ×50.
8. aC, right lateral view; ZPAL O.XXXI/84, ×50.
9. aLV, inner view; ZPAL O.XXXI/85, ×65.
10. aC, right lateral view; ZPAL O.XXXI/86. ×50.

Loxoconcha sp. 1

11. aC, a — ventral side, b — left lateral view; ZPAL O.XXXI/87, ×53; ×65.
12. jC, left lateral side; ZPAL O.XXXI/88, ×65.

"*Paijenborchellina*" ?*libyca* Szczechura

13. jLV, lateral view; ZPAL O.XXXI/89, ×60.

"*Paijenborchellina*" sp.

14. jC, right lateral view; ZPAL O.XXXI/90, ×76.

Loculicytheretta libyca Szczechura

15. aC, left lateral view; ZPAL O.XXXI/91, ×30.
All specimens from the western coast of the Gulf of Suez (Egypt), section x_1.

Plate 8

Neomonoceratina ruggierii sp. n.

1. aFLV, inner view; ZPAL O.XXXI/92, ×63.
9. aFC, ventral view; ZPAL O.XXXI/93, ×46.
12. aFC, right lateral view, holotype; ZPAL O.XXXI/94, ×57.
13. aMC, left lateral view; ZPAL O.XXXI/95, ×53.
14. aMC, right lateral view; ZPAL O.XXXI/96, ×50.
15. aFC, dorsal view; ZPAL O.XXXI/97, ×46.

Neomonoceratina ?ruggierii sp. n.

8. aFC, right lateral view; ZPAL O.XXXI/98, ×50.

Neomonoceratina keiji sp. n.

2. aFLV, inner view; ZPAL O.XXXI/99, ×60.
3. aFRV, inner view; ZPAL O.XXXI/100, ×57.
4. aFC, dorsal view; ZPAL O.XXXI/101, ×45.
5. aFC, ventral view; ZPAL O.XXXI/102, ×40.
6. aFC, left lateral view, holotype; ZPAL O.XXXI/103, ×49
7. aFC, right lateral view; ZPAL O.XXXI/104, ×40.
10. aMC, right lateral view; ZPAL O.XXXI/105, ×40.
11. aMC, right lateral view; ZPAL O.XXXI/106, ×34.

Krithe sp.

16. aC, right lateral view; ZPAL O.XXXI/107, ×44.

?Propontocypris sp.

17. ?aC, right lateral view; ZPAL O.XXXI/108, ×37.

?Paradoxostoma sp.

18. ?aC, right lateral view; ZPAL O.XXXI/109, ×46.

1—10 — Sirte Basin (Libya);
11—18 — western coast of the Gulf of Suez (Egypt), section x_1.

Plate 9

Keijella cf. *fusa* (van den Bold)

1. aFC, ventral view; ZPAL O.XXXI/110, ×28.
2. aMC, ventral view; ZPAL O.XXXI/111, ×28.
3. aMC, dorsal view; ZPAL O.XXXI/112, ×28.

4. aFC, dorsal view; ZPAL O.XXXI/113, ×28.
5. aLV, lateral view; ZPAL O.XXXI/114, ×28.
6. aFC, right lateral view; ZPAL O.XXXI/115, ×28.
7. aMC, right lateral view; ZPAL O.XXXI/116, ×28.
8. aMLV, inner view; ZPAL O.XXXI/117, ×28.

Keijella africana El-Waer

9. aMC, right lateral view; ZPAL O.XXXI/118, ×36.
10. aFC, right lateral view; ZPAL O.XXXI/119, ×33.
11. aMC, oblique right lateral view; ZPAL O.XXXI/120, ×28.
12. aFC, right lateral view; ZPAL O.XXXI/121, ×28.
13. aFLV, lateral view; ZPAL O.XXXI/122, ×38.

?Pontocythere sp.

14. aMLV, lateral view; ZPAL O.XXXI/123, ×41.
15. aFC, lateral view; ZPAL O.XXXI/124, ×40.
16. jRV, lateral view; ZPAL O.XXXI/125, ×41.

All specimens from the western coast of the Gulf of Suez (Egypt), section x_1.

Plate 10

Ruggieria tetraptera tetraptera (Sequenza)

1. aFC, left lateral view; ZPAL O.XXXI/126, ×40.
2. aMC, right lateral view; ZPAL O.XXXI/127, ×42.
3. aMC, left lateral view; ZPAL O.XXXI/128, ×40.
4. aFC, right lateral view; ZPAL O.XXXI/129, ×40.

"Hermanites" haidingeri (Reuss)

5. aC, right lateral view; ZPAL O.XXXI/130, ×52.

?Hemicytheria sp.

6. aRV, lateral view; ZPAL O.XXXI/5, ×40.

Incongruellina rotundata Ruggieri

7. aC, left lateral view; ZPAL O.XXXI/131, ×40.
8. aC, dorsal view; ZPAL O.XXXI/132, ×43.
9. aC, right lateral view; ZPAL O.XXXI/133, ×40.

Chrysocythere cataphracta cataphracta Ruggieri

10. aMC, dorsal view; ZPAL O.XXXI/137, ×25.
11. aFRV, lateral view; ZPAL O.XXXI/134, ×30.

12. aFLV, lateral view; ZPAL O.XXXI/135, ×30.
13. aMLV, lateral view; ZPAL O.XXXI/136, ×30.

Hemicythere ex gr. *notata* (Reuss)

14. aRV, lateral view; ZPAL O.XXXI/4, ×40.

Gen. et sp. indet 2

15. aC, a — dorsal view, b — left lateral view; ZPAL O.XXXI/138, ×30; ×40.

All specimens from the western coast of the Gulf of Suez (Egypt), section x_1.

Plate 11

Eponides repandus (Fichtel et Moll)

1. a — oblique view of spiral side, b — side view; ZPAL F.XXXIII/1, ×46; ×46.

Borelis melo (Fichtel and Moll)

2. a — axial view, b — apertural view; ZPAL F.XXXIII/2, ×42, ×40.

Amphistegina cf. *vulgaris* d'Orbigny

3. Umbilical view of the somewhat damaged specimen; ZPAL F.XXXIII/3, ×42.
4. Side view; ZPAL F.XXXIII/4, ×40.

Mississippina neagui Popescu

5. a — umbilical view, b — spiral view; ZPAL F.XXXIII/5, ×40.
7. Umbilical view of the damaged specimen; ZPAL F.XXXIII/6, ×40.

Gen. et sp. indet. 1

6. aC, a — dorsal view, b — right lateral view; ZPAL O.XXXI/142, ×29; ×39.

Falsocythere maccagnoi (Ciampo)

8. aC, a — left lateral view, b — right lateral view; ZPAL O.XXXI/139, ×40; ×40.

?*Cytherois* sp.

9. ?aC, left lateral view; ZPAL O.XXXI/140, ×40.

?Acuticythereis sp.

10. aC, a — right lateral view, b — left lateral view; ZPAL O.XXXI/141, ×45; ×46.

All specimens, except 7 are from the western coast of the Gulf of Suez (Egypt), section x_1; 7 — Badenian of the Vienna Basin (Austria), outcrop at Soos near Baden.

Plate 12

Pararotalia cf. *armata* (d'Orbigny)

1. Umbilical view; ZPAL F.XXXIII/7, ×50.
2. Umbilical view; ZPAL F.XXXIII/8, ×50.

Elphidium cf. *minutum* (Reuss)

3. General view; ZPAL F.XXXIII/9, ×65.

Elphidium ex gr. *flexuosum* (d'Orbigny)

4. General view; ZPAL F.XXXIII/10, ×50.

Amphistegina cf. *vulgaris* d'Orbigny

5. Umbilical view; ZPAL F.XXXIII/11, ×20.
6. Umbilical view; ZPAL F.XXXIII/12, ×35.

Elphidium sp.

7. General view; ZPAL F.XXXIII/13, ×35.

Hanzawaia boueana (d'Orbigny)

8. Spiral view; ZPAL F.XXXIII/14, ×43.
9. Spiral view; ZPAL F.XXXIII/15, ×40.
10. Umbilical view; ZPAL F.XXXIII/16, ×48.

Textularia sp. 1

11. Side view; ZPAL F.XXXIII/17, ×36.

Textularia sp. 2

12. Side view; ZPAL F.XXXIII/18, ×83.

Ammonia ex gr. *beccarii* (Linné) (forma *parkinsoniana*)

13. Spiral view; ZPAL F.XXXIII/19, ×30.
14. Umbilical view; ZPAL F.XXXIII/20, ×30.

?*Quinqueloculina* sp. 1

15. General view; ZPAL F.XXXIII/21, ×22.

Spiroloculina sp.

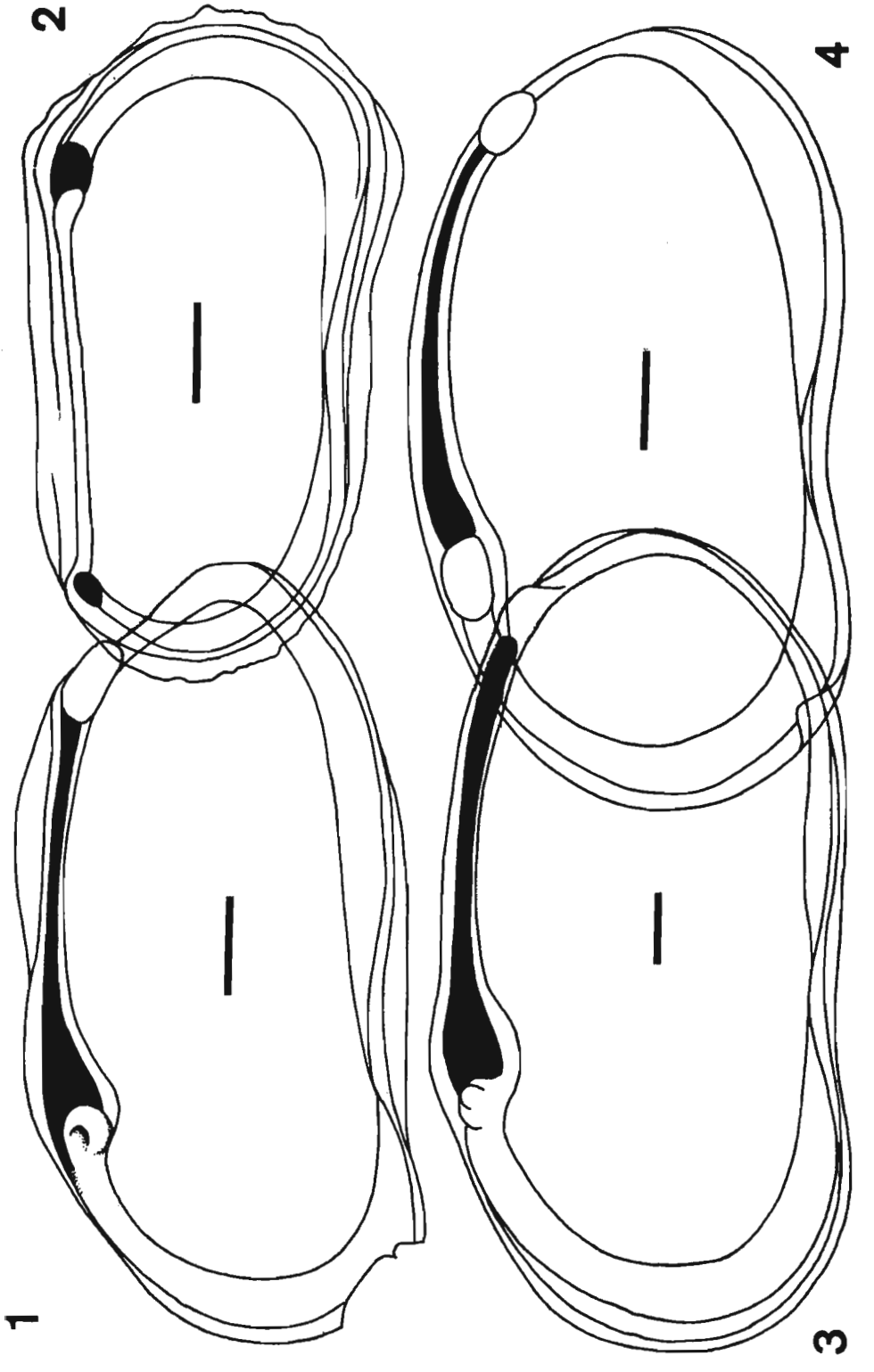
16. General view; ZPAL F.XXXIII/22, ×22.

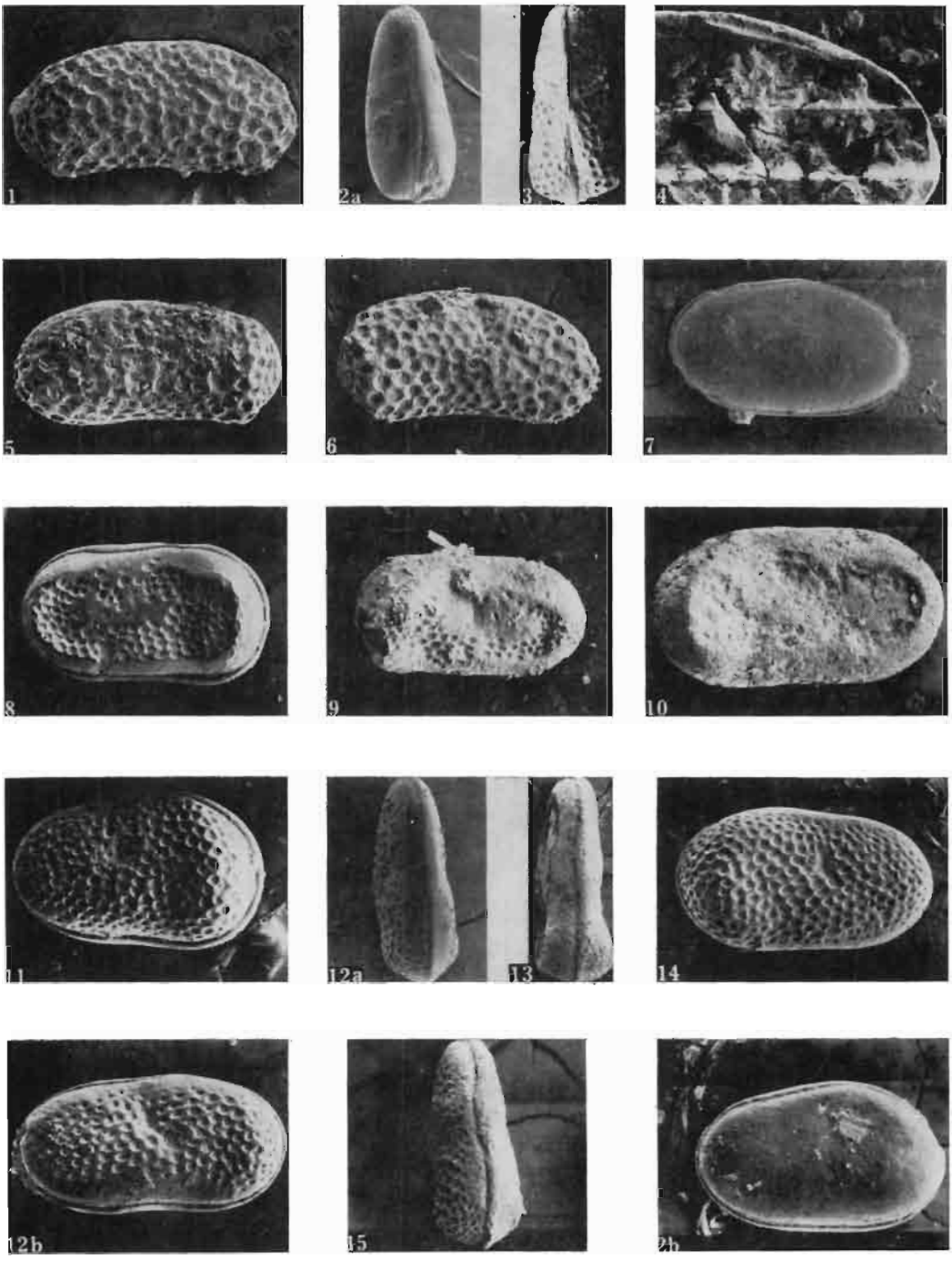
?*Quinqueloculina* sp. 2

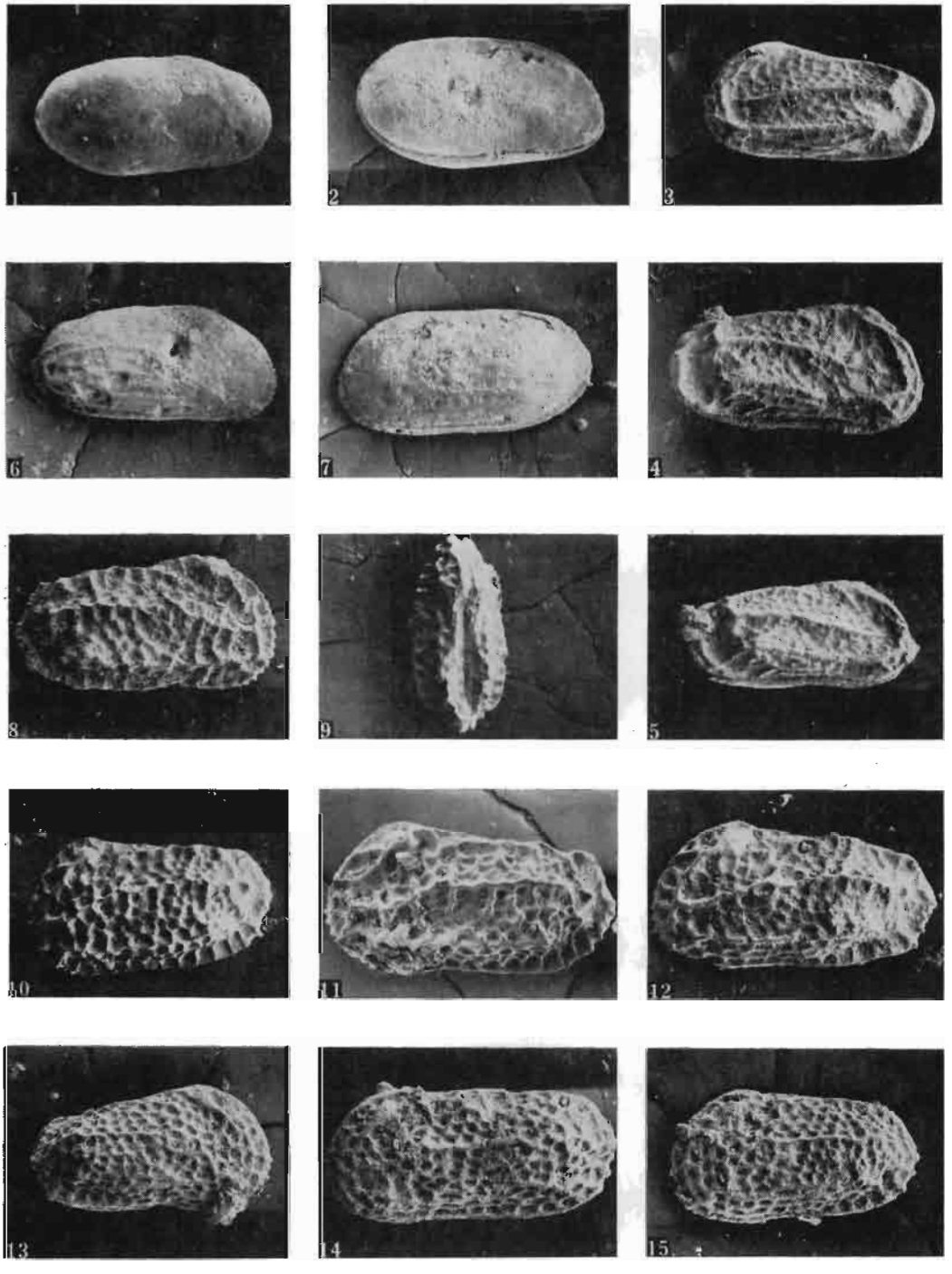
17. General view; ZPAL F.XXXIII/23, ×50.

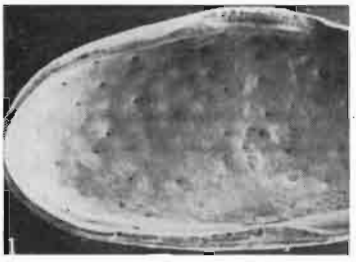
Pyrgo sp.

18. General view; ZPAL F.XXXIII/24, ×32.
All specimens from the western coast of the Gulf of Suez (Egypt), section x_1.

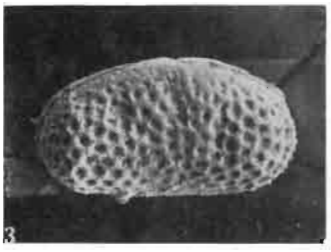

2
4
1
3


1
2a
3
4
5
6
7
8
9
10
11
12a
13
14
12b
15
2b

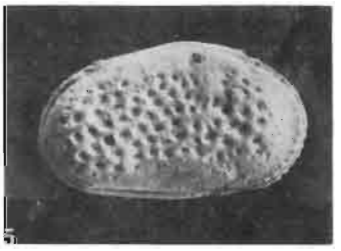

1
2
3
6
7
4
8
9
5
10
11
12
13
14
15

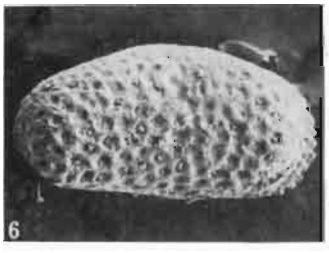

1


2


3

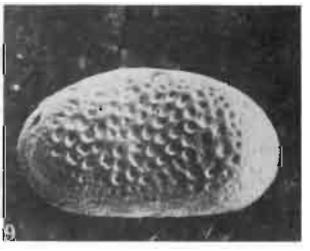

4

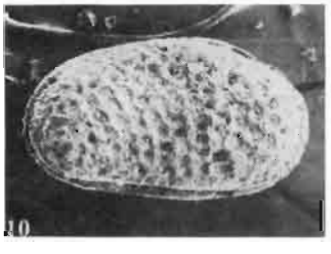

5


6

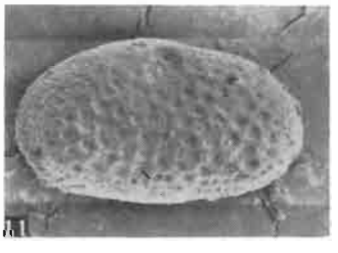

7


8


9

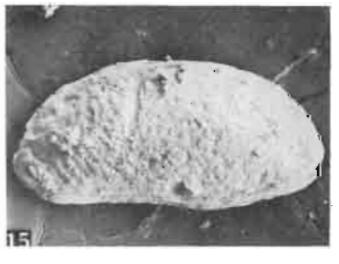

10

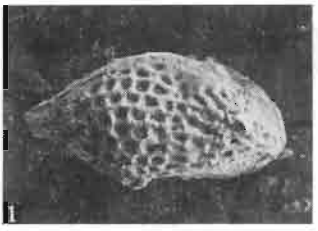

12

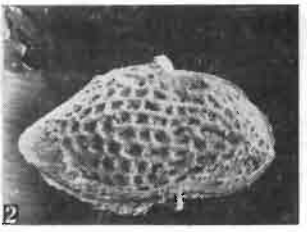

11

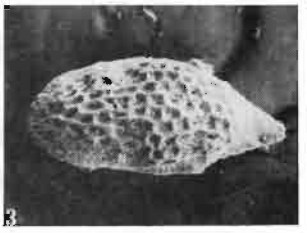

13

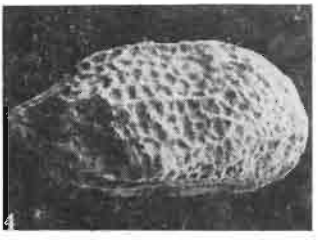

14

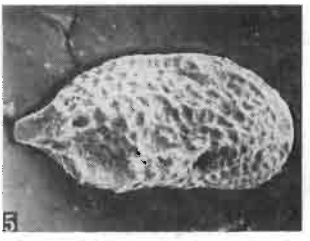

15

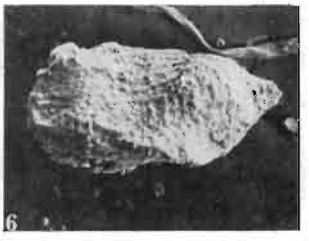

1


2

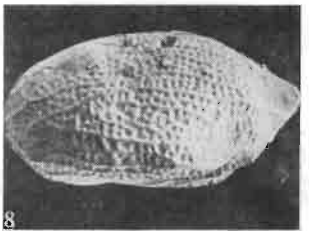

3

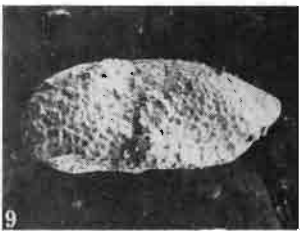

4

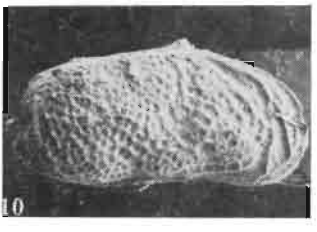

5


6

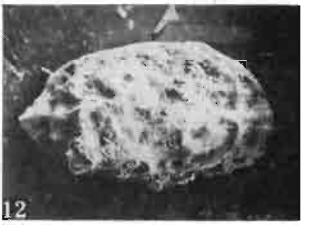

7

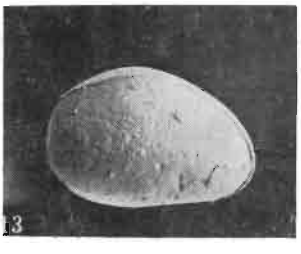

8

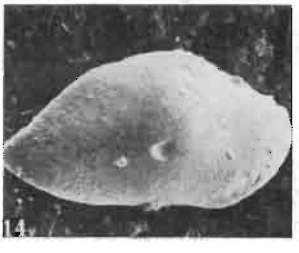

9

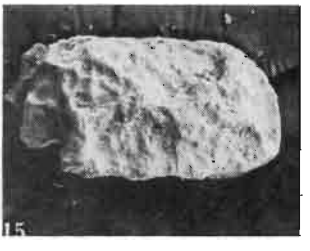

10


11


12

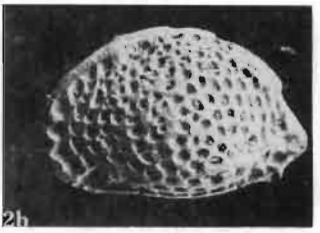

13

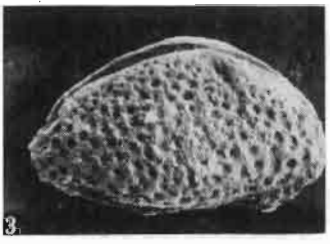

14


15


1

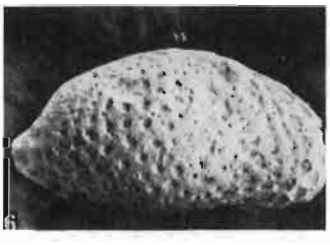

2a


2b


3

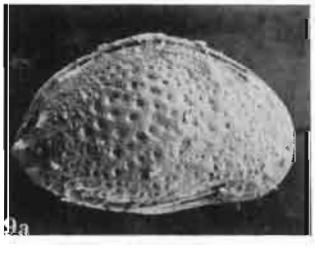

4


5


6


7


8

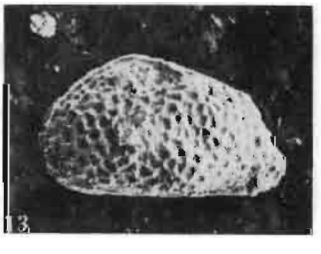

9a

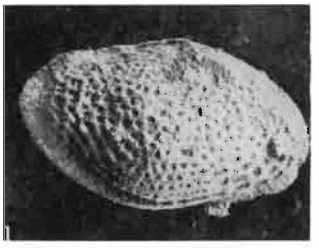

9b

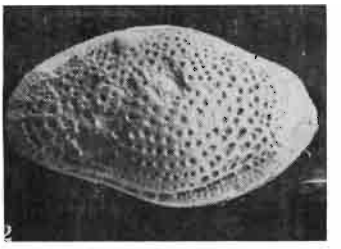

10

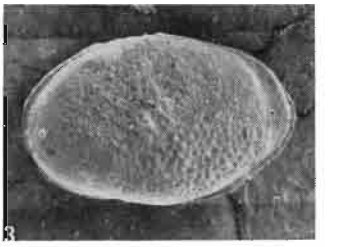

11


12

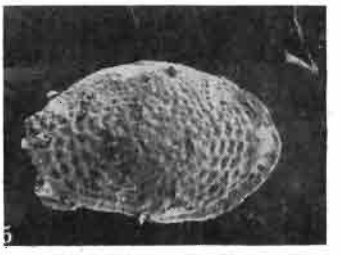

13

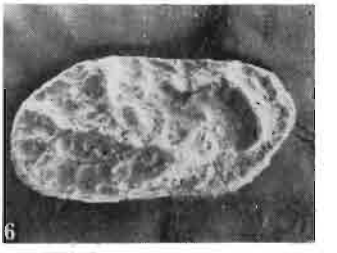

1

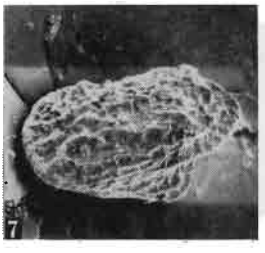

2


3

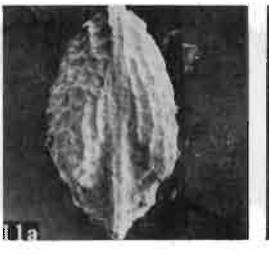

4

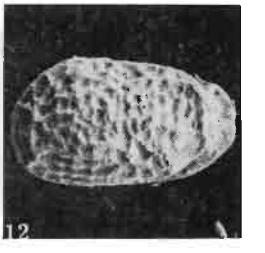

5


6

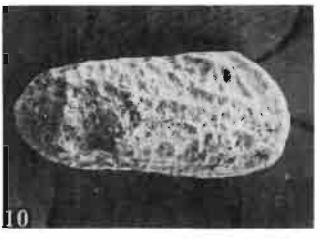

7

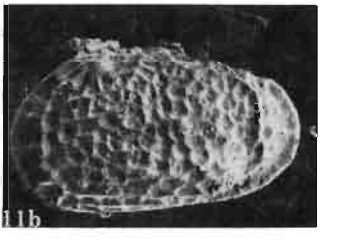

8


11a


12


9


10


11b


13


1


2


3


4


5


6


7

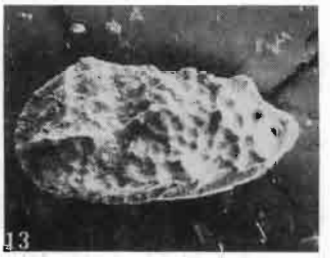

8


9


10


11


12


13

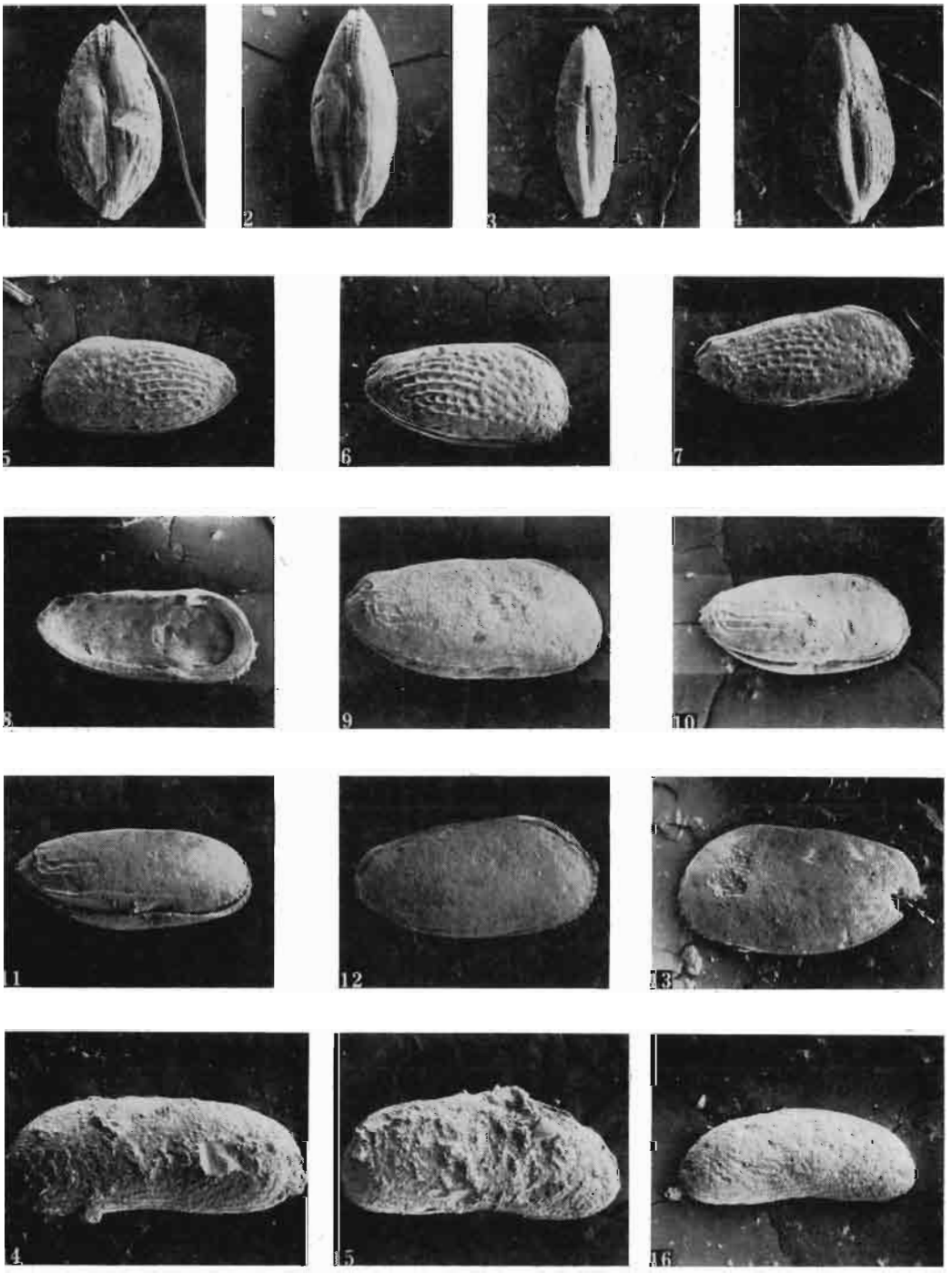

14


15


16


17


18

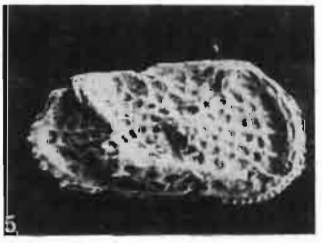

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16


1


2


3


4


5


6


7


8


10


9

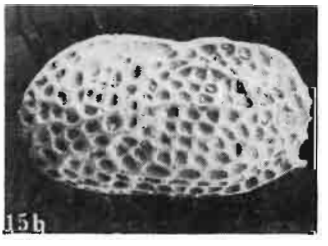

11


12


13


14


15a


15b


1a


1b


2a


3


4


2b


5a


5b

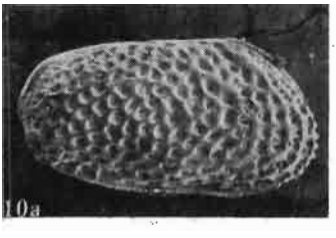

6a

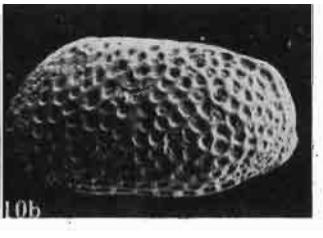

7


8a


8b


9


10a


10b

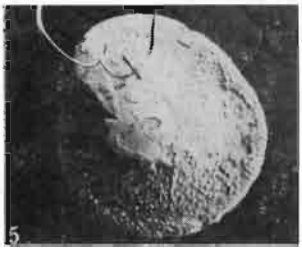

6b


1

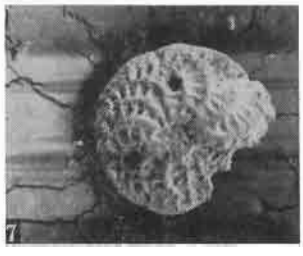

2


3


4

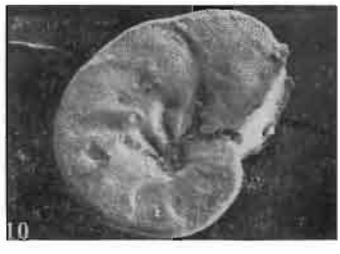

5


6


7


8


9


10


11


12


13


14


15


16


17


18

Table 1

Vertical distribution of ostracods in section X_1

14	5	6	7	8	31	sample
						Cytherelloidea sissinghi sp.n.
						Cytherella libyaensis
						Cytherella sp.
						Bairdia cf. *triangulata*
						Cnestocythere truncata
						Neomonoceratina keiji sp.n.
						Neomonoceratina ruggierii sp.n.
						?Leptocythere sp.
						Miocyprideis cf. *italiana*
						?Miocyprideis sp.
						Hemicyprideis aegyptiaca sp.n.
						?Pontocythere sp.
						Krithe sp.
						Palmia ex gr. *plicatula*
						Cistacythereis cf. *caelatura*
						Chrysocythere cataphracta cataphracta
						Incongruellina rotundata
						Keijella cf. *fusa*
						Keijella africana
						Ruggieria tetraptera tetraptera
						?Acuticythereis sp.
						Hemicythere ex gr. *notata*
						?Hemicytheria sp.
						Aurila ex gr. *convexa*
						Aurila cf. *fastigata*
						Aurila cf. *soummamensis*
						Aurila cf. *ulicznyi*
						Aurila sp.
						Pokornyella minor
						Falsocythere maccagnoi
						"Hermanites" haidingeri
						Cytheretta cf. *rhenana rhenana*
						Cytheretta sp.
						Protocytheretta ?schoelleri
						Loculicytheretta libyca
						Loxoconcha cf. *rhomboidea*
						Loxoconcha cf. *tumida*
						Loxoconcha sp.1
						Loxoconcha sp.2
						?Loxoconcha sp.
						Paracytheridea sp.
						"Paijenborchellina" ?libyca
						"Paijenborchellina" sp.
						Semicytherura cf. *braccata braccata*
						Semicytherura cf. *incongruens*
						Semicytherura cf. *inversa*
						?Semicytherura sp.1
						?Semicytherura sp.2
						Eucytherura cf. *poliphylla*
						Cytheropteron sp.
						Xestoleberis sp.
						?Paradoxostoma sp.
						?Cytherois sp.
						?Propontocypris sp.
						Gen. et sp. indet.1
						Gen. et sp. indet.2