LATE CENOZOIC OSTRACODA OF CYPRUS AND THEIR PALAEOENVIRONMENTAL INTERPRETATION

BY

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DEDICATED TO MY PARENTS
ABSTRACT

This work deals with the study of the ostracod faunas of six important sections in the Neogene succession of Cyprus. The studied sections cover the western and southern parts of the island. The study was carried out using samples collected by the M.Sc. students of the Micropalaeontology Unit, University College, in the course of their field-work during the years 1985-1990. It adds to earlier studies of foraminifera and nannoplankton and is the first of ostracods. 110 samples were collected in total and 410 species/morphotypes of ostracods were recovered belonging to 105 genera.

This is the first time that the geological evolution of the island has been approached from the point-of-view of ostracods. Although ostracods may have been neglected in the past as biostratigraphical indicators, for the sections of this study they gave more precise results than foraminifera or nannoplankton in the recognition of useful biostratigraphical groups:

- **group 9**: Late Pleistocene - upper N22 (Late Calabrian), 4 species/subspecies
- **group 8**: Early Pleistocene - N22 (Calabrian), 30 species/subspecies
- **group 7**: Late Pliocene - N20 (Piacenzian), 51 species/subspecies
- **group 6**: Early Pliocene - N19 (?Mid Zanclean), 10 species/subspecies
- **group 5**: Earliest Pliocene - N18 (Early Zanclean = Late Pontian), 43 species/subspecies
- **group 4**: Latest Miocene - late N17 (Pontian = Latest Messinian), 15 species/subspecies
- **group 3**: Late Miocene - mid N17 (Messinian), 5 species/subspecies
- **group 2**: Late Miocene - mid N15 (Tortonian), 29 species/subspecies
- **group 1**: Mid Miocene - N12 (Serravalian) or older, 40 species/subspecies

As ostracods are well-known for their usefulness in reconstructing palaeoenvironments, the conclusions from this study are significant for the changing bathymetry of the Eastern Mediterranean Basin from Mid Miocene through Pliocene to Pleistocene. In most of the areas studied here, there were marine conditions during the Late Cenozoic, except for the Messinian where the changes are represented in the
sections either by the absence of ostracod assemblages (Steni, Pissouri, Mari) or, if there are any ostracods, they are of limnic, brackish (Polemi, Amargeti) or brackish-influenced (Dhrymou) character.

The scope for future work on biostratigraphy and palaeoecology have been determined including the methodology of assessing life/death assemblages of ostracods.
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CHAPTER 1

INTRODUCTION

1.A. Purpose and aims of the present study

The purpose of this study is primarily to examine the Neogene ostracod assemblages from various areas of Cyprus and to extract biostratigraphical and palaeoenvironmental information to better understand the Late Cenozoic history of the Eastern Mediterranean. So, first of all this study can be taken as an investigation of the ostracods in the Neogene sediments of the west, southwest and south part of the island of Cyprus. It also represents a compilation of the data taken from both the existing literature and the study of the ostracods found. Apart from very few and restricted (in time and space) published works (DORUK, 1973, ATHERSUCH, 1977 & 1979 and PAVLAKELLI, 1986), this is the first time that Cyprus' ostracods are listed, examined and studied in terms of their geographical, stratigraphical and ecological distribution.

1.B. Problems encountered in this study

The basic problems that occurred during this study were:
- the nature of preservation, which quite often caused difficulties during the identification process,
- the taxonomical confusion existing in the nomenclature of some genera and species,
- the uncertain placement of some chronostratigraphical units (e.g. Pontian) in the stratigraphical column, and
- the problem of accurate dating/correlation of marginal and non-marine sequences with the marine record.

1.C. Chapter layout

The layout of the chapters of this thesis is given below, even though this is just an outline scheme, since in each chapter there are smaller subsections which are judged
by the author to make clearer to the reader some points or to give some important additional information about the subject discussed. The structure of Chapters 1 to 3 does not follow a specified scheme because their purpose is basically to give an introductory idea of:

a) what this study deals with (Chapter 1),
b) the general geology of the island of Cyprus and the geological description of the studied sections (Chapter 2), and
c) the equipment used and the techniques that were followed during this study (Chapter 3).

In Chapters 4 to 6 (entitled Taxonomy, Biostratigraphy and Palaeoecology), the structure consists of:

a) an “introductory” part with general remarks which should be borne in mind in this study,
b) a “main” part which provides the data that were extracted during this study, and
c) a “conclusions” part, in which the data and results are discussed.

Finally, in Chapter 7 the Mediterranean and Paratethyan palaeogeographies are reviewed, a comparison of this study’s ostracod assemblages with others takes place, the conclusions of the previous chapters are summarized and discussed, and the perspectives of further work that could be carried out in the future are given.

1.D. Sample and Specimen Depository

All the samples and ostracod specimens used in this study, are deposited in the collections of the Postgraduate Unit of Micropaleontology of University College London.
CHAPTER 2

GENERAL GEOLOGY

2.A. Introduction

The island of Cyprus is situated at the eastern end of the Mediterranean Sea and located between the geographical co-ordinates 34°00" & 36°00" N latitude and 32°00" & 35°00" E longitude.

The exciting Upper Cenozoic geological history of the Eastern Mediterranean starts in the Lower Miocene (about 22.5 M ago) when many of the present day circum-Mediterranean lands had not yet been formed and the water masses of the then existing ocean (called Tethys) were covering most of these areas. This palaeogeography was completed with the existence of a largely enclosed northern water basin called Paratethys (=located near the Tethys) representing the present day land areas of Hungary and parts of Switzerland, Austria, Yugoslavia (former), Czechoslovakia and Romania (Fig. 2). The development in that area of biocommunities different from contemporaneous Tethyan ones has led to difficulties for palaeontological and stratigraphical correlation between these areas.

This palaeogeography is not however the only interesting topic in the "Early Mediterranean's" history. A few million years later, by the end of Miocene (approx. 7 M ago), a series of dramatic events led to the dessication of the pre-existing ocean and its transformation to a vast salt area with some salt lakes which were representative of its deepest basins (Fig. 1). The reason that basically led to this dessication was the "closing" of the Straits of Gibraltar to the west and the marine links to the east (the modern Middle East area), by convergent movements of the African, Arabian and Eurasian plates which closed Tethys (Fig. 3). This dessication is known worldwide to geologists as "The Messinian Salinity Crisis". A large volume of publications from authors of many sciences has appeared in the last 25 years in order to understand and analyze this unique phenomenon.

\[^1\] The name Tethys is derived from the ancient Greek mythology where Tethys was one of the daughters of Ouranos (Sky) and Gaia (Earth) and sister of Oceanos (Ocean).
Fig. 1: Map of the present day Mediterranean Sea showing its deepest basins as they are bordered by the isobath of 2000m. (1: Balearic, 2: Tyrrhenian, 3: Ionian, 4: Levantine) (after BONADUCE et al., 1983).

Fig. 2: Diagrammatic palaeogeography of Tethys and Paratethys during the Lower Miocene (after STEININGER & ROEGL, 1984).
Fig. 3: The motion of Africa relative to Eurasia deduced from the Atlantic opening history by LIVERMORE & SMITH (1984). Motion trajectories illustrated are of points on a rectilinear grid fixed to Africa. Note the relatively smooth curves in the Eastern Mediterranean and the periods of accelerated motion around 170 Ma and 100 Ma.
Later on, in the Early Pliocene (approx. 5 M ago), the plate movements between Africa and Europe allowed the influx of oceanic water via Gibraltar into this dessicated basin, its filling and the formation of the present day Mediterranean.

After this crisis, the Eastern Mediterranean area still had a paleogeography of great complexity and this can be easily proved having in mind: a) the separation of the Aegean Sea from the Black Sea Basin that took place during much of the Pliocene and Quaternary, and b) the forming of the present day circum- Mediterranean coast-lines due to the sea-level changes during the Quaternary. The environmental importance of such events as the sea-level changes is shown by the attention that has been paid in the last few years to their study, not only by geologists and palaeontologists but also by archaeologists, ecologists and environmental scientists.

Among the numerous works dealing with the Neogene and Quaternary deposits of Cyprus, only a relatively small number focus on the fossil organisms, mainly to give age determinations of the sediments. So, the fossils studied were mainly the so-called markers, i.e. the ones that lived only for a very short - geologically speaking - time period and which had wide geographical distribution. Such fossils are mainly the Planktonic Foraminifera, Calcareous Nannoplankton and Palynomorphs (see Table below). In addition, a comparatively small number of works is dedicated to the study of other micro- as well as macro-organisms and vertebrates (e.g. mammals), mainly for palaeoecological and ecostratigraphical reasons. These works are basically concerned either with the Quaternary or with the Messinian (Late Miocene) environments and palaeogeographies. Among the above mentioned organisms the ostracods are the ones that are most important for palaeoecological study due to their sensitivity to environmental changes in marine and non-marine waters, but have previously been neglected in relation to Cyprus.

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<th>AUTHOR</th>
<th>DATE</th>
<th>ORGANISMS</th>
<th>AGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHERTSUCH</td>
<td>1979</td>
<td>Ostracoda</td>
<td>Recent</td>
</tr>
<tr>
<td>BAROZ et al.</td>
<td>1978</td>
<td>Plankt. forams &amp; nanofossils</td>
<td>Late Miocene &amp; Pliocene</td>
</tr>
<tr>
<td>ROUCHY et al.</td>
<td>1980</td>
<td>Foraminifera</td>
<td>Late Messinian</td>
</tr>
<tr>
<td>ORSZAG-SPERBER et al.</td>
<td>1980</td>
<td>Foraminifera</td>
<td>Late Miocene &amp; Pliocene</td>
</tr>
<tr>
<td>BIZON et al.</td>
<td>1979</td>
<td>Plankt. forams &amp; nanofossils</td>
<td>Late Miocene</td>
</tr>
<tr>
<td>BAROZ &amp; BIZON</td>
<td>1974</td>
<td>Plankt. forams</td>
<td>Oligocene-E.Pliocene</td>
</tr>
</tbody>
</table>
2.B. General geological background of Cyprus

Cyprus lies in a complex collision zone that separates the African and Eurasian tectonic plates and subsequently its geological history is strongly related to the tectonic collision between these plates. Although there is not well-defined volcanic arc, it is believed that the Cyprus active margin has undergone northward limited subduction at least since the early Miocene times. Pulsed uplift of the Troodos ophiolite resulted in deposition of an overall regressive-upwards megasquence. Following a relatively stable Early Tertiary deep-marine carbonate sedimentation, Miocene convergence gave rise to three subparallel, tectonic compressional lineaments in southern Cyprus (ROBERTSON et al, 1991). An important compressional lineament of E-W direction (Arakapas Fault Zone) (Fig. 4) activated at the southern outcrop of the Troodos ophiolitic massif in the Miocene (ROBERTSON et al, 1991). This is considered to be a late Cretaceous oceanic fracture zone (SIMONIAN & GASS, 1978; MURTON & GASS, 1986; MACLEOD, 1990).

The general geological structure of the island consists mainly of igneous rocks at the bottom, followed upwards by sedimentary formations of different composition and age. The oldest geotectonically autochthonous part of Cyprus is the Troodos Massif (ophiolites) of Cretaceous age (Campanian or older), which was brought together subsequently with the Kyrenia Mountains and Mamonia Complex. Both the latter two units are allochthonous and they originated from the area of modern Turkey. The flyschs of Kythrea (N. Cyprus) and Adana (Turkey) through the Tertiary are considered to represent fore-arc basins in front of related intra-continental volcanic arcs sited in central Anatolia (e.g. HASAN DAG; INNOCENTI et al. 1982). During this time Cyprus including the Troodos Massif was essentially stranded in a fore-arc setting, being rotated towards its present position by the Mid-Tertiary (SHELTON & GASS, 1980). According to CLUBE et al (1985) and CLUBE & ROBERTSON (1986) the Troodos ophiolite underwent 90° of anticlockwise rotation between late Cretaceous (Campanian) and Early Eocene times. The microplate boundaries are partly located in south-west and south Cyprus and formed zones of structural weakness that were also reactivated in the Neogene (ROBERTSON et al, 1991).
Fig. 4: Major faults of south and west Cyprus. The main depositional sub-basins are outlined (after ROBERTSON et al., 1991) locating also the studied sections: ST: Steni, DH: Dhrymou, PO: Polemi, AM: Amargeti, PI: Pissouri, MA: Mari.
During early Tertiary times relatively thin (tens of metres) pelagic carbonates were deposited along the north margin of the Troodos ophiolite, while at the same time much thicker (>1000m) successions were deposited in tectonically active basins in south Cyprus as the Maastrichtian-Oligocene Lefkara Formation (MANTIS, 1970; ROBERTSON, 1976). In the Oligocene, during a time of relative tectonic quiescence, a gradual shallowing of the Troodos Massif took place (Upper Lefkara Formation) (MANTIS, 1970; ROBERTSON, 1977).

The Neogene evolution of Cyprus (Fig. 5) marked by a fundamental change in sedimentation, from relatively uniform pelagic carbonate deposition (Upper Lefkara Formation), to much more varied carbonate and clastic sedimentation in tectonically controlled small basins bordering the Troodos ophiolite (Pakhna Formation) (ROBERTSON, 1977). This early to late Miocene sedimentation took place throughout central and south Cyprus, south of the Ovgos fault, and probably also covered much of the Troodos ophiolite (ROBERTSON, 1977).

On the top of the Pakhna Formation lie evaporitic lithofacies of the Messinian Kalavasos Formation (EATON, 1987; FOLLOWS, 1990). In the lower and upper parts of the the Pakhna Formation, interstratified reefal units are exposed (EATON, 1987; FOLLOWS & ROBERTSON, 1990; FOLLOWS, 1990), belonging to the Aquitanian-Burdigalian Terra Member and the Tortonian Koronia Member (ROBERTSON et al, 1991).

The Pliocene of Cyprus is represented by the Nicosia Formation which starts with locally exposed (e.g. Mari area) basal Pliocene silts unconformably overlying Miocene evaporites and marls (ROBERTSON et al, 1991), and continues with relatively stable deposition of marly sediments. On seismic profiles, Plio-Pleistocene sediments above the inferred Messinian unconformity are not deformed (MCCALLUM, 1989).

The Nicosia Formation is covered by bioclastic sediments of the Athalassa Formation which is locally unconformably sitting on it. The Athalassa Formation is laterally equivalent to the Kakkaristra and Apalos Formations in south Cyprus (MCCALLUM, 1989; MCCALLUM & ROBERTSON, 1990). Later in the Pleistocene all the circum-Troodos sedimentary basins are covered by coarse conglomerates which overlie all older formations. Thus drastic updoming of the Troodos Massif took place
during the Pleistocene (ROBERTSON, 1977) which may reflect the initial underthrusting of thinned African continental margin crust, implying that little fully oceanic crust still persists in the East Mediterranean sea south of Cyprus (DIXON & ROBERTSON, 1984). Radiometric dating of corals in coastal terrace deposits indicates that rapid uplift was over prior to Holocene times (POOLE et al, 1990), when the modern topography was attained. Cyprus is still a seismically active area.

<table>
<thead>
<tr>
<th>FORMATION</th>
<th>LITHOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLEISTOCENE</td>
<td>ATHALASSA</td>
</tr>
<tr>
<td></td>
<td>KAKKARISTA</td>
</tr>
<tr>
<td></td>
<td>APALOS</td>
</tr>
<tr>
<td>PLIOCENE</td>
<td>NICOSIA</td>
</tr>
<tr>
<td></td>
<td>CALAVASOS</td>
</tr>
<tr>
<td></td>
<td>KORONIA</td>
</tr>
<tr>
<td></td>
<td>MEMBER</td>
</tr>
<tr>
<td></td>
<td>PAKHNA</td>
</tr>
<tr>
<td>MIocene</td>
<td>LOWER</td>
</tr>
<tr>
<td></td>
<td>MEMBER</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Oligocene</td>
<td>UPPER LEFKARA</td>
</tr>
</tbody>
</table>

Fig. 5: Stratigraphic nomenclature of the Neogene of Cyprus (after ROBERTSON et al., 1991).
2.C. Description of the sections

The following sections present the descriptions and various topographical data of the sections as they were given in the unpublished reports of M.Sc. students of the U.C.L. Micropalaeontology Unit. Wherever possible, extra information has been extracted from the study of the sample material by the present author. The table below shows the M.Sc. students from whose work information has been taken for each specific section:

<table>
<thead>
<tr>
<th>SECTION</th>
<th>STUDENT</th>
<th>YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steni</td>
<td>WEST</td>
<td>1988</td>
</tr>
<tr>
<td>Dhrymou</td>
<td>NASIB</td>
<td>1986</td>
</tr>
<tr>
<td>Polemi</td>
<td>OUTRAM &amp; McCARTHY</td>
<td>1990</td>
</tr>
<tr>
<td>Amargeti</td>
<td>RADLEY &amp; MONDEJAR</td>
<td>1990</td>
</tr>
<tr>
<td>Pissouri</td>
<td>LI, PEARCE</td>
<td>1985</td>
</tr>
<tr>
<td>Mari</td>
<td>PAVLAKELLI</td>
<td>1986</td>
</tr>
</tbody>
</table>

The sampling localities and samples numbers are also the ones used by the M.Sc. students.

2.C.i. Steni

The section is located at the northern part of the Polis Basin, on the eastern margin, near the town of Polis (Fig. 4). It is resting unconformably on the Koronia Member. Sixteen samples were collected from this section (Fig. 6).

The sediments at the Steni section (Fig. 6) are essentially a sequence of fairly well consolidated marls and foraminiferal ooze (Nicosia Formation). The marls are pink/red at the base of the section and then grade up into white colour. At the top of the section the marls become brown. The marls overlie limestone (Koronia Member) at the base of the section and are overlain by Quaternary conglomerate at the top (Athalassa Formation?). The marls at the base represent sediment fill of the eroded limestone surface, i.e. deposition in hollows. The hiatus represents Messinian time and
LEGEND

CONGLOMERATE
MARL
MARLS WITH PLANKT. FORAMS
FOSSILIFEROUS LIMESTONE
LIMESTONE

Fig. 6: Lithological column of the Steni section
the marls were deposited during the subsequent marine transgression in latest Miocene-early Pliocene times. The descriptions of the samples are as following in ascending order:

9526: White, calcareous marl/siltstone. Contains sub-angular to rounded grains of calcite, subordinate quartz, pyrite crystals and gypsum. Planktonic foraminifera are very sparse; no benthic fauna were recorded. Poor preservation of sparse planktonic foraminifera present, indicates reworking.

9527: White/buff marl, similar to 9526. Contains some grains of igneous origin (reworked)

9528: Yellow/buff marl. Contains some pyrite and igneous grains but these are not as abundant as in 9527. Sample 9528 also contains some foraminifera.

9529: Marl, same as 9528.

9530: Pink/red marl, containing abundant and diverse planktonic foraminifera (>95% of total grains and fossils amount).

9531: Marl, same as 9530.

9532: Taken from a gradational boundary between the red and white marls. Yellow/buff foraminiferal clay (approx. 99% of total grains and fossils amount).

9533 - 9536: White foraminiferal clay; contains some pyrite crystals.

9537: White foraminiferal clay/marl as before, but also containing abundant small iron nodules, indicating oxidising conditions.

9539 & 9540: White, fossiliferous marl, containing >98% planktonic foraminifera.

9541: White/greenish coloured marl, with reduced faunal content; contains 10-20% of grains and fossils amount planktonic foraminifera and less abundant benthic species than in previous samples.

The following table summarizes the foraminiferal results of WEST (1988):

<table>
<thead>
<tr>
<th>SAMPLE</th>
<th>PLANKTONIC FORAMINIFERA ZONE</th>
<th>AGE</th>
<th>ENVIRONMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>9541</td>
<td><em>Gbt. puncticulata</em> (Interval zone) = Piacenzian upper (top) N19 (Late Plioc.)</td>
<td>Outer self-slope environment i.e. fully marine conditions (upper mesobathyal zone, palaeodepth &gt;1000m), temperate to sub-tropical</td>
<td></td>
</tr>
</tbody>
</table>
9540  *Gbt. margaritae / Gbt. puncticulata* (Concurrent zone) = 
middle/upper N19  

Zanclean (Early Plioc.)  
Outer self-slope environment i.e. fully 
marine conditions (upper mesobathyal 
zone, palaeodepth >1000m), temperate to 
sub-tropical

9539  *Gbt. margaritae* (Interval zone) = 
low N19  

Zanclean (Early Plioc.)  
Outer self-slope environment i.e. fully 
marine conditions (upper mesobathyal 
zone, palaeodepth >1000m), temperate to 
sub-tropical

9537  *Gbt. margaritae* (Interval zone) = 
low N19  

Zanclean (Early Plioc.)  
Outer self-slope environment i.e. fully 
marine conditions (upper mesobathyal 
zone, palaeodepth >1000m), temperate to 
sub-tropical

9536  *Gbt. margaritae* (Interval zone) = 
low N19  

Zanclean (Early Plioc.)  
Outer self-slope environment i.e. fully 
marine conditions (upper mesobathyal 
zone, palaeodepth >1000m), temperate to 
sub-tropical

9535  *Gbt. margaritae* (Interval zone) = 
low N19  

Zanclean (Early Plioc.)  
Outer self-slope environment i.e. fully 
marine conditions (upper mesobathyal 
zone, palaeodepth >1000m), temperate to 
sub-tropical

9534  *Gbt. margaritae* (Interval zone) = 
low N19  

Zanclean (Early Plioc.)  
Outer self-slope environment i.e. fully 
marine conditions (upper mesobathyal 
zone, palaeodepth >1000m), temperate to 
sub-tropical

9533  *Gbt. margaritae* (Interval zone) = 
low N19  

Zanclean (Early Plioc.)  
Outer self-slope environment i.e. fully 
marine conditions (upper mesobathyal 
zone, palaeodepth >1000m), temperate to 
sub-tropical

9532  First appearance of *Gbt. margaritae* (Interval zone) = low 
N19  

Zanclean (Early Plioc.)  
Outer self-slope environment i.e. fully 
marine conditions (upper mesobathyal 
zone, palaeodepth >1000m), temperate to 
sub-tropical

9531  *Spaeroidinellopsis* Acme zone  
(Ecozone) = top N18/base N19  

Zanclean (Early Plioc.)  
Outer self-slope environment i.e. fully 
marine conditions (upper mesobathyal 
zone, palaeodepth >1000m), temperate to 
sub-tropical

9530  *Spaeroidinellopsis* Acme zone  
(Ecozone) = top N18/base N19  

Zanclean (Early Plioc.)  
Deep open marine conditions

14
Non-distinctive (after laccarino & Salvatorini, 1982) N17 - N18

Non-distinctive (after laccarino & Salvatorini, 1982) N17 - N18

Non-distinctive (after laccarino & Salvatorini, 1982) N17 - N18

Non-distinctive (after laccarino & Salvatorini, 1982) N17 - N18

2.C.Ü. Dhrymou

Twenty eight samples were taken from the positions which are indicated in the lithological column (Fig. 7). The section consists of several faulted blocks of the Nicosia Formation. Consequently the section is not always continuous. However it was thought that the visible parts were forming an almost complete sequence. The section is briefly interrupted at two points due to vegetation covering.

The basal part of the Nicosia Formation (calcarenite of unknown thickness) seems to lie on the Kalavasos Formation gypsum but the actual boundary is covered by vegetation over approx. 1m thickness. This is the first break in the section. A 0.7m thick bed of conglomerate follows upwards. The top of the basal beds is erosive. There is another break in the section of about 1.8m thickness.

The next visible group of beds (thickness 3.29m) starts with a marly bed (0.2-0.6m) and proceeds with alternating bands of marls, sands, calcareous sands and sandy marls (Fig. 7). If one looks carefully at this sequence there is a very distinct repetition of certain layers forming altogether two sedimentary cycles. More specifically, the sequence: calcareous sand - marl - sand - sandy marl is developed within each cycle. The first three sediments are repeated twice while the sandy marl layer (0.005m) which forms the top of the lower cycle is not exposed (due to vegetation) in the upper cycle; it also happens to the boundary between this cyclic sedimentation and the following “monotonous” marly sequence.

An observation about the relative duration of the cyclic sedimentation is reflected by the calcareous sand which shows in the lower (1st) cycle a thickness of
Fig. 7: Lithological column of the Dhrymou area, showing the sampling points.
0.41m while in the upper (2nd) of approx. 0.035m which is the 1/10 of its thickness in the lower cycle. The ratio is reversed for the marl layers in the upper (0.6m) and lower (0.07m) cycles, while for the sand layers the thicknesses are the same in both the cycles (0.4m).

As has been mentioned above, the cyclic units are followed upwards by a continuous marl (89.37m) with thinner beds of various distinctive colours (mainly pink, buff, white and brown). Their existence is only recognised from the changes in the colour since there are no obvious boundaries except for the last few beds towards the top of this formation. In various intervals there is also participation of distinctive muddy, silty and sandy layers in the sediment but in minor quantities. The layers also start to contain (towards the top of the column) more sandy laminations and macrofossils such as pectinids, molluscs and plant debris.

The top of the section consists of a series of calcarenite sand waves (> 3.5m) intercalated with soft calcareous sandstone of light buff colour.

*Orbulina* is seen throughout the whole section while towards the top of the marly formation, biserial, triserial and trochospiral forams become common.

The ostracods found in samples 9903 to 9907 are recrystallized and found only in the larger than 250 im fractions. From sample 9908 up to 9911, ostracods are *in-situ* (not recrystallized) but small in size (<250 im) and number. From sample 9912 and upwards, ostracods were found in almost all fractions of each sample and were generally abundant (with some fluctuations). In some samples they also look transported (red-yellow-brown colour) either the whole assemblage or mixed with *in-situ* specimens and this is going to give us useful information for the palaeoecology of the samples.

The following table summarises the foraminiferal results of NASIB (1986):

<table>
<thead>
<tr>
<th>SAMPLE</th>
<th>PL. FORAM. ZONE</th>
<th>AGE</th>
<th>ENVIRONMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>9930</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>9929</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>9928</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>9927</td>
<td><em>Gbt. puncticulata</em> (Interval zone) = Placenzian (Late Plioc.)</td>
<td>Upper mesobathyal, &gt;1300m</td>
<td></td>
</tr>
</tbody>
</table>
9926  *Gbt. puncticulata* (Interval zone) = Piacenzian (Late Plioc.)
upper (top) N19

9925  *Gbt. puncticulata* (Interval zone) = Piacenzian (Late Plioc.)
Upper mesobathyal, >1300m
upper (top) N19

9924  *Gbt. puncticulata* (Interval zone) = Piacenzian (Late Plioc.)
Upper mesobathyal, >1300m
upper (top) N19

9923  ?
9922  ?
9921  ?
9920  ?

9919  *Gbt. margaritae/Gbt. puncticulata* (Interval zone) = Zanclean (Early Plioc.)
(Concurrent zone) = middle/upper
N19

9918  *Gbt. margaritae/Gbt. puncticulata* (Interval zone) = Zanclean (Early Plioc.)
(Concurrent zone) = middle/upper
N19

9917  *Gbt. margaritae/Gbt. puncticulata* (Interval zone) = Zanclean (Early Plioc.)
(Concurrent zone) = middle/upper
N19

9916  *Gbt. margaritae/Gbt. puncticulata* (Interval zone) = Zanclean (Early Plioc.)
(Concurrent zone) = middle/upper
N19

9915  ?
9914  *Gbt. margaritae* (Interval zone) = Zanclean (Early Plioc.)
low N19

9913  *Gbt. margaritae* (Interval zone) = Zanclean (Early Plioc.)
low N19

9912  *Gbt. margaritae* (Interval zone) = Zanclean (Early Plioc.)
low N19

9911  ?
9910  ?

9909  *Spaeroidinellopsis* Acme zone (Ecozone) = base N19
Zanclean (Early Plioc.)
Upper mesobathyal, >1300m

9908  *Spaeroidinellopsis* Acme zone (Ecozone) = base N19
Zanclean (Early Plioc.)
At base = Mioc./Plioc.
boundary
Upper mesobathyal, >1300m

9907  Non-distinctive (after lazzarino &
Latest Mioc. At top = Inner neritic, 30-50m
Salvatorini, 1982) interval zone = Mioc./Plioc. boundary
N17 - N18

9906  Non-distinctive (after lazzarino &
Latest Mioc.
Inner neritic, 30-40m
Salvatorini, 1982) interval zone = N17 - N18
2.C.iii. Polemi

The studied area is around the village of Polemi which is located in the SW part of the island and about 15 Km NE of Paphos. Geologically, the area is placed in the Polis Basin (Fig. 4).

In general, the sequence consists of Messinian evaporitic deposits (Kalavasos Formation), occupying the Polemi Basin (ROBERTSON, 1977) and overlain by Pliocene marls (Nicosia Formation), with coarse bioclastic limestones of the Athalassa Formation on the top (Fig. 8). Data below derived from OUTRAM & McCARTHY (1990):

LOCALITY 31 / Sample 10352

A very thick sequence of tabular gypsum belonging to the Kalavasos Formation was observed. A gypsum sample was taken in order to try to date this part of the formation.

LOCALITY 32 / Samples 10353 and 10361

The sequence here consisted of marls (Nicosia Formation) which were grouped in four beds, in ascending order:
1) 3-5 m of Orbitolina-rich, pale buff well-bedded marl. Sample 10353 was taken from the base of this bed.
2) 5 m of pale cream coloured marl, softer and less consolidated.
3) 2-5 m of white bedded marl, fairly hard.
Fig. 8: Schematic lithostratigraphical column of the Polemi section
4) 5-10 m of *Orbulina*-rich, hard pink marl. Sample 10361 was taken from the top of this bed.

LOCALITY 19 / Sample 10354

A marly gypsum bed between two gypsum beds. The marl was white, soft and fine-grained and was sampled in the belief that it is the top of the Kalavasos Formation.

LOCALITY 21A / Sample 10355

This is a sample taken from a fine-grained creamy white marl at the same height as sample 10354 but further to NE. This sample was taken for correlation of the two samples and (due to its position at the base of a faulted block that was capped by Nicosia and Athalassa Formations) in an attempt to find out whether this marl was at the base of the Nicosia or the top of the Kalavasos Formation.

LOCALITY 24 / Samples 10356, 10357 and 10358

10356: Green/buff fine-grained marl that weathers grey.
10357: Fine-grained, creamy, coloured marl that weathers orange. The sample was taken from the base of the sequence.
10358: Buff, coarse grained bioclastic limestone with corals, oysters and *Pecten* present.

LOCALITIES 5, 30 / Samples 10359 and 10360

This was at the top of a hill that was formed of coarse-grained bioclastic limestones of the Athalassa Formation, while below this unit there was a very fine-grained white friable chalk horizon from where the sample 10360 was taken. The sample 10359 consisted of cream/buff very coarse-grained bioclastic limestone with corals, bivalves and oysters.

LOCALITY 39 / Sample 10362

Bioclastic limestone containing many corals and bivalves above a grey marl (from which the only sample from this locality was taken to see if it can be correlated with that seen at locality 24). The sample was of fine-grained, grey marl with whiter areas present as spots.
LOCALITY 41 / Samples 10364, 10363A, 10363 and 10365

The section here consisted of the following beds in ascending order:

1) Fine-grained marl (Sample 10364) (Nicosia?).
2) Conglomerate layer similar to 5.
3) Soft white chalk (10363A).
4) Fine-grained calcarenite (10363).
5) Conglomerate layer with rounded clasts of Troodos material.
6) Buff, fine-grained bioclastic limestone (Sample 10365) (Athalassa?)

The above samples were dated and interpreted using foraminifera and calcareous nannoplankton (OUTRAM & McCARTHY, 1990) and the results are summarized in the following table:

<table>
<thead>
<tr>
<th>SAMPLE</th>
<th>CALCAREOUS NANNOF. ZONE</th>
<th>FORAMS ZONE</th>
<th>AGE</th>
<th>ENVIRONMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>10359</td>
<td>No nannofossils</td>
<td>No forams</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>10360</td>
<td>Barren</td>
<td>Barren</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>10358</td>
<td>Poor</td>
<td>N9-Recent</td>
<td>Middle Mioc.-Recent</td>
<td>Inner shelf (? high salinity)</td>
</tr>
<tr>
<td>10365</td>
<td>No markers</td>
<td>No pl. forams</td>
<td>Tertiary</td>
<td>High energy inner shelf</td>
</tr>
<tr>
<td>10363</td>
<td>No markers (reworked)</td>
<td>No forams</td>
<td>Tertiary</td>
<td>Crisis conditions</td>
</tr>
<tr>
<td>10363A</td>
<td>Barren</td>
<td>Barren</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>10364</td>
<td>Poor</td>
<td>N16-N21</td>
<td>Late Mioc.-Late Plioc.</td>
<td>Oligohaline, freshwater</td>
</tr>
<tr>
<td>10361</td>
<td>NN17-NN18</td>
<td>No markers</td>
<td>Late Plioc.-Recent</td>
<td>Ocean marine</td>
</tr>
<tr>
<td>10362</td>
<td>No markers</td>
<td>N16-N21</td>
<td>Late Mioc.-Late Plioc.</td>
<td>Marine (outer shelf)</td>
</tr>
<tr>
<td>10356</td>
<td>Late Miocene</td>
<td>N16-N21</td>
<td>Late Mioc.-Late Plioc.</td>
<td>Continental shelf / outer slope</td>
</tr>
<tr>
<td>10357</td>
<td>Late Pliocene</td>
<td>N16-N21</td>
<td>Late Pliocene</td>
<td>Continental slope, low oxygen levels, possibly with turbidity currents</td>
</tr>
<tr>
<td>10355</td>
<td>Sparse microfossils</td>
<td>N19-N21</td>
<td>Pliocene</td>
<td>Continental slope</td>
</tr>
<tr>
<td>10353</td>
<td>NN11-NN15</td>
<td>post N9</td>
<td>Late Mioc.-E. Plioc.</td>
<td>Outer shelf</td>
</tr>
<tr>
<td>10354</td>
<td>Poor</td>
<td>No forams</td>
<td>M.Mioc.-Recent</td>
<td>Brackish, estuarine</td>
</tr>
<tr>
<td>10352</td>
<td>No markers</td>
<td>No forams</td>
<td>Tertiary-Recent</td>
<td>Highly stressed</td>
</tr>
</tbody>
</table>
2.C.iv. Amargeti

Amargeti is located in the southwest part of Cyprus. The samples for this area were collected along a traverse which consists of a southwest-northeast trending section through the southeastern margin of the Polemi evaporite basin, near the southeastern termination of the Polis Graben. Exposures were provided mainly by cuttings along a new road past Amargeti village (see Fig. 9).

The oldest geological unit in the area is the Lefkara Formation which comprises bioturbated foraminiferal chalk and whose age ranges from Late Cretaceous (Maastrichtian) to Early Miocene (ROBERTSON, 1977).

Following upwards, fossiliferous marls, chalks and thin (turbiditic) calcarenites can be found belonging to the Pakhna Formation. Hard micrites with *Discospirina* were found near the top of this unit, which is probably entirely of Mid to early Late Miocene age (ROBERTSON, 1977).

The Pakhna Formation is overlain by more than 7 m of laminated, brecciated and massive gypsum, with hard laminated limestones and marls at the base, comprising together the Kalavasos Formation. According to ROBERTSON (1977) these evaporites belong to the Late Miocene (Messinian).

The Kalavasos Formation is overlain by more than 3 m of marls containing large (up to 2m) boulders of the Kalavasos gypsum in the lower part and the age of this unit assumed to be latest Miocene or early Pliocene.

The next unit upwards is the Nicosia Formation with an unknown thickness (>10m) of soft foraminiferal marls. The base of this unit in this area is thought to be of earliest Pliocene age (ROBERTSON, 1977).

Overlying the Nicosia Formation are found locally gravels, sands, pebbly sandstones and sandy limestones which contain reworked microfossils and clasts of Troodos basic igneous rocks. These are assigned to the Quaternary, including also a small travertine deposit in the southwest of the area (see Fig. 10).

Many of the samples listed below were not found to contain ostracods but are described here as their fauna and age may be useful for environmental interpretation of the sediments.
Fig. 9: Diagrammatic map of the transverse near Amargeti showing the sampling locations (after RADLEY & MONDEJAR, 1990).
Fig. 10: Schematic lithostratigraphic column of the Amargeti area
It is known that localities 1 & 2 belong to Pakhna Formation and localities 3 & 4 to Kalavasos Formation. The description of the rest localities and samples is as follow:

LOCALITY 5 / Sample 10338

This locality is a small road cutting stratigraphically belonging to the Kalavasos Formation with the following sequence:

1) 20-30cm finely laminated limestone, comprising alternations of hard grey crystalline layers and paler softer laminae
2) 10-15cm buff-coloured marl. Sample 10338 was collected from this bed.
3) 10-15cm tabular chalky limestones.

Gap in section (2m)
4) 2m laminated gypsum.
5) 3m massive gypsum.
6) 1m laminated gypsum.

LOCALITY 6 / Sample 10351

Soft pale blocky to laminated foraminiferal marl (Nicosia-type) fills a small channel-like structure 1m deep within massive weathered gypsum. Sample 10351 was collected from this marl.

Fig. 11: The gypsum boulder and sampling positions around it in LOCALITY 7.
LOCALITY 7 / Samples 10347, 10348, 10349, 10350

At this locality a gypsum boulder bed is observed overlying the Kalavasos Formation (Fig. 11).

Northeast of this bed a marl sequence (with a sandy marl containing charophyte oogonia) including intraformational breccias was recorded and from this sandy marl the sample 10347 was taken.

Sample 10348 was taken from bedded marls, draped over gypsum boulders within the gypsum boulder bed, sample 10349 from sheared white laminated fine-grained marl beneath a gypsum boulder, showing syn-sedimentary deformation and dewatering structures.

Sample 10350 was taken from green and orange striped clay, beneath same gypsum boulder as sample 10349.

LOCALITY 8 / Sample 10346

The locality exposes 5m of pale marl, with 20cm thick bed of sandstone, 2m from the base. Sample 10346 was collected from a marl band just below the sandstone to confirm or disprove an age equivalent with the Nicosia Formation.

LOCALITY 9 / Samples 10343 and 10344

The section here contains 3m of shelly bioturbated Nicosia-type marls (sample 10344) with sandy lenses, overlain abruptly by approximately 3m of irregularly bedded gravels (locally cemented), calcareous sandstones and clayey sands, with stringers of matrix-supported clasts (sample 10343).

LOCALITY 15 / Sample 10345

Pale well-bedded foraminiferal marls (approx. 7 metres thickness) typical of the Nicosia Formation were exposed here. Sample 10345 was collected from this location.

LOCALITY 16 / Samples 10339, 10340, 10341, 10342 and "x"

The gypsum boulder bed is exposed here, overlying foraminiferal marls and deposits of sand and gravel. The following samples were taken in order to assess the age of the gypsum boulder bed (Fig. 12):
Fig. 12: Lithology and sampling positions in LOCALITY 16.
sample x: pebbly clayey sand with basic igneous clasts
10339: pale foraminiferal marl above pebbly clayey sand
10340: pale foraminiferal marl above white marls with dark clay bands
10341: grey clay with chalky fragments from white marls with dark clay bands
10342: white "gritty" marl from matrix of gypsum boulders.

LOCALITY 17 / Sample 10337

The locality belongs to the Pakhna Formation and exposes the following sequence of strata (in ascending order):
1) 3m alternating marls and thin chalky limestones, thin-shelled bivalves (including pectinaceans) throughout.
2) 17cm massive hard sharp-based yellow calcarenite. Bivalve and cerithiacean gastropod debris, green mudstone clasts at the base.
3) 2m sharp-based alternating shelly bioturbated chalky micrites and buff to brown shaley marls.

[Fault in section disrupting sequence].
4) 2.5m well-bedded chalky cream-coloured limestones, some bivalve debris and bioturbation.
5) 20cm sharp-based chalky micrite, prominent shaley parting near top. Abundant Discospirina, bivalves and rare gastropods. Sample 10337 was collected from this bed.
6) 2m thinly laminated hard unfossiliferous micrite. Laminaations consist of alternations of brown calcitic layers and softer chalky intercalations.
7) 1m of alternating chalky micrites and shaley marls with moulds of small bivalves.

In the table below, a summary is shown of the results of the sample analyses (from RADLEY & MONDEJAR, 1990):

<table>
<thead>
<tr>
<th>SAMPLE</th>
<th>NANNOFOS. ZONE</th>
<th>FORAM. ZONE</th>
<th>AGE</th>
<th>ENVIRONMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;x&quot;</td>
<td>Reworked</td>
<td>Reworked</td>
<td>Quaternary</td>
<td>fluvial</td>
</tr>
<tr>
<td>10351</td>
<td>?</td>
<td>G. margaritae</td>
<td>Early Pliocene</td>
<td>open marine</td>
</tr>
<tr>
<td>10350</td>
<td>Barren</td>
<td>Barren</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>10349</td>
<td>Miocene-basal Pliocene</td>
<td>?</td>
<td>Miocene - Earliest</td>
<td>marine Pliocene</td>
</tr>
</tbody>
</table>
2.C.v. Pissouri

Pissouri village is located at the SSW part of the island of Cyprus. The Pissouri Marl is confined to the muddy and silty sedimentary sequences found around Pissouri village and near Cape Aspro on the coast south of Pissouri. With a thickness of about 150m, it is well exposed along the branch roads leading to Pissouri village from the Limassol-Paphos main road. The lithology of the sequence (Fig. 13) is fairly uniform, consisting almost entirely of soft grey clays, bioturbated clays and interbedded silts, which reflects to a certain extent relatively stable sedimentary conditions but fast deposition. The underlying beds are a series of solid sandy layers, that may belong (or correspond) to Late Miocene Davlos sandstones. The basal contact is a low angle unconformity (resting on Pakhna Formation on coast and on Kalavasos Formation at
LEGEND

- Interbedded grey clays and red silts
- Red silt beds and grey to dark clays
- Clays (bioturbated and not) of grey and green to olive green colour, with interbedded silt bands; Also some red sandstones and weathered red silts, containing shell fragments
- Same as above with very rare sands
- Mainly fine sands and silts; solid, layered; occasionally interbedded, bioturbated clays in various colours
- Well sorted sandstones and conglomerates, with shell fragments

Fig. 13: Composite lithological column of the sections by Pissouri village, showing the sampling positions
Pissouri) and well-exhibited along the sea-coast near Cape Aspro. The Late Pliocene Athalassa Formation, mainly current-bedded sands and well-sorted conglomerates, overlies unconformably the Pliocene Pissouri Marl.

A total of seventeen samples, were collected from four separate roadside exposures to the north of the village. Among those, one (sample 9473) is believed by one of the MSc students who studied the area, to have been contaminated. The two sets of samples are considered to represent continuous sections, even though breaks in the collecting occurred.

The following table shows the results of the foraminiferal and nannofossil studies of the M.Sc. students (PEARCE, 1985 and LI, 1985 respectively):

<table>
<thead>
<tr>
<th>SAMPLE</th>
<th>PL. FORAM.</th>
<th>BENTHIC FORAM.</th>
<th>CALC. ASSEMBL.</th>
<th>AGE</th>
<th>ENVIRONMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>9472</td>
<td>Globorotalia truncatulinoides</td>
<td>Dorothia gibbosa - Asterigerinata mamila</td>
<td>?</td>
<td>Pleistocene</td>
<td>Warm, near-shore (&lt;50m)</td>
</tr>
<tr>
<td>9471</td>
<td>Globorotalia inflata (Interval zone) = top N21</td>
<td>Dorothia gibbosa - Asterigerinata mamila</td>
<td>Reticulofenestra pseudoumbilica - Eudioaster asymmetricus = NN15</td>
<td>Late</td>
<td>Placenzian (&lt;50m)</td>
</tr>
<tr>
<td>9470</td>
<td>Globorotalia inflata (Interval zone) = top N21</td>
<td>Dorothia gibbosa - Asterigerinata mamila</td>
<td>?</td>
<td>Late</td>
<td>Placenzian (&lt;50m)</td>
</tr>
<tr>
<td>9469</td>
<td>Globorotalia inflata (Interval zone) = top N21</td>
<td>Dorothia gibbosa - Asterigerinata mamila</td>
<td>Reticulofenestra pseudoumbilica - Eudioaster asymmetricus = NN15</td>
<td>Late</td>
<td>Placenzian (&lt;50m)</td>
</tr>
</tbody>
</table>
9468 Globigerinoides obliquus extremus
(Interval zone) = N20 - upper N21

9467 Globigerinoides obliquus extremus
(Interval zone) = N20 - upper N21

9466 Globigerinoides obliquus extremus
(Interval zone) = N20 - upper N21

9465 Globigerinoides obliquus extremus
(Interval zone) = N20 - upper N21

9464 Globigerinoides obliquus extremus
(Interval zone) = N20 - upper N21

9463 Globigerinoides obliquus extremus
(Interval zone) = N20 - upper N21

9462 Sphaeroidinellop sis subdehiscent
(Interval zone) = top N19
<table>
<thead>
<tr>
<th>Page</th>
<th>Event</th>
<th>Interval Zone</th>
<th>Age</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>9457</td>
<td>Globorotalia margaritae evoluta (Lineage zone) = middle - upper N19</td>
<td>Bulimina exilis</td>
<td>Late</td>
<td>Cool, middle to outer neritic (50-150/200m)</td>
</tr>
<tr>
<td>9456</td>
<td>Globorotalia margaritae evoluta (Lineage zone) = middle - upper N19</td>
<td>Bulimina exilis</td>
<td>Late</td>
<td>Cool, near-shore (&lt;50m)</td>
</tr>
<tr>
<td>9458</td>
<td>Sphaeroidinellopsis subdehiscens (Interval zone) = top N19</td>
<td>Marginulina - Cylindroclavulina ruderis</td>
<td>Reticulofenestra pseudoumbilica - Eudiscoaster asymmetricus</td>
<td>Early</td>
</tr>
<tr>
<td>9459</td>
<td>Sphaeroidinellopsis subdehiscens (Interval zone) = top N19</td>
<td>Marginulina - Cylindroclavulina ruderis</td>
<td>Reticulofenestra pseudoumbilica - Eudiscoaster asymmetricus</td>
<td>Early</td>
</tr>
<tr>
<td>9460</td>
<td>Sphaeroidinellopsis subdehiscens (Interval zone) = top N19</td>
<td>Marginulina - Cylindroclavulina ruderis</td>
<td>Reticulofenestra pseudoumbilica - Eudiscoaster asymmetricus</td>
<td>Early</td>
</tr>
</tbody>
</table>

2.C.vi. Mari

Both the Mari sections (1 & 2) are located between the coast and the main road from Limassol to Nicosia on the south coast of Cyprus and they may be considered representative of those sediments that have been deposited in local, tectonically
controlled, subsiding basins that adjoined shallow areas of small islands with fringing lagoons, reefs and shoals.

The Mari section (Fig. 14) consists of approximately 35m of homogeneous, in parts heavily bioturbated, green-grey clays, grey-brown silts and sands, overlain by approximately 15m thickness of conglomerates, aeolian dune sands and thin-bedded silts. In the fine-grained sections, the transition from the clay to the silt was noticed to be gradual in places, except from the upper silt which overlies the silty clay of sample 9443 with an irregular boundary.

The whole sequence is dominated by both intact and broken shells of bivalves and gastropods. In section 1, vertical burrows containing wood remains and laminae of organic material are shown in the brown clay band from which sample 9436 was taken. These horizons seem to be strongly affected by diagenetic processes (responsible for the formation of layers and lenses of iron oxides which eventually destroyed the ostracod fauna in places). Also, the orange, fine-grained sand horizon, which is placed between the two irregular boundaries, just below the conglomerates, is laminated, slightly bioturbated and less affected by diagenesis, containing fragmented and intact shells of bivalves, gastropods and scaphopods.

The age of the Mari sequence was believed by PAVLAKELI (1986) to be Early Pliocene. In total 16 samples were collected, 13 (9428-9440) from the first section (section 1) and 3 (9441-9443) from the second (section 2). In section 1, samples 9434, 9436 and 9438 proved to be barren and so did sample 9441 from section 2. The most ostracod-rich parts of both the sections were in the middle, while the generally poor density of the ostracods limits the value of the results to the specific basin only. Finally, the environment interpreted for the lower and middle parts of the sections is a deep, open marine environment with an autochthonous fauna. More specifically, the bottom of this faulted basin is believed to correspond to continental slope depth (lower part of the Mari sequence), with a temperature higher than 10°C (thermosphaeric basin, i.e. depth < 500m). Towards the upper part of the sections, a shallowing is suggested (due to the strong decrease of the number of deep-water taxa, even though there is no evidence of an in-situ near-shore fauna). The sections have not been studied for planktonic foraminifera and calcareous nannoplankton.
Fig. 14: Lithology of the two sampled sections in the Mari area
CHAPTER 3

MATERIALS AND METHODS

3.A. The usefulness of ostracods for the interpretation of the palaeoenvironments.

Ostracods are small arthropods living in a bivalved shell of low Mg calcite, whose two valves are articulated by a dorsal hinge which allows them to open and close. They inhabit almost all aquatic environments (marine and non-marine ones) with many different types of form and this makes them a very valuable tool for ecological and palaeoecological studies.

Their special position in the animal kingdom is becoming better understood, bearing in mind that they first appeared in Cambrian times and their phylogeny can be traced to the Recent. It is reasonable to assume that, if a group of organisms has been able to survive and distribute itself very successfully world-wide for more than half a billion years, then this group has generally to be very flexible ecologically, in order to go through any changes of environmental conditions and adapt to new ones. This is one point that gives to ostracods great advantages over other fossil groups in Late Miocene palaeoenvironments. Since ostracods "inhabit" all aquatic environments, they are one of the few groups providing a continuous record before, through and after the Messinian Salinity Crisis.

Many ostracodologists consider that ostracods are also useful for (at least local) biostratigraphical purposes. A very extensive work in this direction has been carried out by SISSINGH (1972, 1973, 1974, 1976, 1982) who divided the Late Cenozoic of the Eastern Mediterranean into biozones based on ostracods of different facies (Fig. 15). However, the usefulness of ostracods in biostratigraphy is not totally accepted by researchers, since these organisms do not always show the short-time evolutionary changes that are observed in other fossil groups through geological time. The carapace morphology and the species composition of these organisms are also often strongly facies (i.e. environmentally) dependent as they are usually part of the benthos. So, the stability of their carapace morphology and species composition under specific environmental conditions and the fact that adaptation to new ones is followed
Fig. 15: Tentative ostracod biozonation for the Late Cenozoic of the South Aegean island arc (proposed by SISSINGH, 1972).

Fig. 16: Stratigraphic distribution of some ostracod genera in relation to the temperature conditions (after BENSON, 1976).

Fig. 17: Open ocean depth/temperature zonation of Mediterranean Neogene fossil ostracods (after BENSON, 1976).
by slight morphological changes, leads to the suggestion that a system of bioecological rather than biostratigraphical zones would be more reliable and successful for at least basinal stratigraphical use of these organisms. Such an approach to the stratigraphic use of ostracods based in palaeoenvironmental conditions, is given by BENSON (1976) who used temperature zonations (Figs. 16 & 17).

3.B. Materials and methods

The samples were disaggregated in boiling unbuffered Calgon solution (Sodium hexametaphosphate) and washed through a 63 μm sieve. The residue was dry-sieved with 500 μm - 250 μm - 125 μm sieves and separated into four fractions: >500 μm, 500-250 μm, 250-125 μm and 125-63 μm. Each fraction was then subdivided (using a sediment splitter) into smaller, manageable subsamples (of random size), with each containing at least 300 intact ostracods individuals.

Specimens were picked, examined and identified using a Zeiss BR 6 stereomicroscope. For the identification of the very small-sized specimens and the observation of detailed morphological characters of the valves, a Zeiss DSM 940 Scanning Electron Microscope was used. Photographs were also taken using the S.E.M. For photography of the transparent specimens, a Zeiss light camera-microscope was used. Measurements were made at first with a graduated eyepiece scale in the stereomicroscope and were confirmed later from the S.E.M. photographs. For the photographed specimens, the number that follows the letters “SG” represents the specimen catalogue number, while for the measurements the abbreviations L for length and H for height are used (in microns).

3.C. Review of the main studies dealing with Eastern Mediterranean ostracods that were most useful for this work

Many researchers have worked on ostracods from the Eastern Mediterranean. An introduction of their works and the help that they offered in this study is presented below. For the species identification firstly, among the most useful works were those of:
Very useful for understanding the changing environments of the Mediterranean with time were the works of VAN HARTEN (1978-1987) where he explains and presents with detail the ostracod faunas living in the Mediterranean and the changes that can observed to these faunas with the changing palaeogeography and palaeoceanography. The works of ZANGGER & MALZ (1989) and ZANGGER (1991) were also useful since they clearly exhibit how by using Quaternary ostracod faunas from selected areas of Greece they reached paleoenvironmental reconstructions, which were later used for archaeological purposes. The statistical procedures of WHATLEY’s (1982a and b) for using ostracoda for paleoenvironmental analysis were also of great help. Among his numerous works on ostracods and palaeoenvironments, the work of BENSON (1976): The evolution of the Ostracode Costa Analyzed by Theta-Rho Difference, helped very much in understanding how the changing in the ostracods through time takes place.

Apart from the above works, there are also others, which gave combined information and were used for identifications, biostratigraphy and palaeoecology. Such works are presented below:

GRAMANN, F. (1969) and GRAMANN, F. and F. KOCKEL (1969) study the Neogene of the Strymon Basin (North Greece) and among their detailed palaeoenvironmental interpretations they present ostracods which are very similar to the Paratethyan faunas.

SISSINGH, W. (1972a) studying the Late Cenozoic Ostracoda of the South Aegean Island, gives a detailed account of the ostracods he discovered in four Greek islands. In his biostratigraphy part he attempts to establish an ostracod biozonation scheme
(tentative) for the Neogene of the Eastern Mediterranean, while in the palaeoecological part he introduced a method for evaluating depth of deposition and salinity. Although the present study has many species in common with those of SISSINGH (1972a), the low counts in the present work were such, that did not allow (at least completely) the recognition of the tentative biozones proposed by him.

ATHERSUCH (1977) reviewed the genus *Urocythereis* from Europe and Mediterranean redescribing many species, defining similarities and differences among them and giving their geographic (where possible) and palaeogeographic distributions. The same author later (1979) studied littoral ostracods from Cyprus, explaining their habitats and their preferred environments.

TSAPRALIS (1981) studied (Ph.D. Thesis) the ostracod fauna included in Pleistocene sediments of Zakynthos island (Ionian Sea) giving at the same time a very good account of the palaeoenvironments.

MOSTAFAWI (1981) studied the Pleistocene ostracod fauna from the island of Kos, which he re-studied in 1986. In 1988 he studied the Plio-Pleistocene freshwater ostracods of Kos and one year later (1989) the marine and nonmarine ones from Rhodos island. All the above works of this author among his many studies in various areas of Greece, contain very good photographs of ostracods and together form an important record of the ostracods in the Greek islands of the South Aegean.

ROMMELT-DOLL (1990) studied the Neogene and Pleistocene ostracod fauna from cores of Corinth Channel. This work, apart from the very interesting compositions of the fauna that he recorded, also presents a very detailed palaeoecological interpretation using statistical methods for both the ostracods and the sediment.

DORUK (1973) studied the Late Cenozoic ostracods from the Basins of Adana and Antakya. Although in this work little space is given to the reconstruction of the palaeoenvironments, it has however a very extensive taxonomical part, extremely rich in good quality SEM photographs. These are accompanied by age and distribution.
information for each species, which made this work to be of great help for the present study.
CHAPTER 4

TAXONOMY

4.A. Introduction

The taxonomic classification of the ostracods recovered during this study is presented in this chapter and includes 410 species belonging to 105 genera. Since the study is not intended to be primarily taxonomic or biostratigraphic, only the information that is useful for ecological interpretation is given here. For each species, four types of information are given:

1. **Dimensions**: this section contains the dimensions of every illustrated specimen. They are given in the format of two numbers separated by a comma. The first number corresponds to the length of the valve and the second to the height. All the dimensions are in mm. Finally, the Catalogue number of the specimen is given in parentheses.

2. **Distribution**: the geographical and stratigraphical distribution of the species in the Mediterranean, as it is recorded by previous authors, in the following format: **age range**: area (author, date of publication). The age range is given as precisely as possible and for the correlation of Paratethyan and Mediterranean stages the diagram in Fig. 19 is used. This section can also be used in a sense as a synonymy list, in which however the information is arranged in such a way that is more easily retrievable for the purposes of the present study.

3. **Remarks**: this section contains any additional information (e.g. new distributional data) that would be of interpretative importance for this study. Also, any deviations from the original description as well as any similarities / relations with other species are discussed.

For the subdivision of the marine environments according to depth, the scheme appearing in Fig. 18 is followed. For the description of environments in relation to salinity the following ranges (as they were decided in the Napoli Ostracod Symposium (1967)) were followed:

- Hypersaline (Marine) \( >40 \, \%_{\text{oo}} \)
- Euhaline (Marine) \( 40-30 \, \%_{\text{oo}} \)
Mixohaline (Brackish)  30-0.5 °/oo
Limnic (Freshwater)  <0.5 °/oo

4. Occurrence: the occurrence of the species in the studied samples is given in this section. The samples localities and numbers are:

**SECTION**  **SAMPLES**
Polemi  10354-10365
Amargeti  10342-10351 & 10465-10468
Dhrymou  9903-9930
Steni  9531-9540
Mari  9428-9443
Pissouri  9456-9473

(see also Chapter 2)

![Fig. 18: Basic subdivisions of the marine environments (after BERGGREN, 1972, slightly modified)](image-url)
4.B. Taxonomic classification

The suprafamily-level classification of Ostracoda has been the subject of discussion in many publications especially in the last 20-25 years. The most recent complete reviews are those of ADELE (1982) and MADDOCKS (1982). The most obvious structural difference between the two papers is that ADELE treats Ostracoda as a sublass (subdivided into five orders) as had been the tradition before, while MADDOCKS raises them in the class level, believing that their relationship to the other Crustacea remains uncertain. Further, she divides ostracoda into six orders (Bradoriida, Leperditicopida, Myodocopida, Palaeocopida, Platycopida and Podocopida).

Although the present study is not intended to be a taxonomical one, the doubts expressed by MADDOCKS (1982) concerning the taxonomic placement of Ostracoda are thought to be valid and her classification scheme is used for the suprafamily levels. For the familial and lower levels, the classification of HARTMANN & PURI (1974) is mainly used, being only modified when necessary (for example, when more recently described species had to be added). Also, due to the confusion existing in the generic and infrageneric nomenclature of the Candoia forms, the relatively stable scheme proposed by KRSTIC (1972) is followed here as it is thought to be the most complete one. So, the scheme of classification for the ostracods of this study is as follows:

KINGDOM ANIMALS

PHYLUM ARTHROPODA

CLASS OSTRACODA Latreille, 1806

ORDER MYODOCOPIDA Sars, 1866

SUBORDER CLADOCOPINA SARS, 1866

SUPERFAMILY POLYCOPACEA Sars, 1866

FAMILY POLYCOPIDAE Sars, 1866

Genus Polycope Sars, 1866

ORDER PLATYCOPIDA Sars, 1866

SUBORDER PLATYCOPINA Sars, 1866

SUPERFAMILY CYTHERELLACEA Sars, 1866
FAMILY CYTHERELLIDAE Sars, 1866
   Genus Cytherella Jones, 1849
   Genus Cytherelloidea Alexander, 1929

ORDER PODOCOPIDA Mueller, 1894
SUBORDER PODOCOPINA Sars, 1866
SUPERFAMILY BAIRDIACEA Sars, 1866
FAMILY BAIRDIIDAE Sars, 1888
   Genus Bairdia McCoy, 1844
   Genus Bairdoppilata Coryell, Sample & Jennings, 1935
   Genus Neonesidea Maddocks, 1969
   Genus Anchistrocheles Brady & Norman, 1889

FAMILY BYTHOCYPRIDIDAE Maddocks, 1969
   Genus Bythocypris Brady, 1880

SUPERFAMILY CYTHERACEA Baird, 1850
FAMILY CYTHERIDAE Baird, 1850
   SUBFAMILY CYTHERINAE Baird, 1850
      Genus Cytheromorpha Hirschmann, 1909
      Genus Microcytherura Mueller, 1894
      Genus Microceratina Swanson, 1980
      Genus Kroemmelbeinella Mostafawi, 1984
      Genus Pajenborchella Kingma, 1948
      Subgenus Pajenborchella Kingma, 1948
      Subgenus Eopajenborchella Kingma, 1948

FAMILY LEPTOCYtherIDAE Hanai, 1957
   SUBFAMILY LEPTOCYtherINAE Hanai, 1957
      Genus Leptocythere Sars, 1925
      Subgenus Leptocythere Sars, 1925
      Subgenus Amnicythere Devoto, 1965
      Genus Callistocythere Ruggieri, 1953
      Genus Ionicythere Mostafawi, 1986
      Genus Euxinocythere Stancheva, 1968
FAMILY EUCYTHERIDAE Puri, 1954
Genus Eucythere Brady, 1868

FAMILY CYTHERIDEIDAE Sars, 1925
SUBFAMILY CYTHERIDEINAE Sars, 1925
Genus Cyprideis Jones, 1857
Genus Cytherissa Sars, 1925
Genus Miocyprideis Kollmann, 1960
Genus Neocyprideis Apostolescu, 1956

FAMILY CUSHMANIDEIDAE Puri, 1973
Genus Cushmanidea Blake, 1933

FAMILY KRITHIDAE Mandelstam, 1960
Genus Krithe Brady, Crosskey & Robertson, 1874
Genus Parakrithe van den Bold, 1958

FAMILY NEOCYTHERIDAE Puri, 1957
Genus Neocythereis Puri, 1952
Genus Pseudopsammocythere Carbonnel, 1966

FAMILY TRACHYLEBERIDIDAE Sylvester-Bradley, 1948
SUBFAMILY TRACHYLEBERIDINAE Sylvester-Bradley, 1948
Genus Carinocythereis Ruggieri, 1956
Genus Costa Neviani, 1928
Genus Agrenocythere Benson, 1972
Genus Cistacythereis Uliczny, 1969
Genus Falunia Grekoff & Moyes, 1955
Subgenus Falunia Grekoff & Moyes, 1955
Subgenus Hiltermannicythere Bassiouni, 1970
Genus Incongruellina Ruggieri, 1958
Subgenus Incongruellina Ruggieri, 1958
Subgenus Lixouria Uliczny, 1969
Genus Pterygocythereis Blake, 1933
Genus Echinocythereis Puri, 1954
Subgenus Echinocythereis Puri, 1954
Subgenus *Rhodicythereis* Sissingh, 1972

Genus *Henryhowella* Puri, 1957

Genus *Occultocythereis* Howe, 1951

Genus *Acanthocythereis* Howe, 1963

Genus *Bosquetina* Keij, 1957

**SUBFAMILY BUNTONIINAE** Apostolescu, 1961

Genus *Buntonia* Howe, 1935

Subgenus *Buntonia* Howe, 1935

Subgenus *Quasibuntonia* Ruggieri, 1958

Subgenus *Rectobuntonia* Sissingh, 1972

**SUBFAMILY CAMPYLOCYTHERINAE** Puri, 1960

Genus *Ruggieria* Keij, 1957

Genus *Basslerites* Howe, 1937

**FAMILY HEMICYTHERIDAE** Puri, 1953

**SUBFAMILY HEMICYTHERINAE** Puri, 1953

Genus *Hemicytheria* Pokorny, 1955

Genus *Aurila* Pokorny, 1955

Genus *Mutilus* Neviani, 1928

Genus *Pokornyella* Oertli, 1956

Genus *Tyrrenocythere* Ruggieri, 1955

Genus *Hermanites* Puri, 1955

Genus *Poseidonamicus* Benson, 1972

Genus *Quadracythere* Hornibrook, 1952

Subgenus *Tenedocythere* Sissingh, 1972

Genus *Graptocythere* Ruggieri, 1972

**SUBFAMILY UROCYTHEREIDINAE** Hartmann & Puri, 1974

Genus *Urocythereis* Ruggieri, 1950

**SUBFAMILY ORIONININAE** Puri, 1973

Genus *Caudites* Coryell & Fields, 1937

Genus *Pachycaudites* Uliczny, 1969

**FAMILY CYTHERETTIDAE** Triebel, 1972
Genus *Flexus* Neviani, 1928

FAMILY LOXOCONCHIDAE Sars, 1925

Genus *Loxocauda* Schornikov, 1969
Genus *Loxoconcha* Sars, 1866
Subgenus *Loxoconcha* Sars, 1866
Subgenus *Loxocaspia* Lubimova, 1961
Subgenus *Loxocorniculina* Krstic, 1972
Genus *Hirschmania* Elofson, 1941
Genus *Phlyctocythere* Keij, 1958

FAMILY PARACYTHERIDEIDAE Puri, 1957

Genus *Paracytheridea* Mueller, 1894

FAMILY CYTHERURIDAE Mueller, 1894

SUBFAMILY CYTHERURINAE Mueller, 1894

Genus *Pedicythe* Eagar, 1965
Genus *Cytherura* Sars, 1866
Genus *Eucytherura* Mueller, 1894
Genus *Hemicytherura* Elofson, 1941
Genus *Pseudocytherura* Dubowski, 1939
Genus *Semicytherura* Wagner, 1957
Genus *Paraheminyahella* Dingle, 1984

SUBFAMILY CYTHEROPTERINAE Hanai, 1957

Genus *Cytheropteron* Sars, 1866
Genus *Aversovalva* Hornibrook, 1952
Genus *Kangarina* Coryell & Fields, 1937
Genus *Rimacytheropteron* Whatley & Coles, 1987

FAMILY XESTOLEBERIDIDAE Sars, 1928

Genus *Xestoleberis* Sars, 1866
Subgenus *Pontoleberis* Krstic & Stancheva, 1967

FAMILY BYTHOCYTHERIDAE Sars, 1866

Genus *Monoceratina* Roth, 1928
Genus *Pseudocythere* Sars, 1866
Genus *Profundobythere* Coles & Whatley, 1989

**FAMILY PARADOXOSTOMATIDAE Brady & Norman, 1889**

Genus *Paradoxostoma* Fischer, 1855

Genus *Paracythereis* Mueller, 1894

Genus *Sclerochilus* Sars, 1866

**SUPERFAMILY CYPRIDACEA Baird, 1845**

**FAMILY MACROCYPRIDIDAE Mueller, 1912**

Genus *Macrocypri s* Brady, 1868

Genus *Macropyxis* Maddocks, 1990

Genus *Macroscapha* Maddocks, 1990

**FAMILY ILYOCYPRIDIDAE Kaufmann, 1900**

Genus *Ilyocypris* Brady & Norman, 1889

**FAMILY PONTOCYPRIDAE Mueller, 1894**

Genus *Argilloecia* Sars, 1866

Genus *Pontocypris* Sars, 1866

Genus *Propontocypris* Sylvester-Bradley, 1947

Genus *Australocypris* Mackenzie, 1967

Genus *Pontocyprilla* Liubimova, 1955

**FAMILY CANDONIDAE Kaufmann, 1900**

**SUBFAMILY PARACYPRIDINAE Sars, 1923**

Genus *Paracypris* Sars, 1866

**SUBFAMILY CANDONINAE Kaufmann, 1900**

Genus *Candona* Baird, 1845

Subgenus *Candona* Baird, 1845

Subgenus *Camptocypris* Zalanyi, 1959

Subgenus *Fabaecformiscandona* Krstic, 1972

Subgenus *Pontoniella* Mandelstam, 1960

Subgenus *Typhlocyprella* Krstic, 1972

Genus *Cavernocyprilla* Hartmann, 1964

**FAMILY CYPRIDIDAE Baird, 1845**

**SUBFAMILY CYPRINOTINAE Bronstein, 1947**
Genus *Cyprinotus* Brady, 1866

**SUBFAMILY EUCYPRIDINAE** Bronstein, 1947

Genus *Stanchevia* Krstic, 1968

**SUBFAMILY CYPRIDINAE** Baird, 1845

Genus *Cypris* Mueller, 1776

**FAMILY CYPRIDOPSIDAE** Kaufmann, 1960

**SUBFAMILY CYPRIDOPSINAЕ** Bronstein, 1947

Genus *Potamocypris* Brady, 1870

**ORDER UNCERTAIN**

Species (represented usually by only one individual) which lack diagnostic characters to help their classification.

**FAMILY UNCERTAIN**

Gen. et sp. indet. 1
Gen. et sp. indet. 2
Gen. et sp. indet. 3
Gen. et sp. indet. 4
Gen. et sp. indet. 5
Gen. et sp. indet. 6
Gen. et sp. indet. 7
Gen. et sp. indet. 8
Gen. et sp. indet. 9
Gen. et sp. indet. 10
Gen. et sp. indet. 11
Gen. et sp. indet. 12
Gen. et sp. indet. 13

The following abbreviations used and their meanings are shown in the table below:

<table>
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<th>ABBREVIATION</th>
<th>LATIN TERM</th>
<th>MEANING</th>
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<tr>
<td><strong>aff.</strong></td>
<td><em>affinis</em></td>
<td>It is related to ... but it is not identical (i.e. biological relationship probably</td>
</tr>
</tbody>
</table>
exists)
cf. confer Comparable to ... (i.e. morphological
comparison with no biological
relationship necessarily implied)
ex.gr. ex grupo Belonging to the group of ...
Cytherella postdenticulata OERTLI, 1961

(Pl. 1, fig. 2)

Dimensions: 0.91, 0.56 mm (SG2).
Distribution: Italy (RUGGIERI, 1962; DIECCI & RUSSO, 1964; RUSSO, 1964); Late Miocene: Gavdos, Crete (SISSINGH, 1972); Lower Miocene-Pliocene: Turkey (DORUK, 1973).
Remarks: Marine.
Occurrence: Steni: 9536, 9537, 9539, 9540; Dhrymou: 9925; Polemi: 10361; Pissouri: 9468, 9469; Mari: 9433, 9442.

Cytherella russoi SISSINGH, 1972

(Pl. 1, fig. 3)

Dimensions: 0.84, 0.59 mm (SG3).
Distribution: Pliocene: Turkey (DORUK, 1973); Late Pliocene: Peloponnesos (DANATSAS, 1989); Late Miocene: Crete (SISSINGH, 1972).
Remarks: Marine.
Occurrence: Amargeti: 10344, 10467; Mari: 9442.

Cytherella terquemi SISSINGH, 1972

(Pl. 1, fig. 4)

Dimensions: 0.64, 0.44 mm (SG4).
Remarks: Marine.
Occurrence: Steni: 9536, 9539, 9540; Dhrymou: 9916, 9925, 9926, 9930; Polemi: 10356; Amargeti: 10347, 10344; Pissouri: 9458, 9459, 9465, 9466, 9468, 9469, 9471, 9473; Mari: 9428, 9429, 9430, 9431, 9432, 9433, 9435, 9437, 9439, 9440, 9442, 9443.
**Cytherella vulgata** RUGGIERI, 1962

(Pl. 1, fig. 5)

**Dimensions:** 0.89, 0.59 mm (SG5).

**Distribution:** Tortonian: Sicily (RUGGIERI, 1962); Late Miocene-Pliocene: Crete (SISSINGH, 1972); Late Miocene: Gavdos (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972), Peloponnese (DANATSAS, 1989); Pleistocene: Rhodos (SISSINGH, 1972); Piacenzian: Off-Valearides islands (BENSON, 1975); Pleistocene: Italy (CIAMPO, 1971), Zakynthos (TSAPRALIS, 1981); Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975), Levantine, Balearic, (BONADUCE, CILIBERTO, MASOLI, MINICHELLI & PUGLIESE, 1983); Pliocene - Pleistocene: Italy (Calabria) (COLALONGO, 1965); Pliocene: Turkey (DORUK, 1973); SE France (CARBONNEL & BALLESIO, 1982).

**Remarks:** Marine.

**Occurrence:** Steni: 9536, 9537, 9539, 9540; Dhrymou: 9923, 9925, 9926; Polemi: 10356; Amargeti: 10344; Pissouri: 9459, 9462, 9465, 9466, 9468, 9469, 9471, 9473; Mari: 9428, 9435, 9440, 9442, 9443.

**Cytherella sp.**

**Remarks:** Marine.

**Occurrence:** Polemi: 10361.

**Genus Cytherelloidea** Alexander, 1929

**Cytherelloidea beckmanni** BARBEITO-GONZALEZ, 1971

(Pl. 1, fig. 6)

**Dimensions:** 0.73, 0.47 mm (SG6).

**Distribution:** Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982); a) Tortonian - Piacenzian: Crete, b) Piacenzian: Karpathos, c) Pleistocene: Rhodos (SISSINGH, 1972);
SE France (CARBONNEL & BALLESIO, 1982); Elafonisos (Greece) (MALZ & JELLINEK, 1984).

Remarks: Marine.

Occurrence: Polemi: 10356; Pissouri: 9463, 9464, 9467, 9468; Mari: 9429, 9432, 9435, 9442.

*Cytherelloidea sordida* MUELLER, 1894

(Pl. 1, fig. 7)

Dimensions: 0.77, 0.43 mm (SG7).

Distribution: Late Pliocene: Kos island (Greece) (MOSTAFawi, 1981)

Remarks: Marine.

Occurrence: Mari: 9431.

*Cytherelloidea* sp.

Remarks: Marine.

Occurrence: Amargeti: 10467.

ORDER PODOCOPIA Mueller, 1894

SUBORDER PODOCOPINA Sars, 1866

SUPERFAMILY BAIRDIACEA Sars, 1866

FAMILY BAIRDIIDAE Sars, 1888

Genus *Bairdia* McCoy, 1844

*Bairdia subdeltoidea* (von MUNSTER, 1830)

(Pl. 1, fig. 8)

Dimensions: 0.78, 0.54 mm (SG8).

Distribution: Lower Miocene - Pliocene: Turkey and Cyprus (DORUK, 1973); Miocene: Italy (RUGGIERI, 1960), Crete (SISSINGH, 1972).
Remarks: Marine.

Occurrence: Dhrymou: 9925; Pissouri: 9459.

*Bairdia* sp. 1

(Pl. 1, fig. 9)

Dimensions: 1.23, 0.91 mm (SG9).

Remarks: Marine.

Occurrence: Dhrymou: 9920, 9925.

*Bairdia* sp. 2

(Pl. 1, fig. 10)

Dimensions: 0.41, 0.31 mm (SG10).

Remarks: Marine.

Occurrence: Steni: 9539.

Genus *Bairdoppilata* Coryell, Sample & Jennings, 1935

*Bairdoppilata supradentata* (TERQUEM, 1878)

(Pl. 1, fig. 11)

Dimensions: 0.96, 0.68 mm (SG11).

Distribution: Pliocene: Turkey (DORUK, 1973), Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972); Late Pliocene-Pleistocene: Rhodos (SISSINGH, 1972).

Remarks: Marine.

Occurrence: Dhrymou: 9916; Pissouri: 9459.

Genus *Neonesidea* Maddocks, 1969
Neonesidea formosa (BRADY, 1868)
(Pl. 1, fig. 12)

Dimensions: 0.50, 0.31 mm (SG12).
Distribution: Pleistocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972); Late Pliocene-Pleistocene: Rhodos (SISSINGH, 1972).
Remarks: Marine.
Occurrence: Mari: 9429, 9437, 9439.

Neonesidea longevaginata (MUELLER, 1894)
(Pl. 1, fig. 13)

Dimensions: 0.36, 0.21 mm (SG13).
Distribution: Recent: Gulf of Naples (MUELLER, 1894), Adriatic (BONADUCE et al., 1975), Naxos (BARBEITO-GONZALEZ, 1971), Algeria (YASSINI, 1979); Pleistocene-Recent: Turkey & Cyprus (DORUK, 1973); Late Pliocene: Kos (MOSTAFAWI, 1981), Rhodos (SISSINGH, 1972), Peloponnesos (DANATSAS, 1989); Early Pliocene: Algeria (YASSINI, 1979).
Remarks: Neonesidea sp.1 of PAVLAKELLI (MS, 1986) is the juvenile form of N. longevaginata.
Occurrence: Mari: 9431, 9432, 9440.

Neonesidea mediterranea MUELLER, 1894
(Pl. 1, fig. 14)

Dimensions: 0.53, 0.35 mm (SG14).
Distribution: Recent: Adriatic Sea (BONADUCE, CIAMPO & MASOLI, 1975), Evros Delta (Greece) (STAMBOLIDIS, 1982).
Remarks: Marine.
Occurrence: Pissouri: 9463, 9464.
Neonesidea sp. 1
(Pl. 1, fig. 15)

Dimensions: 0.51, 0.36 mm (SG15).
Remarks: Marine.
Occurrence: Dhrymou: 9916.

Neonesidea sp. 2

Remarks: Marine.
Occurrence: Mari: 9429, 9435, 9439.

Neonesidea sp. 3
(Pl. 1, fig. 16)

Dimensions: 1.00, 0.67 mm (SG16).
Remarks: Marine.
Occurrence: Pissouri: 9464, 9468.

Neonesidea sp. 4
(Pl. 1, fig. 17)

Dimensions: 0.62, 0.39 mm (SG17).
Remarks: Marine.
Occurrence: Polemi: 10358.

Genus Anchistrocheles Brady & Norman, 1889

Anchistrocheles tenera (BREMAN, 1975)
(Pl. 1, fig. 18)
Dimensions: 0.86, 0.42 mm (SG18).


Remarks: Marine.

Occurrence: Steni: 9534, 9533.

**FAMILY BYTHOCYPRIDIDAE** Maddocks, 1969

**Genus** *Bythocypris* Brady, 1880

*Bythocypris bosquetiana* (BRADY, 1866)

(Pl. 2, fig. 1)

Dimensions: 0.96, 0.64 mm (SG19).

Distribution: Recent: Balearic, Tyrrenian, Ionian, Sea of Crete, Levantine (BONADUCE, CILIBERTO, MASOLI, MINICHELLI & PUGLIESE, 1983) Atlantic Ocean (BRADY, 1866); Late Miocene - Late Pliocene: Crete (SISSINGH, 1972); Adriatic (BONADUCE, CIAMPO & MASOLI, 1975 & SISSINGH, 1972); Pleistocene: Italy (COLALONGO, 1965); Pliocene: SE France (CARBONNEL & BALLESIO, 1982), Turkey (DORUK, 1973).

Remarks: Bathyal.

Occurrence: Steni: 9533, 9534, 9535, 9536; Dhrymou: 9909, 9913, 9920, 9916, 9925; Polemi: 10356; Amargeti: 10465, 10344; Pissouri: 9459, 9462.

*Bythocypris compressa* BRADY, 1880

(Pl. 2, fig. 2)

Dimensions: 0.36, 0.22 mm (SG20).


Remarks: Marine.

Occurrence: Mari: 9463.

*Bythocypris lucida* (SEGUENZA, 1880)

(Pl. 2, fig. 3)
Dimensions: 1.07, 0.58 mm (SG21).

Distribution: Pliocene: S. Italy (SEGUENZA, 1880); Late Miocene - Late Pliocene: Crete (SISSINGH, 1972); Pliocene: SE France (CARBONNEL & BALLESIO, 1982).

Remarks: Marine.

Occurrence: Steni: 9532, 9533, 9534, 9535, 9536, 9537, 9539, 9540; Dhrymou: 9909, 9912, 9913, 9916, 9920, 9923, 9925, 9926; Polemi: 10356, 10361; Amargeti: 10347, 10344; Pissouri: 9458, 9459, 9461, 9462, 9463, 9464, 9466, 9471; Mari: 9431, 9432, 9433, 9443.

**Bythocypris obtusata** (SARS, 1869)

(Pl. 2, fig. 4)

Dimensions: 1.13, 0.60 mm (SG22).

Distribution: Recent: South coast of Norway (SARS, 1866), Balearic, Tyrhenian, Ionian, Sea of Crete & Levantine (BONADUCE, CILIBERTO, MASOLI, MINICHELLI & PUGLIESE, 1983); Calabrian: Rhodos (SISSINGH, 1972); Pliocene - Pleistocene: Western Tyrrenian Sea (COLALONGO & PASINI, 1988); Pleistocene: Zakynthos (TSAPRALIS, 1981); Pleistocene: Rhodos (MOSTAFAWI, 1989); Pliocene - Pleistocene: Italy (Calabria) (COLALONGO, 1965).

Remarks: Littoral to bathyal.

Occurrence: Steni: 9535; Dhrymou: 9916, 9920, 9925, 9926; Polemi: 10356; Amargeti: 10347, 10465, 10344; Pissouri: 9459; Mari: 9431.

SUPERFAMILY CYTHERACEA Baird, 1850

FAMILY CYTHERIDAE Baird, 1850

SUBFAMILY CYTHERINAE Baird, 1850

Genus *Cytheromorpha* Hirschmann, 1909

*Cytheromorpha fuscata* (BRADY, 1868)

(Pl. 2, fig. 5)
Dimensions: 0.49, 0.32 mm (SG23).

Distribution: Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982); Late Pleistocene: Italy (COLALONGO, 1965).

Remarks: Brackish.

Occurrence: Amargeti: 10347.

\textit{Cytheromorpha reticulata} COLALONGO & PASINI, 1980

(Pl. 5, fig. 18)

Dimensions: 0.47, 0.25 mm (SG87).

Distribution: Pliocene-Pleistocene: Italy (COLALONGO & PASINI, 1980); Late Pliocene: Peloponnesos (DANATSAS, 1989).

Remarks: Marine.

Occurrence: Steni: 9534; Pissouri: 9468.

Genus \textit{Microcytherura} Mueller, 1894

\textit{Microcytherura angulosa} (SEGUENZA, 1880)

(Pl. 2, fig. 6)

Dimensions: 0.45, 0.23 mm (SG24).

Distribution: Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pleistocene: Zakynthos (TSAPRALIS, 1981); Pliocene-Pleistocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972); Late Pliocene-Pleistocene: Rhodos (SISSINGH, 1972).

Remarks: Marine.

Occurrence: Pissouri: 9458, 9461, 9463; Mari: 9432, 9433.

Genus \textit{Microceratina} Swanson, 1980
**Microceratina reticulata** BONADUCE, CIAMPO & MASOLI, 1975

(Pl. 3, fig. 18)

**Dimensions:** 0.36, 0.18 mm (SG54).

**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Lower Pleistocene: Rhodos (MOSTAFAWI, 1989).

**Remarks:** Marine.

**Occurrence:** Steni: 9534.

Genus *Kroemmelbeinella* Mostafawi, 1984

*Kroemmelbeinella coae* (MOSTAFAWI, 1983)

(Pl. 2, fig. 7)

**Dimensions:** 0.64, 0.40 mm (SG25).

**Distribution:** Pleistocene: Kos (MOSTAFAWI, 1986).

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9927; Polemi: 10356; Mari: 9428, 9440.

Genus *Paijenborchella* Kingma, 1948

Subgenus *Paijenborchella* Kingma, 1948

*Paijenborchella* (*Paijenborchella*) *iocosa* KINGMA, 1948

(Pl. 2, fig. 8)

**Dimensions:** 0.86, 0.32 mm (SG26).

**Distribution:** Pleistocene: Zakynthos (TSAPRALIS, 1981); Late Miocene - Piacenzian: Crete (SISSINGH, 1972); Pliocene - Pleistocene: East Java (KINGMA, 1948).

**Remarks:** Marine.

**Occurrence:** Steni: 9531, 9540; Dhrymou: 9908; Polemi: 10356; Pissouri: 9462, 9468.
Subgenus *Eopaijenborchella* Kingma, 1948

*Paijenborchella (Eopaijenborchella) malaiensis* KINGMA, 1948

(Pl. 2, fig. 9)

**Dimensions:** 0.53, 0.29 mm (SG27).

**Distribution:** Pleistocene: Zakynthos (TSAPRALIS, 1981); Late Pliocene: Crete (SISSINGH, 1972); Pliocene - Pleistocene: East Java (KINGMA, 1948); Miocene: Burma (GRAMANN, 1975).

**Remarks:** Marine.

**Occurrence:** Steni: 9537; Dhrymou: 9912, 9913; Pissouri: 9458.

**FAMILY LEPTOCYTHERIDAE** Hanai, 1957

**SUBFAMILY LEPTOCYTHERINAE** Hanai, 1957

**Genus Leptocythere** Sars, 1925

**Subgenus Amnicythere** Devoto, 1965

*Leptocythere (Amnicythere) affinis* (BRADY, 1869)

**Distribution:** Late Pliocene: Rhodos (MOSTAFAWI, 1989).

**Remarks:** Marine.

**Occurrence:** Polemi: 10356.

*Leptocythere (Amnicythere) cymbula* (LIVENTAL, 1929)

(Pl. 2, fig. 16)

**Dimensions:** 0.43, 0.25 mm (SG34).


**Remarks:** Non-marine.

**Occurrence:** Polemi: 10354, 10356.
**Leptocythere (Amnicythere) litica** LIVENTAL, 1935

(Pl. 2, fig. 17)

**Dimensions:** 0.56, 0.35 mm (SG35).

**Distribution:** Late Pontian: Dacian Basin (OLTEANU, 1989), Pannonian Basin (SOKAC, 1989); N17/base of N18 approximately: France (CARBONNEL, 1978).

**Remarks:** 15.5-16 C, stenohaline (12-13%\textsubscript{o}) (CARBONNEL, 1978).

**Occurrence:** Polemi: 10355.

**Leptocythere (Amnicythere) microlata** (LIVENTAL, 1961)

(Pl. 2, fig. 18)

**Dimensions:** 0.37, 0.23 mm (SG36).


**Remarks:** Characteristic of the Pontian according to NAIDINA (1989). Brackish.

**Occurrence:** Polemi: 10354.

**Leptocythere (Amnicythere) multituberculata** (LIVENTAL, 1929)

(Pl. 3, fig. 1)

**Dimensions:** 0.47, 0.27 mm (SG37).


**Remarks:** Characteristic of the Pontian according to NAIDINA (1989). Brackish.
Occurrence: Polemi: 10355.

*Leptocythere (Amnicythere) stancheva*e KRSTIC, 1973

(Pl. 3, fig. 3)

**Dimensions:** 0.46, 0.26 mm (SG39).

**Distribution:** Late Pannonian: Turkmenistan (KRSTIC, 1973); Late Miocene-Pliocene: Peloponnesos (DANATSAS, 1989).

**Remarks:** Brackish.

**Occurrence:** Polemi: 10355.

*Leptocythere (Amnicythere) sp.* 1

**Remarks:** Brackish.

**Occurrence:** Amargeti: 10347.

*Leptocythere (Amnicythere) sp.* 2

**Remarks:** Brackish.

**Occurrence:** Amargeti: 10346.
Subgenus *Euxinocythere* Stancheva, 1968

*Leptocythere (Euxinocythere) bisaltiana* GRAMANN, 1969

(Pl. 3, fig. 4)

**Dimensions:** 0.64, 0.34 mm (SG40).
**Remarks:** Brackish.
**Occurrence:** Polemi: 10355.

*Leptocythere (Euxinocythere) quinquetuberculata* SCHWEYER, 1949

(Pl. 3, fig. 5)

**Dimensions:** 0.38, 0.23 mm (SG41).
**Distribution:** Late Pontian: Dacian Basin (OLTEANU, 1989).
**Remarks:** Brackish.
**Occurrence:** Polemi: 10354, 10355.

*Leptocythere (Euxinocythere) schweyeri* (SCHNEIDER, 1949)

(Pl. 3, fig. 6)

**Dimensions:** 0.44, 0.23 mm (SG42).
**Distribution:** Bessarabian (Middle Sarmatian): North Bulgaria, Russia (STANCHEVA, 1990).
**Remarks:** Brackish.
**Occurrence:** Polemi: 10354.

Subgenus *Leptocythere* Sars, 1925

*Leptocythere (Leptocythere) aff. L. caspia* (LIVENTAL, 1938)

(Pl. 2, fig. 11)

**Dimensions:** 0.32, 0.17 mm (SG29).
Remarks: Brackish.

Occurrence: Polemi: 10354.

*Leptocythere (Leptocythere) multipunctata* (SEGUENZA, 1884)

**Distribution:** Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982), Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pleistocene: Sicily (SEGUENZA, 1884), Italy (RUGGIERI, 1950b), Zakynthos (TSAPRALIS, 1981); Late Pliocene-Pleistocene: Rhodos (SISSINGH, 1972).


Occurrence: Steni: 9539; Pissouri: 9468, 9473.

*Leptocythere (Leptocythere) aff. L. nostrata* LIVENTAL, 1962

(Pl. 2, fig. 12)

**Dimensions:** 0.47, 0.24 mm (SG30).

Remarks: Brackish.

Occurrence: Polemi: 10354.

*Leptocythere (Leptocythere) salebrosa* MOSTAFawi, 1986

(Pl. 2, fig. 10)

**Dimensions:** 0.44, 0.23 mm (SG28).

**Distribution:** Recent: N. Adriatic (UFFENORDE, 1972); Pleistocene: Kos island (Greece) (MOSTAFawi, 1986).

Remarks: Marine.

Occurrence: Mari: 9437, 9443.

*Leptocythere (Leptocythere) sp. 1* (Pl. 2, fig. 13)
Dimensions: 0.45, 0.23 mm (SG31).

Occurrence: Mari: 9439, 9432, 9435.

*Leptocythere (Leptocythere)* sp. 2
(Pl. 2, fig. 14)

Dimensions: 0.34, 0.20 mm (SG32).

Occurrence: Pissouri: 9439.

*Leptocythere (Leptocythere)* sp. 3

Occurrence: Polemi: 10356.

*Leptocythere (Leptocythere)* sp. 4
(Pl. 2, fig. 15)

Dimensions: 0.54, 0.30 mm (SG33).

Occurrence: Amargeti: 10347.

Genus *Callistocythere* Ruggieri, 1953

*Callistocythere crispata* (BRADY, 1868)
(Pl. 3, fig. 7)

Dimensions: 0.66, 0.36 mm (SG43).

Distribution: Recent: Tenedos (BRADY, 1868, BARBEITO-GONZALEZ, 1971, as *C. diffusa* (MUELLER)); Adriatic (MASOLI, 1968; BONADUCE, CIAMPO & MASOLI, 1976, both as *C. adriatica* MASOLI); Cyprus (J. AHERSUCH collection); Pleistocene: Corinth Channel (KRSTIC & DERMITAKIS, 1981 as *C. adriatica* MASOLI).

Remarks: Known only from the Eastern Mediterranean. Marine.
Occurrence: Dhrymou: 9919, 9921; Pissouri: 9461, 9464; Mari: 9430, 9433, 9437, 9439, 9443.

*Callistocythere folliculosa* BONADUCE, CIAMPO & MASOLI, 1975

(Pl. 3, fig. 8)

Dimensions: 0.49, 0.27 mm (SG44).

Distribution: Recent: Adriatic (BONADUCE et al., 1975), Limski-Channel (UFFENORDE, 1972), British islands and Cyprus (ATHERSUCH & WHITTAKER, 1977); Pleistocene: Zakynthos (TSAPRALIS, 1981); Late Pliocene: Kos (MOSTAFAWI, 1981), W. Peloponnesos (DANATSAS, 1989).

Remarks: Marine.

Occurrence: Pissouri: 9458.

*Callistocythere gilva* BONADUCE, CIAMPO & MASOLI, 1975

(Pl. 3, fig. 9)

Dimensions: 0.42, 0.28 mm (SG45).

Distribution: Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975).

Remarks: Marine.

Occurrence: Polemi: 10356, 10358.

*Callistocythere littoralis* (MUELLER, 1894)

(Pl. 3, fig. 10)

Dimensions: 0.56, 0.33 mm (SG46).

Distribution: Recent: Adriatic (BONADUCE et al., 1975), Bay of Naples (MUELLER, 1894); Pleistocene: Corinth Channel (KRSTIC & DERMITAKIS, 1981); Plio-Pleistocene: W. Peloponnesos (DANATSAS, 1989).

Remarks: Marine.

Occurrence: Dhrymou: 9919, 9922, 9927; Pissouri: 9461, 9466.
Callistocythere lobiancoi (MUELLER, 1912)
(Pl. 3, fig. 11)

Dimensions: 0.66, 0.35 mm (SG47).
Distribution: Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982), Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pleistocene: Corinth Channel (KRSTIC & DERMITAKIS, 1981).
Remarks: Marine.
Occurrence: Pissouri: 9461.

Callistocythere macilenta CIAMPO
(Pl. 3, fig. 12)

Dimensions: 0.57, 0.28 mm (SG48).
Remarks: Marine.
Occurrence: Polemi: 10356; Amargeti: 10347.

Callistocythere montana DORUK, 1980
(Pl. 3, figs. 13, 14)

Dimensions: 0.45, 0.25 mm / 0.42, 0.25 mm (SG49/SG50).
Remarks: This species is suggested to be characteristic of Late Miocene deposits. In Callistocythere montana may also belong C. cf. littoralis of GRAMANN (1969, pl. 34, fig. 10).
Occurrence: Steni: 9532, 9533, 9534, 9536, 9539; Dhrymou: 9914, 9916, 9919, 9925; Polemi: 10356, 10354; Amargeti: 10351; Pissouri: 9458, 9461, 9463, 9465, 9467, 9468, 9471, 9472; Mari: 9428, 9429, 9432, 9433, 9439, 9442, 9443.
**Callistocythere pallida** (MUELLER, 1894)

(Pl. 3, fig. 15)

**Dimensions:** 0.40, 0.22 mm (SG51).

**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pleistocene: Zakynthos (TSAPRALIS, 1981); Late Miocene-Pleistocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972); Late Pliocene-Pleistocene: Rhodos (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Pissouri: 9462, 9473.

**Callistocythere** sp. 1

**Remarks:** Marine.

**Occurrence:** Amargeti: 10347.

**Callistocythere** sp. 2

(Pl. 3, fig. 16)

**Dimensions:** 0.45, 0.29 mm (SG52).

**Remarks:** Marine.

**Occurrence:** Mari: 9431, 9439.

**Callistocythere** sp. 3

**Remarks:** Marine.

**Occurrence:** Amargeti: 10344.

**Callistocythere** sp. 4

**Remarks:** Marine.
Occurrence: Mari: 9440.

*Callistocythere* sp. 5

Remarks: Marine.

Occurrence: Polemi: 10356.

Genus *Ionicythere* Mostafawi, 1986

*Ionicythere golnarae* YASSINI, 1979

(Pl. 3, fig. 17)

Dimensions: 0.43, 0.26 mm (SG53).


Remarks: Marine.

Occurrence: Mari: 9428, 9432, 9433, 9435, 9437, 9439, 9440.

**FAMILY EUCYTHERIDAE** Puri, 1954

Genus *Eucythe* Brady, 1868

*Eucythe* cf. *E. curta* RUGGIERI, 1974

Remarks: cf. because material is higher posteriorly than *E. curta*.

Occurrence: Dhrymou: 9912.

**FAMILY CYTHERIDEIDAE** Sars, 1925

**SUBFAMILY CYTHERIDEINAE** Sars, 1925

Genus *Cyprideis* Jones, 1857

*Cyprideis torosa* JONES, 1857

(Pl. 4, figs. 1-6; pl. 20, fig. 12)
Dimensions: 1.16, 0.61 mm / 1.16, 0.68 mm / 0.48, 0.26 mm / 0.44, 0.22 mm (SG55 / SG56 / SG57 / SG57 / SG57 / SG57 / SG57).

Distribution: Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982), Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pleistocene: Zakynthos (TSAPRALIS, 1981); Pliocene: Turkey (DORUK, 1973).

Remarks: DECIMA (1964) published one of the biggest works on the genus *Cyprideis* from Italian areas. One of the characteristics of his work, was the formal description of many new species and subspecies. Although well intended, his attempt to sort things out has led many later authors into confusion concerning some representatives of this genus that were only known from Paratethyan areas. As a result, experienced Paratethyan researchers on the taxonomy of this genus tried to resolve this problem: KRSTIC (1968, p. 153-154) notes that "of the species of the genus *Cyprideis* that were described by DECIMA (1964) from the Neogene of Italy, not one has been found in the Neogene (especially not in the Pannonian) of the Pannonian Basin". In the same paper of KRSTIC it is noted (op. cit. p. 153-154) that "*Cyprideis pannonica pannonica* and *Cyprideis tuberculata tuberculata* of DECIMA (1964) are similar but not identical to the original forms described from the Paratethys, they should only be named *Cyprideis cf. pannonica* (MEHES) and *Cyprideis cf. tuberculata* (MEHES) respectively and so, no stratigraphic correlation can be made between these DECIMA's species and the Paratethyan ones". Moreover, CARBONNEL (1978) states that material from the Mediterranean DSDP cores (Leg 42A, site 376) in which BENSON (1978) reported that he found *Cyprideis pannonica*, was distributed to four specialists with this kind of fauna (E. BRESTENSKA, R. JIRICEK, N. KRSTIC and A. SOKAC), and the result was that none of them recognised the species *Cyprideis pannonica* among their individuals of BENSON's *C. pannonica*. The *Cyprideis pannonica* identification of BENSON (1978) has also been questioned and rejected by other authors (e.g. VAN HARTEN, 1984 & 1989). Finally, CARBONNEL (1978) questions the existence of *C. pannonica* in the Upper Miocene of Tethys and, based on the results of his work, excludes this possibility. BASSIOUNI (1979), in his extensive
work on the marine ostracod fauna from Turkey, noted that “Cyprideis pannonica agrigeniina looks more close to Cyprideis torosa than to the smaller Cyprideis pannonica pannonica”. Thus, the form C. pannonica agrigeniina of DECIMA should be called Cyprideis agrigeniina which, however, seems to be conspecific with the older name Cyprideis torosa which should for this reason be adopted. In the case of the future demonstration of differentiation between the two forms, then Cyprideis torosa agrigeniina would be the appropriate name for the non-C. torosa s.s. forms.

In the present study, all the Cyprideis individuals belong in one species and from the above review and from personal discussion with Dr. D. van HARTEN, the name Cyprideis torosa was thought to be the most appropriate one.

Only unnoded forms of Cyprideis torosa were observed in the samples of the present study and so, the salinity for this species is > 8‰ (CARBONEL, 1988).

**Occurrence:** Steni: 9540; Polemi: 10354, 10355, 10356, 10362; Amargeti: 10468, 10347, 10342, 10467, 10348, 10351, 10466, 10346; Pissouri: 9465, 9469; Mari: 9430, 9435, 9440.

**Cyprideis triangulata** KRSTIC, 1963
(Pl. 4, fig. 10)

**Dimensions:** 0.65, 0.32 mm (SG61).

**Distribution:** SOKAC (1989) reports this species apart from Yugoslavia, also from Hungary, being found in deposits corresponding to the Upper Pontian in Yugoslavia; Upper Pontian: Slovenia (STEVANOVIC & SKERLI, 1989).

**Remarks:** Very characteristic species of the Upper Pontian (SOKAC, 1989). Brackish.

**Occurrence:** Amargeti: 10347.

**Cyprideis aff. C. versiliaensis** DECIMA, 1964
(Pl. 4, fig. 7)

**Dimensions:** 0.80, 0.52 mm (SG58).
Remarks: Brackish.

Occurrence: Dhrymou: 9904.

Genus **Cytherissa** Sars, 1925

*Cytherissa* aff. *C. bogatschovi* (LIVENTAL, 1938)
(Pl. 4, figs. 8, 9)

**Dimensions:** 0.28, 0.19 mm / 0.28, 0.18 mm (SG59/SG60).

**Distribution:** Pontian: N.Bulgaria (STANCHEVA, 1990).

Remarks: Brackish to non-marine.

Occurrence: Polemi: 10354.

Genus **Miocyprideis** Kollmann, 1960

*Miocyprideis goeckenae* BASSIOUNI, 1979

**Distribution:** Late Pliocene: Peloponnesos (DANATSAS, 1989), Kos (MOSTAFAWI, 1981), Turkey (BASSIOUNI, 1979).

Remarks: Marine.

Occurrence: Mari: 9430, 9433, 9437.

Genus **Neocyprideis** Apostolescu, 1956

*Neocyprideis pseudadonta* HANAI, 1959
(Pl. 5, fig. 7)

**Dimensions:** 0.57, 0.28 mm (SG76).

**Distribution:** Pliocene-Pleistocene: Okinawa, Recent: Japan (HANAI, 1959).

Occurrence: Amargeti: 10344.

FAMILY CUSHMANIDEIDAE Puri, 1973

Genus Cushmanidea Blake, 1933

Cushmanidea elongata (BRADY, 1868)

Distribution: Pleistocene: Zakynthos (TSAPRALIS, 1981); Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982), Atlantic Ocean (BRADY, 1868), Gulf of Naples (MUELLER, 1894 & PURI, 1958), Adriatic (BONADUCE et al., 1975), Naxos (BARBEITO-GONZALEZ, 1971); Late Miocene-Pliocene: France (CARBONNEL, 1969), Turkey (DORUK, 1973); Pliocene-Pleistocene: Crete & Rhodos (SISSINGH, 1972); Late Pliocene-Recent: Algeria (YASSINI, 1979); Late Pliocene: Kos (MOSTAFAWI, 1981), Peloponnese (DANATSAS, 1989).


Occurrence: Steni: 9534; Amargeti: 10344; Mari: 9431, 9440.

Cushmanidea cf. C. lithodomoides (BOSQUET, 1852)

(Pl. 4, fig. 11)

Dimensions: 0.92, 0.41 mm (SG62).

Remarks: Marine.

Occurrence: Dhrymou: 9919, 9927.

Cushmanidea turbida (MUELLER, 1894)


Remarks: Marine.
Occurrence: Pissouri: 9471.

*Cushmanidea* cf. *C. turbida* (MUELLER, 1894)

(Pl. 4, fig. 12)

Dimensions: 0.78, 0.31 mm (SG63).
Remarks: Marine.
Occurrence: Dhrymou: 9930.

FAMILY KRITHIDAE Mandelstam, 1960

Genus *Krithe* Brady, Crosskey & Robertson, 1874

*Krithe aequabilis* CIAMPO, 1986

(Pl. 4, fig. 13; pl. 19, fig. 1)

Dimensions: 0.63, 0.29 mm / 0.64, 0.29 mm (SG64/SG315).
Remarks: Marine.
Occurrence: Steni: 9535, 9537, 9539; Amargeti: 10344; Mari: 9913.

*Krithe aquilonia* COLES, WHATLEY & MOGUILEVSKY, 1994

(Pl. 19, fig. 2)

Dimensions: 0.59, 0.34 mm (SG316).
Distribution: Miocene-Quaternary: N. Atlantic (COLES et al., 1994).
Remarks: Marine.
Occurrence: Dhrymou: 9912.

*Krithe citae* OERTLI, 1961

(Pl. 4, fig. 14)
**Krithe compressa dertonensis** RUGGERI, 1962

(Pl. 4, fig. 15)

**Dimensions:** 0.71, 0.34 mm (SG66).

**Distribution:** Late Miocene: Gavdos (SISSINGH, 1972), Sicily (RUGGERI, 1962).

**Remarks:** Marine.

**Occurrence:** Steni: 9532, 9534, 9535; Dhrymou: 9909, 9911, 9916; Amargeti: 10344.

**Krithe dolichodeira** van den BOLD, 1946

**Distribution:** Early Eocene-Quaternary: N. Atlantic (COLES et al., 1994).

**Remarks:** Marine.

**Occurrence:** Steni: 9535; Dhrymou: 9913, 9923.

**Krithe aff. K. dolichodeira** BOLD, 1946

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9910, 9913.

**Krithe hyalina** BRADY, 1880

(Pl. 4, fig. 16)

**Dimensions:** 0.50, 0.31 mm (SG67).

**Distribution:** Recent: Japan (PUJI & HULINGS, 1976).
Remarks: Marine.
Occurrence: Dhrymou: 9913.

*Krithe martinsoni* COLALONGO & PASINI, 1988
(Pl. 19, fig. 4)

Dimensions: 0.64, 0.27 mm (SG318).
Distribution: Pleistocene: Western Tyrrhenian Sea.
Remarks: Psychrosphaeric (bathyal).
Occurrence: Dhrymou: 9925; Mari: 9433, 9435, 9437.

*Krithe monosteracensis* (SEGUENZA, 1880)
(Pl. 4, fig. 17, pl. 19, fig. 5)

Dimensions: 0.55, 0.31 mm / 0.39, 0.17 mm (SG68/SG319).
Distribution: Balearic, Ionian, Tyrrhenian, Bathyal: (BONADUCE, CILIBERTO, MASOLI, MINICHELLI & PUGLIESE, 1983); Pliocene - Pleistocene: Italy (Calabria) (COLALONGO, 1965), Western Tyrrhenian Sea (COLALONGO & PASINI, 1988); Pliocene: Turkey (DORUK, 1973), Crete (SISSINGH, 1972), Calabrian: Rhodos (SISSINGH, 1972); Pleistocene: Zakynthos (TSAPRALIS, 1981); Early Pleistocene: Rhodos (MOSTAFAWI, 1989); Pliocene - Late Pleistocene: Sicily (SISSINGH, 1973).
Remarks: Bathyal. *Krithe* sp. 1 (BECKER) of CARBONNEL, 1969 (Pl. 12, fig 3) belongs to this species.
Occurrence: Steni: 9532, 9533, 9534, 9535, 9536, 9537, 9539; Dhrymou: 9912, 9913, 9914, 9916, 9920; Polemi: 10356, 10357, 10361; Pissouri: 9458; Mari: 9429, 9443.

*Krithe morkhoveni ayressi* COLES, WHATLEY & MOGUILEVSKY, 1994
(Pl. 4, fig. 18, pl. 19, fig. 6)

Dimensions: 0.75, 0.38 mm / 0.51, 0.31 mm (SG69/SG320).
Remarks: Marine.

Occurrence: Steni: 9536, 9537, 9539, 9540; Dhrymou: 9925; Polemi: 10357, 10356; Amargeti: 10344; Pissouri: 9459; Mari: 9428, 9439.

*Krithe padovanii* COLALONGO & PASINI, 1988

(Pl. 19, fig. 7)

Dimensions: 0.54, 0.32 mm (SG321).

Distribution: Western Tyrrhenian Sea, Latest Pliocene - Pleistocene.

Remarks: Psychro Schaeric (bathyal).

Occurrence: Polemi: 10356.

*Krithe cf. K. padovanii*

(Pl. 19, fig. 3)

Dimensions: 0.49, 0.29 mm (SG317).

Remarks: Marine.

Occurrence: Mari: 9429.

*Krithe pernoides pernoides* CIAMPO, 1986

(Pl. 19, fig. 8)

Dimensions: 0.59, 0.33 mm (SG322).

Distribution: Miocene-Quaternary: N. Atlantic (COLES et al., 1994).

Remarks: Marine.

Occurrence: Steni: Dhrymou: Pissouri:

*Krithe pernoides sinuosa* CIAMPO, 1986

(Pl. 19, fig. 9)
**Krithe praetexta** (SARS, 1866)

(Pl. 19, fig. 10)

- **Dimensions:** 0.64, 0.29 mm (SG323).
- **Distribution:** Miocene-Quaternary: N. Atlantic (COLES et al., 1994).
- **Remarks:** Marine.
- **Occurrence:** Steni: 9536, 9537; Dhrymou: 9925, 9927; Pissouri: 9473.

**Krithe producta** BRADY, 1880

(Pl. 5, fig. 1; pl. 19, fig. 11)

- **Dimensions:** 0.61, 0.32 mm (SG324).
- **Distribution:** Quaternary: Rhodos (MOSTAFAWI, 1989).
- **Remarks:** Marine.
- **Occurrence:** Dhrymou: 9913; Mari: 9428, 9429.

**Krithe sp. 1**

(Pl. 5, fig. 2; pl. 19, fig. 12)

- **Dimensions:** 0.71, 0.35 mm / 0.64, 0.32 mm (SG71/SG326).
- **Remarks:** The specimen named *Krithe* sp. 15 of COLES, WHATLEY & MOGUILEVSKY (1994) probably belongs to this species. Marine.
- **Occurrence:** Polemi: 10356; Amargeti: 10344.
**Krithe** sp. 2

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9908, 9914.

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**Krithe** sp. 3

(Pl. 5, figs. 3, 4; pl. 19, fig. 13)

**Dimensions:** 0.71, 0.33 mm / 0.67, 0.32 mm / 0.69, 0.32 mm (SG72/SG73/SG327).

**Remarks:** This form has an elongate, posteriorly pointed carapace but it lacks the anterodorsal shallow concavity of *K. citae*. The vestibulum is wider than that of *K. monosteracensis*. Marine.

**Occurrence:** Steni: 9532, 9533, 9534, 9535; Dhrymou: 9914, 9916, 9925; Mari: 9429, 9430, 9431, 9432, 9433.

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**Krithe** sp. 4

(Pl. 19, fig. 14)

**Dimensions:** 0.60, 0.29 mm (SG328).

**Remarks:** Looks like *K. citae* but differs in the shape of the vestibulum, the well-developed marginal zone and the number of the marginal pore canals. It is more likely, that this species is identical with *K. morkhoveni ayressi* of WHATLEY et al. (1994). Marine.

**Occurrence:** Mari: 9430, 9431, 9433, 9435.

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**Krithe** sp. 5

(Pl. 20, fig. 1)

**Dimensions:** 0.59, 0.32 mm (SG329).

**Remarks:** This form looks identical with *K.* sp. 1 BECKER of CARBONNEL, 1969, pl. 12. In PAVLAKELLI (1986) it is reported as *K. monosteracensis*, but differs from that in the shape of the vestibulum. Marine.
**Occurrence:** Steni: 9532, 9533, 9534, 9535, 9537, 9539, 9540; Dhrymou: 9914, 9916, 9923, 9925; Amargeti: 10344; Mari: 9430, 9431, 9432, 9433, 9435, 9439, 9442.

**Genus Parakrithe** van den Bold, 1958

*Parakrithe dactylomorpha* RUGGIERI, 1962

(Pl. 20, fig. 2)

**Dimensions:** 0.54, 0.26 mm (SG330).

**Distribution:** Recent: Balearic (BONADUCE, CILIBERTO, MASOLI, MINICHELLI & PUGLIESE, 1983), Elafonisos (Greece) (MALZ & JELLINEK, 1984); Tortonian: Italy (DIECI & RUSSO, 1964); Tortonian - Piacenzian: Crete (SISSINGH, 1972); Pliocene: SE France (CARBONNEL & BALLESI, 1982 & CARBONNEL, 1969), Turkey (DORUK, 1973).

**Remarks:** Bathyal.

**Occurrence:** Steni: 9536, 9540; Dhrymou: 9912, 9919, 9923, 9925, 9926, 9928; Amargeti: 10347; Pissouri: 9462, 9463, 9469; Mari: 9430, 9432, 9435, 9437, 9442, 9443.

*Parakrithe dimorpha* BONADUCE, CIAMPO & MASOLI, 1975

(Pl. 5, figs. 5, 6; pl. 20, fig. 3)

**Dimensions:** 0.51, 0.21 mm / 0.49, 0.19 mm / 0.44, 0.20 mm (SG74/S75/SG331).

**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pleistocene: Zakynthos (TSAPRALIS, 1981).

**Remarks:** Marine.

**Occurrence:** Polemi: 10356; Dhrymou: 9925, 9908; Amargeti: 10344; Mari: 9433.

*Parakrithe* sp. 1

(Pl. 20, fig. 4)
Dimensions: 0.51, 0.25 mm (SG332).
Remarks: Marine.
Occurrence: Dhrymou: 9925; Steni: 9540; Pissouri: 9459, 9461, 9462, 9465; Mari: 9433.

*Parakrithe* sp. 2
(Pl. 20, fig. 5)

Dimensions: 0.56, 0.27 mm (SG333).
Remarks: Marine.
Occurrence: Steni: 9540; Polemi: 10356; Pissouri: 9465, 9468, 9471.

**FAMILY NEOCYTHERIDEIDAE** Puri, 1957

Genus *Neocytherideis* Puri, 1952

*Neocytherideis fasciata* (BRADY & ROBERTSON, 1874)
(Pl. 5, fig. 8)

Dimensions: 0.40, 0.17 mm (SG77).
Remarks: Marine.
Occurrence: Steni: 9534; Dhrymou: 9927; Amargeti: 10346; Pissouri: 9458; Mari: 9432, 9443.

*Neocytherideis foveolata* (BRADY, 1870)
(Pl. 5, fig. 9)
Dimensions: 0.36, 0.14 mm (SG78).

**Distribution:** Late Pliocene: W. Peloponnesos (DANATSAS, 1989); Late Pliocene - Recent: Algeria (YASSINI, 1979); Recent: Gul (YASSINI, 1979); Recent: Gulf of Naples (PUPI et al)

**Remarks:** Marine.

**Occurrence:** Steni: 9535.

*Neocytherideis fusiformis* YASSINI, 1979  
(Pl. 5, fig. 10)

Dimensions: 0.77, 0.28 mm (SG79).

**Distribution:** Late Pliocene: Algeria (YASSINI, 1979), Peloponnesos (DANATSAS, 1989).

**Remarks:** Marine.

**Occurrence:** Pissouri: 9471.

*Genus Pseudopsammocythere* Carbonnel, 1966

*Pseudopsammocythere kolmanni* CARBONNEL, 1966

**Distribution:** Late Miocene: Crete (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Polemi: 10356; Pissouri: 9462, 9463, 9471; Mari: 9429, 9430, 9431, 9432, 9433, 9435.

*Pseudopsammocythere reniformis* (BRADY, 1868)  
(Pl. 5, fig. 11)

Dimensions: 0.41, 0.21 mm (SG80).

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9916.
Pseudopsammocycythere similis (MUELLER, 1894)
(Pl. 20, fig. 10)

Dimensions: 0.54, 0.25 mm (SG338).
Distribution: Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pliocene: Crete (SISSINGH, 1972); Pliocene-Pleistocene: Rhodes (SISSINGH, 1972).
Remarks: Marine.
Occurrence: Steni: 9536; Polemi: 10358; Mari: 9429, 9431, 9433.

FAMILY TRACHYLEBERIDIDAE Sylvester-Bradley, 1948
SUBFAMILY TRACHYLEBERIDINAE Sylvester-Bradley, 1948
Genus Carinocythereis Ruggieri, 1956

Carinocythereis antiquata (BAIRD, 1850)
(Pl. 5, fig. 12)

Dimensions: 0.64, 0.34 mm (SG81).
Distribution: Recent: Island of Skye (BAIRD, 1850), Naples Gulf (MUELLER, 1894), Adriatic (BONADUCE et al., 1975), Monaco (ROME, 1942), Limski-Channel (UFFENORDE, 1972), Pliocene-Recent: Cephalonia (ULICZNY, 1969); Late Pliocene-Early Pleistocene: Rhodes (SISSINGH, 1972); Late Pliocene: W. Peloponnnesos (DANATSAS, 1989).
Remarks: Marine.
Occurrence: Polemi: 10356; Amargeti: 10345; Mari: 9430, 9432, 9437, 9440, 9443.

Carinocythereis carinata (ROEMER, 1838)
(Pl. 5, fig. 13)

Dimensions: 0.59, 0.36 mm (SG82).
Distribution: Tortonian - Quaternary: Italy (RUGGIERI, 1959), Crete (SISSINGH, 1972); Late Pliocene: Rhodes (MOSTAFAWI, 1989), Pyrgos Basin (Peloponnnesos,
Greece) (LUTTIG, 1962); Pliocene: France (CARBONNEL & BALLESIO, 1982 &
CARBONNEL, 1969), Italy (ROEMER, 1838), Greece (Strymon Basin) (GRAMANN,
1969), Karpathos (SISSINGH, 1972); Pleistocene: Zakynthos (TSAPRALIS, 1981),
Rhodos (SISSINGH, 1972 & MOSTAFawi, 1989); Recent: Evros Delta (Greece)
(STAMBOLIDIS, 1982), Gulf of Naples (PURi, BONADUCE & MALLOY, 1964); Late
Miocene-Recent: Cephalonia (ULICZNY, 1969).

Remarks: Marine (20-139 m).

Occurrence: Steni: 9533; Dhrymou: 9922; Pissouri: 9461, 9464, 9468, 9471; Mari:
9429, 9431, 9433, 9435, 9443.

Genus *Costa* Neviani, 1928

*Costa batei* (BRADY, 1866)

(Pl. 5, fig. 14)

**Dimensions:** 1.02, 0.50 mm (SG83).

**Distribution:** Recent: Adriatic (BONADUCE et al., 1975), Limski-Channel
(UFFENORDE, 1972); Miocene: Turkey (TUNOGLU & GOKCEN, 1991); M. Pliocene:
Cephalonia (ULICZNY, 1969); Late Pliocene: Karpathos (SISSINGH, 1972); Late
Pliocene-Pleistocene: Turkey (DORUK, 1973 & BASSIOUNI, 1979), Rhodos
(MOSTAFawi, 1989 & SISSINGH, 1972); Late Pliocene-Recent: (YASSINI, 1979),
Late Pliocene: Kos (MOSTAFawi, 1981), Peloponnesos (DANATSAS, 1989); Pliocene:
S.Spain, France, Sicily (ARANKI, 1987); Pleistocene: Italy (CIAMPO, 1971).

Remarks: Marine.

**Occurrence:** Dhrymou: 9916, 9919; Polemi: 10465; Pissouri: 9468.

*Costa edwardsii* (ROEMER, 1838)

(Pl. 5, fig. 15)

**Dimensions:** 0.64, 0.39 mm (SG84).
**Distribution:** Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982), Adriatic (BONADUCE et al., 1975), Limski-Channel (UFFENORDE, 1972); **Pliocene:** Cephalonia (ULICZNY, 1969); **Late Pliocene:** Kos (MOSTAFAWI, 1981), Peloponnesos (DANATSAS, 1989); **Pliocene-Pleistocene:** Turkey (DORUK, 1973); **Pliocene:** S.Spain (ARANKI, 1987); **Pleistocene:** France, Sicily (ARANKI, 1987), Italy (CIAMPO, 1971), Zakynthos (TSAPRALIS, 1981), Corinth Channel (KRSTIC & DERMITAKIS, 1981); **Middle - Late Miocene:** Gavdos (SISSINGH, 1972); **Late Miocene - Pliocene:** Crete (SISSINGH, 1972); **Late Pliocene - Recent:** Algeria (YASSINI, 1979).

**Remarks:** Marine, shallow waters (Mediterranean: 24-125m, optimum: 71-125m, (BONADUCE et al., 1975)).

**Occurrence:** Pissouri: 9468, 9470.

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**Costa punctatissima** RUGGIERI, 1962

**Distribution:** **Pliocene-Recent:** Cephalonia (ULICZNY, 1969); **Pliocene:** Crete (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Mari: 9431, 9435.

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**Genus Oblitythereis** BENSON, 1977

**Oblitythereis mediterranea** BENSON, 1977

(Pl. 5, fig. 16)

**Dimensions:** 1.17, 0.69 mm (SG85).

**Distribution:** **Pliocene:** SE France (CARBONNEL & BALLESIO, 1982), Crete (SISSINGH, 1972); Sicily (BONADUCE & SPROVIERI, 1984).

**Remarks:** The specimen reported by SISSINGH (1972, p. 122, pl. 9, fig. 13) as *Bradleya?* sp. belongs to this species. Marine.
Genus *Agrenocythere* BENSON, 1972

*Agrenocythere pliocenica* (SEGUENZA, 1880)

(Pl. 5, fig. 17)

**Dimensions:** 1.45, 0.80 mm (SG86).

**Distribution:** Pliocene - Pleistocene: Western Tyrhenian Sea (COLALONGO & PASINI, 1988); Pliocene - Early Pleistocene: Sicily (SISSINGH, 1973); Zanclean: Crete (VAN HARTEN, 1984).

**Remarks:** Characteristic of psychrosphaeric conditions (bathyal). The extinction level of *Agrenocythere pliocenica* in Hole 654A of DSDP, indicates that the change from psychrosphaeric to thermosphaeric conditions took place in the Mediterranean during or after the time-interval corresponding to the Small *Gephyrocapsa* (Coccolith) Zone i.e. the latest Early Pleistocene (COLALONGO & PASINI, 1988). Marine.

**Occurrence:** Steni: 9532, 9533, 9534, 9535, 9536, 9537, 9539; Dhrymou: 9912, 9913, 9925, 9926, 9927; Polemi: 10356, 10361; Amargeti: 10344; Pissouri: 9459, 9464, 9465, 9466, 9473; Mari: 9430, 9431, 9432.

Genus *Cistacythereis* Uliczny, 1969

*Cistacythereis pokornyi hellenica* ULCZNY, 1969

(Pl. 6, fig. 1)

**Dimensions:** 0.75, 0.42 mm (SG88).

**Distribution:** Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982); Pliocene: Cephalonia (ULICZNY, 1969), Crete (SISSINGH, 1972).

**Remarks:** Marine.
Genus *Falunia* Grekoff & Moyes, 1955
Subgenus *Falunia* Grekoff & Moyes, 1955

*Falunia (Falunia) plicatula* (REUSS, 1850)
(Pl. 6, fig. 2)

**Dimensions:** 0.69, 0.39 mm (SG89).

**Distribution:** Miocene: Turkey (TUNOGLU & GOKCEN, 1991); Middle - Late Miocene: Gavdos, Crete (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9919.

*Falunia (Falunia) sphaerulineata* (JONES, 1856)
(Pl. 6, fig. 3)

**Dimensions:** 0.64, 0.37 mm (SG90).

**Distribution:** Late Pliocene-Recent: S.Spain (ARANKI, 1987); Late Miocene: Turkey (DORUK, 1973), Rhone-Basin (CARBONNEL, 1969); Pliocene-Pleistocene: Crete & Rhodos (SISSINGH, 1972); Pliocene: England (JONES, 1856); Late Pliocene: Peloponnesos (DANATSAS, 1989).

**Remarks:** Marine.

**Occurrence:** Pissouri: 9468; Mari: 9440.

Subgenus *Hiltermannicythere* Bassiouni, 1970

*Falunia (Hiltermannicythere) cephalonica* (ULICZNY, 1969)
(Pl. 6, fig. 4)
**Falunia (Hiltermanicythere) quadridentata** (BAIRD, 1850)

(Pl. 6, fig. 5)

*Dimensions*: 1.00, 0.49 mm (SG92).

*Distribution*: Pliocene-Recent: Cephalonia (ULICZNY, 1969); Pliocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972).

*Remarks*: Marine.

*Occurrence*: Dhrymou: 9922, 9927; Pissouri: 9461.

**Falunia (Hiltermanicythere) retifastigata** (JONES, 1856)

(Pl. 6, fig. 6)

*Dimensions*: 0.86, 0.40 mm (SG93).

*Distribution*: Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982); Pliocene-Recent: Cephalonia (ULICZNY, 1969); Pliocene-Pleistocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972); Late Pliocene-Pleistocene: Zakynthos (TSAPRALIS, 1981), Rhodos (SISSINGH, 1972).

*Remarks*: Marine.

*Occurrence*: Dhrymou: 9919, 9920, 9927; Polemi: 10356; Pissouri: 9461, 9462, 9464, 9469, 9470; Mari: 9428, 9430, 9432, 9435, 9439, 9443.

**Falunia (Hiltermanicythere) rugosa** (COSTA, 1853)

(Pl. 6, fig. 7)

*Dimensions*: 0.88, 0.44 mm (SG94).
Remarks: Marine.
Occurrence: Dhrymou: 9923; Pissouri: 9461, 9463, 9471.

*Falunia (Hiltermanicythere) turbida* (MUELLER, 1894)
(Pl. 6, fig. 8)

Dimensions: 0.63, 0.44 mm (SG95).
Distribution: Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982), Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pliocene-Recent: Cephalonia (ULICZNY, 1969).
Remarks: Marine.
Occurrence: Dhrymou: 9930; Mari: 9440.

Genus *Incongniellina* Ruggieri, 1958
Subgenus *Incongniellina* Ruggieri, 1958

*Incongniellina (Incongniellina) semispinescens* RUGGIERI, 1958
(Pl. 6, fig. 9)

Dimensions: 0.88, 0.60 mm (SG96).
Distribution: Pliocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972); Pleistocene: Rhodos (SISSINGH, 1972).
Remarks: Marine.
Occurrence: Pissouri: 9463, 9465; Mari: 9432.

Subgenus *Lixouria* Uliczny, 1969

*Incongniellina (Lixouria) keiji* (SISSINGH, 1972)
(Pl. 6, fig. 10)
**Incongruellina (Lixouria) marginata** (TERQUEM, 1878)

(Pl. 6, fig. 11)

**Dimensions:** 0.89, 0.59 mm (SG98).

**Distribution:** Pliocene: SE. France (CARBONNEL & BALLESIO, 1982), Crete (SISSINGH, 1972); Late Pliocene: Algeria (YASSINI, 1979), Karpathos (SISSINGH, 1972), Pliocene-Pleistocene: Peloponnesos (DANATSAS, 1989); Pleistocene: Italy (CIAMPO, 1976).

**Remarks:** Marine.

**Occurrence:** Pissouri: 9469.

**Genus Pterygocythereis** Blake, 1933

**Pterygocythereis ceratoptera** (BOSQUET, 1852)

(Pl. 6, fig. 12)

**Dimensions:** 1.22, 0.65 mm (SG99).

**Distribution:** Miocene: Turkey (TUNOGLU & GOKCEN, 1991); Late Pliocene: Rhodos (SISSINGH, 1972), Peloponnesos (DANATSAS, 1989); Recent: Gulf of Naples (MUELLER, 1894), Adriatic (BONADUCE et al., 1975), NW. Scotland, Biscay Gulf, Cyprus (ATHERSUCH, 1978); Late Miocene: Gavdos, Crete (SISSINGH, 1972); Pliocene: Cephalonia (ULICZNY, 1969), SE France (CARBONNEL & BALLESIO, 1982), Egypt (BASSIOUNI, 1966), Pleistocene: N. Italy (RUGGIERI, 1974).

**Remarks:** Marine.
Occurrence: Dhrymou: 9923; Amargeti: 10344; Mari: 9461.

*Pterygocythereis jonesii* (BAIRD, 1850)

**Distribution:** Pliocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972), Peloponnesos (DANATSAS, 1989), Kos (MOSTAFAWI, 1981); Late Pliocene-Pleistocene: Rhodos (SISSINGH, 1972); Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982), Adriatic (BONADUCE et al., 1975), Limski-Channel (UFFENORDE, 1972); Late Pliocene-Recent: Algeria (YASSINI, 1979); Pleistocene: N.Italy (RUGGIERI, 1974).

**Remarks:** Marine.

**Occurrence:** Pissouri: 9469.

*Genus Echinocythereis* Puri, 1954

*Subgenus Echinocythereis* Puri, 1954

*Echinocythereis keyseri* STAMBOLIDIS, 1982

(Pl. 6, fig. 13)

**Dimensions:** 0.43, 0.25 mm (SG100).

**Distribution:** Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982).

**Remarks:** Marine.

**Occurrence:** Pissouri: 9461; Mari: 9437.

*Echinocythereis aff. E. keyseri* STAMBOLIDIS, 1982

**Remarks:** Named as *E. aff. keyseri*, because a part of it is broken. Marine.

**Occurrence:** Mari: 9437.

*Echinocythereis scabra* (von MUNSTER, 1830)

(Pl. 6, fig. 14)
**Dimensions:** 0.94, 0.54 mm (SG101).

**Distribution:** Eocene-Pliocene: Cephalonia (ULICZNY, 1969).

**Remarks:** Marine.

**Occurrence:** Pissouri: 9464.

Subgenus *Rhodicythereis* SISSINGH, 1972

*Echinocythereis (Rhodicythereis)* sp.

**Remarks:** This species is differentiated from *E. (R.) ruggierii* SISSINGH, 1972 and *E. (R.)* sp. SISSINGH, 1972, by its reticulate lateral surface. Marine.

**Occurrence:** Mari: 9435.

Genus *Henryhowella* Puri, 1957

*Henryhowella asperrima* (REUSS, 1849)

(Pl. 6, figs. 15, 16, 17)

**Dimensions:** 0.91, 0.53 mm / 0.90, 0.58 mm / 0.89, 0.53 mm (SG102/SG103/SG104).

**Distribution:** Pliocene - Pleistocene: Italy (Calabria) (COLALONGO, 1965); Late Miocene: Gavdos (SISSINGH, 1972); Late Miocene - Late Pliocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972); Pleistocene: Rhodos (SISSINGH, 1972); Early Miocene: France (CARBONEL, 1985); Recent: France (GUILLAUME, PEYPOUQUET & TETART, 1985); Tortonian: Vienna Basin (MALZ & JELLINEK, 1984); Late Miocene - Early Pliocene: Tunisia (BONADUCE, RUGGIERI, RUSSO & BISMUTH, 1992); Pleistocene: Zakynthos (TSAPRALIS, 1981); Late Oligocene-Early Pleistocene: Turkey (BASSIOUNI, 1979); Late Miocene - Quaternary: Atlantic Ocean (WHATLEY & COLES, 1987); Pliocene: Turkey (DORUK, 1973), SE France (CARBONNEL & BALLESIO, 1982), France (CARBONNEL, 1969), Western Tyrrhenian Sea (COLALONGO & PASINI, 1988).
Remarks: Continental margin, Bathyal. The form called H. sp. by PAVLAKELLI (1986), belongs to H. asperrima.

Occurrence: Steni: 9532, 9533, 9534, 9535, 9536, 9537, 9539, 9540; Dhrymou: 9911, 9912, 9913, 9914, 9916, 9920, 9922, 9923, 9925; Polemi: 10356, 10361; Amargeti: 10347, 10345, 10344; Pissouri: 9458, 9459, 9461, 9473; Mari: 9431, 9432, 9433, 9442, 9443.

*Henryhowella irpex* (BRADY, 1880)

(Pl. 6, fig. 18)

Dimensions: 1.10, 0.70 mm (SG105).


Occurrence: Dhrymou: 9919.

Genus *Occultocythereis* Howe, 1951

*Occultocythereis bituberculata* (REUSS, 1849)

(Pl. 7, fig. 8)

Dimensions: 0.47, 0.24 mm (SG113).

Distribution: Late Pliocene: Peloponnesos (DANATSAS, 1989); Pliocene: Cephalonia (ULICZNY, 1969); Oligocene-Recent: Europe (ULICZNY, 1969); Tortonian: Vienna Basin & Sicily (CARBONNEL, 1969).

Remarks: Marine.

Occurrence: Dhrymou: 9909, 9912; Pissouri: 9458.

*Occultocythereis dohrni* PURI, 1963

(Pl. 7, fig. 9)
Dimensions: broken, 0.30 mm (SG114).

Distribution: Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Middle-Late Miocene: Gavdos (SISSINGH, 1972); Late Miocene-Late Pliocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972); Pleistocene: Rhodos (SISSINGH, 1972).

Remarks: Marine.

Occurrence: Steni: 9535.

Genus Acanthocythereis Howe, 1963

Acanthocythereis hystrix REUSS, 1850

(Pl. 7, fig. 10)

Dimensions: 1.16, 0.61 mm (SG115).

Distribution: Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982), Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Miocene-Recent: Cephalonia (ULICZNY, 1969); Middle Miocene: Chzechoslovakia (ATHERSUCH, 1979), Bulgaria (STANCHEVA, 1962), Gavdos (SISSINGH, 1972); Early Pliocene: S.Spain (ARANKI, 1987); Late Pliocene: Kos (MOSTAFAWI, 1981), Karpathos (SISSINGH, 1972), Turkey (DORUK, 1973), W. Peloponnesos (DANATSAS, 1989); Middle Miocene-Early Pliocene: Crete (SISSINGH, 1972); Middle Miocene - Late Pliocene: Turkey (BASSIOUNI, 1979); Early to Late Pliocene: Algeria (YASSINI, 1979); Late Pliocene-Pleistocene: Rhodos (SISSINGH, 1972); Miocene: Libya (GAMMUDI & KEEN, 1993).

Remarks: Marine.


Genus Bosquetina Keij, 1957

Bosquetina carinella (REUSS, 1850)

(Pl. 7, fig. 11)
Dimensions: 0.47, 0.30 mm (SG116).

Distribution: Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982); Pleistocene: Zakynthos (TSAPRALIS, 1981); Pliocene-Recent: Cephalonia (ULICZNY, 1969); Middle Miocene: Gavdos (SISSINGH, 1972); Middle Miocene-Late Pliocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972), W. Peloponnesos (DANATSAS, 1989), Kos (MOSTAFAWI, 1981); Late Pliocene-Early Pleistocene: Rhodos (SISSINGH, 1972), Pliocene: Algeria (YASSINI, 1979); Early Pliocene: S.Spain (ARANKI, 1988).

Remarks: Marine.

Occurrence: Mari: 9432, 9433, 9435, 9437, 9440.

*Bosquetina rhodiensis* SISSINGH, 1972

(Pl. 7, fig. 12)

Dimensions: 1.26, 0.77 mm (SG117).


Remarks: Marine.

Occurrence: Dhrymou: 9927; Pissouri: 9462, 9463, 9464, 9465, 9466, 9468, 9469, 9470, 9471, 9473.

*Bosquetina* sp. 1

Remarks: named as *B*. sp. because it is laterally compressed and impossible identify to specific level. Marine.

Occurrence: Dhrymou: 9916.

*Bosquetina* sp. 2

Remarks: Marine.
Occurrence: Mari: 9429.

**SUBFAMILY BUNTONIINAE Apostolescu, 1961**

Genus *Buntonia* Howe, 1935

Subgenus *Buntonia* Howe, 1935

*Buntonia (Buntonia) giesbrechti robust* RUGGIERI, 1954

(Pl. 7, fig. 1)

**Dimensions:** 0.60, 0.39 mm (SG106).

**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pleistocene: Zakynthos (TSAPRALIS, 1981); Late Pliocene: W. Peloponnesos (DANATSAS, 1989), Kos (MOSTAFAWI, 1981); Pliocene-Recent: Cephalonia (ULICZNY, 1969); Pliocene: Crete (SISSINGH, 1972); Plio-Pleistocene: Rhodos (SISSINGH, 1972), Italy (RUGGIERI, 1954).

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9922; Pissouri: 9461.

*Buntonia (Buntonia) multicostata* RUGGIERI, 1952

(Pl. 7, fig. 2)

**Dimensions:** 0.60, 0.35 mm (SG107).

**Distribution:** Recent: W. Mediterranean (BONADUCE et al, 1983).

**Remarks:** Marine.

**Occurrence:** Steni: 9534; Dhrymou: 9912, 9914, 9925; Pissouri: 9463.

*Buntonia (Buntonia) sublatissima sublatissima* (NEVIANI, 1906)

(Pl. 7, fig. 4)

**Dimensions:** 0.47, 0.31 mm (SG109).
**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pliocene-Recent: Cephalonia (ULICZNY, 1969); Pleistocene-Recent: Italy (NEVIANI, 1906); Late Miocene-Pliocene: Crete (SISSINGH, 1972); Pliocene: Karpathos (SISSINGH, 1972); Late Pliocene-Early Pleistocene: Rhodos (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9926; Pissouri: 9462, 9463, 9465; Mari: 9428, 9432, 9442.

*Buntonia (Buntonia) sublatissima dertonensis* RUGGIERI, 1954

(Pl. 7, fig. 3)

**Dimensions:** 0.59, 0.39 mm (SG108).

**Distribution:** Late Miocene: Italy (RUGGIERI, 1954), Crete (SISSINGH, 1972); Middle Miocene: Gavdos (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Steni: 9926; Polemi: 10356; Amargeti: 10344; Mari: 9435.

*Buntonia (Buntonia) textilis* BONADUCE, CIAMPO & MASOLI, 1975

(Pl. 7, fig. 5)

**Dimensions:** 0.45, 0.27 mm (SG110).

**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Early Pliocene-Quaternary: Atlantic Ocean (WHATLEY & COLES, 1987).

**Remarks:** PAVLAKELLI (1986, pl.3, fig.38) considers this form to be *B. sublatissima*. Marine.

**Occurrence:** Steni: 9535, 9540; Dhrymou: 9925; Pissouri: 9458, 9459, 9465; Mari: 9428, 9429.

**Subgenus Quasibuntonia** Ruggieri, 1958

*Buntonia (Quasibuntonia) seguenziana* (RUGGIERI, 1958)

(Pl. 7, fig. 6)

100
Dimensions: 0.40 mm, broken (SG111).

Remarks: Marine.
Occurrence: Polemi: 10356; Pissouri: 9462.

Subgenus Rectobuntonia SISSINGH, 1972

Buntonia (Rectobuntonia) miranda BONADUCE, CIAMPO & MASOLI, 1975

Distribution: Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975).
Remarks: Marine.
Occurrence: Mari: 9431.

SUBFAMILY CAMPYLOCYThERINAe Puri, 1960

Genus Ruggieria Keij, 1957

Ruggieria tetraptera (SEGUENZA, 1880)
(Pl. 7, fig. 7)

Dimensions: 0.77, 0.45 mm (SG112).

Distribution: Lower Miocene-Pliocene: Turkey (DORUK, 1973); Miocene: Libya (GAMMUDI & KEEN, 1993); Late Miocene-Pliocene: Cephalonia (ULICZNY, 1969); M.-Late Miocene: Gavdos (SISSINGH, 1972); Late Miocene-Pleistocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972); Late Pliocene- Pleistocene: Rhodos (SISSINGH, 1972).
Remarks: Marine.
Occurrence: Dhrymou: 9920, 9921, 9922, 9923, 9926, 9930; Pissouri: 9462, 9463, 9464, 9465, 9466, 9468, 9470, 9471.
Genus *Basslerites* Howe, 1937

*Basslerites berchoni* (BRADY, 1867-72)

**Distribution:** Early Pliocene: S. Spain (ARANKI, 1987); Late Pliocene: W. Peloponnesos (DANATSAS, 1989), Kos (MOSTAFAWI, 1981); Pleistocene: Rhodos (SISSINGH, 1972), N. Italy (RUGGIERI, 1974); Pliocene: France (CARBONNEL, 1969), Turkey (DORUK, 1973), SE. France (CARBONNEL & BALLESIO, 1982); Recent: Gulf of Naples (MUELLER, 1894), Evros Delta (Greece) (STAMBOLIDIS, 1982), Aegean (BARBEITO-GONZALEZ, 1971).

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9904, 9921; Pissouri: 9468, 9472.

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**FAMILY HEMICYTHERIDAE** Puri, 1953

**SUBFAMILY HEMICYTHERINAE** Puri, 1953

Genus *Hemicytheria* Pokorny, 1955

*Hemicytheria* sp.

**Remarks:** Marine.

**Occurrence:** Amargeti: 10347.

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Genus *Aurila* Pokorny, 1955

*Aurila albicans* (RUGGIERI, 1958)

*(Pl. 7, fig. 13)*

**Dimensions:** 0.66, 0.41 mm (SG118).

**Distribution:** Late Miocene (“Sahelian”): San Marino Republic (RUGGIERI, 1958), Gavdos (SISSINGH, 1972), Turkey (DORUK, 1973); Late Miocene-Early Pliocene: Crete (SISSINGH, 1972).
Remarks: Marine.

Occurrence: Dhrymou: 9919.

*Aurila aspidoides* ULICZNY, 1969

(Pl. 7, fig. 14)

Dimensions: 0.50, 0.31 mm (SG119).

Distribution: a) Late Pliocene: Crete, b) Early Pleistocene: Rhodos (SISSINGH, 1972); Pliocene: SE France (CARBONNEL & BALLESIO, 1982); Pliocene - Recent: Cephalonia (ULICZNY, 1969).

Remarks: From Marine.

Occurrence: Steni: 9534, 9536, 9537, 9539, 9540; Dhrymou: 9913, 9914, 9919, 9920, 9921, 9925, 9926, 9930; Polemi: 10356, 10358; Pissouri: 9456, 9459, 9461, 9462, 9463, 9464, 9465, 9466, 9467, 9468, 9471, 9473; Mari: 9433.

*Aurila convexa convexa* BAIRD, 1850

(Pl. 7, fig. 15)

Dimensions: 0.92, 0.60 mm (SG120).

Distribution: Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982), Adriatic (BONADUCE, CIAMPO & MASOLI, 1975), Gulf of Naples (MUELLER, 1894), Algeria (YASSINI, 1979 & MOSTAFAWI, 1981), France (GUILLAUME, PEYPOUQUET & TETART, 1985), Cyprus (ATHERSUCH, 1979), Balearic (BONADUCE, CILIBERTO, MASOLI, MINICHELLI & PUGLIESE, 1983); Late Miocene-Pliocene: Turkey (DORUK, 1973); Piacenzian-Pleistocene: Turkey (BASSIOUNI, 1979); Pliocene: Egypt (BASSIOUNI, 1965), SE France (CARBONNEL & BALLESIO, 1982), France (CARBONNEL, 1969); Late Tortonian: Kythira (MOSTAFAWI, 1990); Miocene-Recent: Europe (DORUK, 1973); Late Pliocene: W. Peloponnesos (DANATSAS, 1989); Late Miocene (Tortonian)-Recent: Cephalonia (ULICZNY, 1969).

Occurrence: Steni: 9533, 9534, 9539, 9540; Dhrymou: 9919, 9920, 9921, 9922, 9926, 9927, 9930; Polemi: 10356, 10358; Pissouri: 9456, 9458, 9459, 9461, 9462, 9463, 9464, 9467, 9468, 9473; Mari: 9428, 9429, 9430, 9431, 9432, 9433, 9435, 9437, 9439, 9440, 9442, 9443.

Aurila convexa emathiae ULICZNY, 1969
(Pl. 7, fig. 16)

Dimensions: 0.84, 0.59 mm (SG121).
Distribution: Late Pliocene: Cephalonia (ULICZNY, 1969); Pliocene: Crete (SISSINGH, 1972).
Remarks: Marine.
Occurrence: Pissouri: 9461; Mari: 9430.

Aurila cruciata cruciata (RUGGIERI, 1950)
(Pl. 7, fig. 17)

Dimensions: 0.94, 0.68 mm (SG122).
Remarks: Marine.
Occurrence: Dhrymou: 9919, 9920, 9927; Polemi: 10356.

Aurila cruciata minor ULICZNY, 1969
(Pl. 7, fig. 18)

Dimensions: 0.44, 0.29 mm (SG123).
Distribution: a) Late Miocene-Pliocene: Crete, b) Late Pliocene: Karpathos, c) Late Pliocene-Lowest Pleistocene: Rhodos (SISSINGH, 1972); Pliocene-Pleistocene: Cephalonia (ULICZNY, 1969).
Remarks: Marine.

Occurrence: Dhrymou: 9919, 9926, 9927, 9930; Polemi: 10356; Pissouri: 9461.

*Aurila fialodes* ULICZNY, 1969

(Pl. 8, fig. 1)

Dimensions: 0.97, 0.71 mm (SG124).

Distribution: Late Pliocene: W. Peloponnesos (DANATSAS, 1989), Late Pliocene: Cephalonia (ULICZNY, 1969).

Remarks: Marine.

Occurrence: Dhrymou: 9919, 9920, 9921, 9922, 9927, 9930; Amargeti: 10347; Pissouri: 9459, 9461, 9462, 9464, 9467.

*Aurila hesperiae* (RUGGIERI, 1975)

(Pl. 8, fig. 2)

Dimensions: 0.86, 0.56 mm (SG125).

Distribution: Quaternary: Rhodos (MOSTAFAWI, 1989).

Remarks: Marine.

Occurrence: Dhrymou: 9930.

*Aurila ithacae* ULICZNY, 1969

(Pl. 8, fig. 3)

Dimensions: 0.69, 0.42 mm (SG126).

Distribution: Late Pliocene: Cephalonia (ULICZNY, 1969).

Remarks: Marine.

Occurrence: Dhrymou: 9919.

*Aurila lanceaeformis* ULICZNY, 1969

(Pl. 8, fig. 4)
**Aurila c.f. A. lanceaeformis** ULICZNY, 1969

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9922, 9930; Pissouri: 9464, 9467.

**Aurila loboides** ULICZNY, 1969

(Pl. 8, fig. 5)

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9921, 9922, 9927, 9930; Pissouri: 9467.

**Aurila maculosa** ULICZNY, 1969

(Pl. 8, fig. 6)

**Remarks:** Marine.
**Occurrence:** Dhrymou: 9904, 9919, 9920, 9921, 9922, 9923, 9927, 9930; Polemi: 10356; Pissouri: 9456, 9459, 9461, 9462, 9463, 9464, 9465.

**Aurila pigadiana** SISSINGH, 1972

(Pl. 8, fig. 7)

**Dimensions:** 0.71, 0.49 mm (SG130).

**Distribution:** Pliocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972); Pleistocene: Zakynthos (TSAPRALIS, 1981); Piacenzian: Turkey (BASSIOUNI, 1979).

**Remarks:** Marine.

**Occurrence:** Steni: 9534, 9540; Dhrymou: 9919, 9926, 9927, 9930; Polemi: 10356; Amargeti: 10347; Pissouri: 9464, 9465, 9467, 9468, 9473; Mari: 9428, 9439, 9440, 9442.

**Aurila preacuta** ULICZNY, 1969

(Pl. 8, fig. 8)

**Dimensions:** 0.89, 0.56 mm (SG131).

**Distribution:** Pliocene: SE France (CARBONNEL & BALLESIO, 1982), Cephalonia (ULICZNY, 1969).

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9916, 9919; Mari: 10347.

**Aurila punctata punctata** (von MUNSTER, 1830)

(Pl. 8, fig. 9)

**Dimensions:** 0.72, 0.51 mm (SG132).

**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Late Pliocene: W. Peloponnesos (DANATSAS, 1989), Kos (MOSTAFAWI, 1981); Pliocene:
Schweiz (OERTLI, 1956); Late Miocene (Tortonian)-Pliocene: Cephalonia (ULICZNY, 1969).

Remarks: Marine.

Occurrence: Dhrymou: 9926.

Aurila punctata nilensis  BASSIOUNI, 1966
(Pl. 8, fig. 10)

Dimensions: 0.70, 0.45 mm (SG133).


Remarks: Marine.

Occurrence: Dhrymou: 9923, 9927; Polemi: 10356; Pissouri: 9459, 9461, 9464.

Aurila speyeri  (BRADY, 1868)
(Pl. 8, fig. 11)

Dimensions: 0.98, 0.56 mm (SG134).


Remarks: Shallow to Bathyal.

Occurrence: Dhrymou: 9914, 9921, 9922, 9930; Amargeti: 10347; Pissouri: 9459, 9461; Mari: 9431.
**Aurila ulicznyi** SISSINGH, 1972

(Pl. 8, fig. 12)

**Dimensions:** 0.61, 0.39 mm (SG135).

**Distribution:** Late Pliocene: W. Peloponnesos (DANATSAS, 1989); a) Pliocene and Pleistocene: Crete, b) Late Pliocene: Karpathos, c) Upper Pliocene-Early Pleistocene: Rhodos (SISSINGH, 1972); Pliocene: Cephalonia (ULICZNY, 1969); Piacenzian: Turkey (BASSIOUNI, 1979); Early Pleistocene: Rhodos (MOSTAFAWI, 1989).

**Remarks:** Marine. This species is the same that ULICZNY (1969, p. 45, pl. 14, figs. 2, 3 and 4) described as *Aurila* sp. a and *Aurila* sp. B.

**Occurrence:** Steni: 9535, 9537; Dhrymou: 9916, 9919, 9921, 9926, 9927, 9930; Polemi: 10356; Pissouri: 9458, 9459, 9461, 9462, 9464, 9465, 9467, 9468, 9469, 9470, 9471, 9473; Mari: 9430, 9432, 9435, 9437, 9439, 9443.

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**Aurila vena** (SEGUENZA, 1883)

**Distribution:** a) Early Pliocene: Crete, b) Late Pliocene: Karpathos, c) Late Pliocene and Pleistocene: Rhodos (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9914; Polemi: 10356; Mari: 9443.

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**Aurila veniliae** (ULICZNY, 1969)

(Pl. 8, fig. 13)

**Dimensions:** 0.72, 0.45 mm (SG136).

**Distribution:** Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982); Late Pliocene: W. Peloponnesos (DANATSAS, 1989), Karpathos (SISSINGH, 1972), Kos (MOSTAFAWI, 1981), Turkey (BASSIOUNI, 1979); Late Pliocene-Early Pleistocene: Rhodos (SISSINGH, 1972), Cephalonia (ULICZNY, 1969).

**Remarks:** Marine.

**Occurrence:** Pissouri: 9459, 9461.
Aurila sp. 1

Remarks: Marine.
Occurrence: Amargeti: 10347.

Aurila sp. 2

(Pl. 8, fig. 14)

Dimensions: 1.05, 0.70 mm (SG137).
Remarks: Marine.
Occurrence: Dhrymou: 9907, 9908, 9921.

Aurila sp. indet.

Remarks: Marine.
Occurrence: Polemi: 10365.

Genus Mutilus Neviani, 1928

Mutilus cimbaciformis (SEGUENZA, 1882)

(Pl. 8, fig. 15)

Dimensions: 0.88, 0.56 mm (SG138).
Distribution: Recent: Adriatic (BONADUCE et al., 1975); Pliocene-Recent: Europe (ULICZNY, 1969); Pliocene: Cephalonia (ULICZNY, 1969); Late Pliocene: Algeria (YASSINI, 1979); Early Pliocene: S.Spain (ARANKI, 1987); Pleistocene: Zakynthos (TSAPRALIS, 1981), Kos (MOSTAFAWI, 1981); Plio-Pleistocene: Peloponnesos (DANATSAS, 1989), Cyprus & Turkey (DORUK, 1973).
Remarks: Marine.
Occurrence: Dhrymou: 9919.
**Mutilus dohrni** ULICZNY, 1969

(Pl. 8, fig. 16)

**Dimensions:** 0.88, 0.54 mm (SG139).

**Distribution:** Pliocene: Cephalonia (ULICZNY, 1969); Pliocene-Pleistocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972); Late Pliocene-Pleistocene: Rhodos (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9927.

**Mutilus retiformis** (TERQUEM, 1878)

(Pl. 8, figs. 17, 18)

**Dimensions:** 0.88, 0.58 mm / 0.96, 0.64 mm (SG140/SG141).

**Distribution:** Pliocene: Cephalonia (ULICZNY, 1969), Turkey (DORUK, 1973 & BASSIOUNI, 1979), SE. France (CARBONNEL & BALLESIO, 1982); Pliocene-Pleistocene: Crete (SISSINGH, 1972), Peloponnesos (DANATSAS, 1989); Late Pliocene: Kos (MOSTAFAWI, 1981), Karpathos (SISSINGH, 1972); Late Pliocene-Pleistocene: Rhodos (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9919; Polemi: 10358; Pissouri: 9461; Mari: 9439.

**Mutilus venetiensis** (ULICZNY, 1969)

(Pl. 9, fig. 1)

**Dimensions:** 0.90, 0.61 mm (SG142).

Remarks: This species is believed to have lived only during the Pliocene. TSAPRALIS (1981) reported that he found few valves in Pleistocene sediments but he thought them to be reworked. Marine.

Occurrence: Dhrymou: 9919, 9920, 9921, 9922, 9923, 9926, 9927; Pissouri: 9463.

Genus *Pokornyella* Oertli, 1956

*Pokornyella deformis* (REUSS, 1850)

(Pl. 9, fig. 2)

Dimensions: 0.57, 0.41 mm (SG143).


Remarks: Marine.

Occurrence: Amargeti: 10347.

Genus *Tyrrenocythere* Ruggieri, 1955

*Tyrrenocythere filipesqui* HANGANU, 1962

(Pl. 9, fig. 12)

Dimensions: 0.75, 0.50 mm (SG153).


Remarks: Non-marine.

Occurrence: Amargeti: 10347.

*Tyrrenocythere pannonicum* OLTEANU, 1989

(Pl. 9, fig. 13)

Dimensions: 0.66, 0.41 mm (SG154).
Distribution: Middle Pontian: Dacian Basin (OLTEANU, 1989).
Remarks: Non-marine.
Occurrence: Polemi: 10355.

_Tyrrhenocythere_ cf. _T. pannonicum_ OLTEANU, 1989

(Pl. 9, fig. 15)

Dimensions: 0.36, 0.23 mm (SG156).
Distribution: Non-marine.
Remarks: Specimen is juvenile and compressed. Non-marine.
Occurrence: Dhrymou: 9909.

_Tyrrhenocythere pignatii_ RUGGIERI, 1955

(Pl. 9, fig. 14)

Dimensions: 0.75, 0.44 mm (SG155).
Distribution: Pontian: Greece (Strymon Basin) (GRAMANN, 1969); Recent: Sicily, USSR, Bulgaria (RUGGIERI, 1955); Late Miocene (Messinian)-Recent: Cephalonia (ULICZNY, 1969).
Remarks: Non-marine.
Occurrence: Amargeti: 10347.

_Tyrrhenocythere_ sp. 1

Remarks: Non-marine.
Occurrence: Amargeti: 10347.

_Tyrrhenocythere_ sp. 2

(Pl. 9, fig. 16)

Dimensions: 0.49, 0.29 mm (SG157).
Remarks: Similar to *Tyrrhenocythere* sp. of OLTEANU, 1989 (p.748) but differs in having slightly more extended anterodorsal part of the anterior margin. Non-marine.

Occurrence: Dhrymou: 9909.

*Tyrrhenocythere* sp. 3

(Pl. 9, fig. 17)

Dimensions: 0.46, 0.29 mm (SG158).

Remarks: Non-marine.

Occurrence: Polemi: 10351.

*Tyrrhenocythere* sp. 4

Remarks: Non-marine.

Occurrence: Amargeti: 10346.

*Tyrrhenocythere* sp. indet.

Remarks: Non-marine.

Occurrence: Polemi: 10365.

Genus *Hermanites* Puri, 1955

*Hermanites heidingeri* (REUSS, 1850)

(Pl. 9, fig. 3)

Dimensions: 0.72, 0.37 mm (SG144).

Distribution: **Miocene**: Libya (GAMMUDI & KEEN, 1993); M.-**Late Miocene**: Gavdos (SISSINGH, 1972); **Burdigalian**: France (CARBONNEL, 1969); **Late Miocene-Pliocene**: Crete (SISSINGH, 1972), Turkey (DORUK, 1973); **Late Pliocene**: Karpathos (SISSINGH, 1972).
Remarks: Marine.

Occurrence: Pissouri: 9459, 9465, 9468.

*Hermanites* sp.

(Pl. 9, fig. 4)

Dimensions: 0.75, 0.50 mm (SG145).

Remarks: Marine.

Occurrence: Steni: 9535; Pissouri: 9459, 9461.

*Genus Poseidonamicus* Benson, 1972

*Poseidonamicus* sp.

(Pl. 9, fig. 5)

Dimensions: 0.72, 0.44 mm (SG146).

Remarks: Marine.

Occurrence: Dhrymou: 9927.

*Genus Quadracythere* Hornibrook, 1952

Subgenus *Tenedocythere* SISSINGH, 1972

*Quadracythere (Tenedocythere) prava* (BAIRD, 1850)

(Pl. 9, figs. 6, 7)

Dimensions: 1.05, 0.64 mm / 1.05, 0.64 mm (SG147/SG148).

Distribution: Pleistocene: Zakynthos (TSAPRALIS, 1981); Pliocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972), Peloponnesos (DANATSAS, 1989); Late Pliocene-Pleistocene: Rhodos (SISSINGH, 1972), Kos (MOSTAFAWI, 1981), Turkey (BASSIOUNI, 1979); Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982),
Gulf of Naples (MUELLER, 1894 & PURI et al. 1964), Adriatic (BONADUCE et al., 1975), Limski-Channel (UFFENORDE, 1972), Paros & Naxos (BARBEITO-GONZALEZ, 1971); Late Pliocene-Recent: Algeria (YASSINI, 1979); Pliocene: S.Spain (ARANKI, 1987), Cephalonia (ULICZNY, 1969).

**Remarks:** Marine.

**Occurrence:** Steni: 9533, 9534; Dhrymou: 9919, 9920, 9921, 9925; Polemi: 10356; Pissouri: 9459, 9463, 9464, 9466, 9467, 9468; Mari: 9430, 9431, 9433, 9435, 9439, 9440, 9443.

*Genus* **Graptocythere** Ruggieri, 1972

*Graptocythere hscripta* (CAPEDER, 1900)

*(Pl. 9, fig. 18)*

**Dimensions:** 0.73, 0.43 mm (SG159).

**Distribution:** Recent: Adriatic (BONADUCE et al., 1975); Late Miocene-Pleistocene: Cephalonia (ULICZNY, 1969); Pliocene-Pleistocene: Crete (SISSINGH, 1972); Late Pliocene: Algeria (YASSINI, 1979), Karpathos (SISSINGH, 1972), Kos (MOSTAFAWI, 1981), Peloponnnesos (DANATSAS, 1989); Late Pliocene-Pleistocene: Rhodos (SISSINGH, 1972); Quaternary: Rhodos (MOSTAFAWI, 1989).

**Remarks:** Marine.

**Occurrence:** Steni: 9537, 9539; Dhrymou: 9908, 9909, 9919, 9921, 9922, 9923; Polemi: 10356; Pissouri: 9458, 9464, 9465, 9466, 9471; Mari: 9428, 9429, 9430, 9431, 9432, 9433, 9435, 9437, 9439.

**SUBFAMILY UROCYTHEREIDINAE** Hartmann & Puri, 1974

*Genus Urocythereis* Ruggieri, 1950

*Urocythereis ustinguenda* (NEVIANI, 1928)

*(Pl. 9, fig. 8)*

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**Dimensions:** 0.86, 0.50 mm (SG149).

**Remarks:** Marine.

**Occurrence:** Steni: 9533, 9534, 9535, 9536, 9537, 9539, 9540; Dhrymou: 9908, 9916, 9920, 9921, 9922, 9927, 9930; Polemi: 10356; Pissouri: 9464, 9466, 9467, 9468, 9473; Mari: 9431, 9433, 9435, 9437, 9439.

**Urocythereis favosa** (ROEMER, 1838)

(Pl. 9, fig. 9)

**Dimensions:** 1.19, 0.70 mm (SG150).

**Distribution:** Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982); Pleistocene: Zakynthos (TSAPRALIS, 1981); Pliocene: Cephalonia (ULICZNY, 1969), Turkey (DORUK, 1973), Crete (SISSINGH, 1972); Late Pliocene: W. Peloponnesos (DANATSAS, 1989), Karpathos (SISSINGH, 1972); Late Pliocene-Pleistocene: Rhodos (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9919, 9920, 9921, 9927.

**Urocythereis sp.**

(Pl. 18, fig. 14)

**Dimensions:** 0.96, 0.51 mm (SG312).

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9921, 9919.

**Urocythereis sp. indet.**

**Remarks:** Marine.

**Occurrence:** Polemi: 10356, 10355.
Subfamily Orionininae Puri, 1973
Genus Caudites Coryell & Fields, 1937

*Caudites calceolatus* (Costa, 1853)

(Pl. 9, fig. 10)

**Dimensions:** 0.57, 0.33 mm (SG151).

**Distribution:** Recent: Evros Delta (Greece) (Stambolidis, 1982), Adriatic (Bonaduce, Ciampo & Masoli, 1975), Naxos (Barbeito-Gonzalez, 1971), Limski-Channel (Uffenorde, 1972); Plioence-Recent: Cephalonia (Uliczny, 1969), Algeria (Yassini, 1979); M.-Late Miocene: Gavdos (Sissingh, 1972); Late Miocene-Pleistocene: Crete (Sissingh, 1972); Pliocene: Turkey (Doruk, 1973), S. France (Carbonnel & Ballesio, 1982); Early Pliocene: S. Spain (Aranki, 1987); Late Pliocene: Peloponnesos (Danatsas, 1989), Karpathos (Sissingh, 1972), Turkey (Bassiouni, 1979); Pleistocene: Zakynthos (Tsapralis, 1981); Late Pliocene-Pleistocene: Rhodos (Sissingh, 1972).

**Remarks:** Marine.

**Occurrence:** Steni: 9534, 9535, 9539; Dhrymou: 9912; Polemi: 10356; Amargeti: 10465; Pissouri: 9463, 9464, 9465, 9468, 9469; Mari: 9428, 9429, 9430, 9431, 9433, 9435, 9437, 9439, 9440, 9442, 9443.

* Caudites sp. 1

**Remarks:** Marine.

**Occurrence:** Amargeti: 10465.

* Caudites sp. 2

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9925.
Genus *Pachycaudites* Uliczny, 1969

*Pachycaudites ungeri* (REUSS, 1849)

(Pl. 9, fig. 11)

**Dimensions:** 1.09, 0.70 mm (SG152).

**Distribution:** Recent: Adriatic (BONADUCE et al., 1975); Pleistocene: Zakynthos (TSAPRALIS, 1981); Late Miocene: Turkey (DORUK, 1973); Late Miocene-Pliocene: Europe (ULICZNY, 1969); Pliocene: Cephalonia (ULICZNY, 1969), S.Spain (ARANKI, 1987); Late Miocene-Pleistocene: Crete (SISSINGH, 1972); Late Pliocene: Algeria (YASSINI, 1979), Karpathos (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Steni: 9533, 9534, 9535, 9536; Dhrymou: 9913, 9921, 9922; Polemi: 10356; Amargeti: 10344; Pissouri: 9458, 9461, 9462, 9467, 9468; Mari: 9432, 9442.

**FAMILY CYTHERETTIDAE** Triebel, 1972

Genus *Flexus* Neviani, 1928

*Flexus obtusa* RUGGERI, 1962

(Pl. 10, fig. 1)

**Dimensions:** 0.92, 0.49 mm (SG160).

**Distribution:** Pleistocene: Rhodos (MOSTAFAWI, 1989); Pliocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Pissouri: 9465; Dhrymou: 9921.

**FAMILY LOXOCONCHIDAE** Sars, 1925

Genus *Loxocauda* Schornikov, 1969
Loxocauda azeri (AGALAROVA, 1961)
(Pl. 10, fig. 2)

Dimensions: 0.37, 0.22 mm (SG161).
Remarks: Brackish.
Occurrence: Polemi: 10355.

Loxocauda decipiens (MUELLER, 1894)

Remarks: Marine.
Occurrence: Polemi: 10355; Mari: 9428, 9433.

Loxocauda limata SCHNEIDER, 1949
(Pl. 10, fig. 3)

Dimensions: 0.49, 0.25 mm (SG162).
Occurrence: Polemi: 10354, 10355.

Loxocauda stevanovici KRSTIC, 1972
(Pl. 10, fig. 4)

Dimensions: 0.49, 0.22 mm (SG163).
**Distribution:** Early Pannonian: Paratethys (JIRICEK, 1985); Slavonian (Pannonian): Serbia (KRSTIC, 1985).

**Remarks:** Brackish.

**Occurrence:** Polemi: 10354, 10355.

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**Loxocauda aff. L. stevanovici** KRSTIC, 1972

**Remarks:** Brackish.

**Occurrence:** Polemi: 10354.

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**Genus** *Loxoconcha* Sars, 1866

**Subgenus** *Loxocaspia* Lubimova, 1961

**Loxoconcha (Loxocaspia) cf. L. (L.) kalickyi** LUBIMOVA, 1981

(Pl. 12, fig. 1)

**Dimensions:** 0.58, 0.34 mm (SG196).

**Distribution:** Pleistocene: Channel of Corinth (KRSTIC & DERMITZAKIS, 1981), Peloponnesos (DANATSAS, 1989).

**Remarks:** Brackish-Limnic.

**Occurrence:** Polemi: 10351; Amargeti: 10347, 10342.

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**Subgenus** *Loxoconcha* Sars, 1866

**Loxoconcha (Loxoconcha) affinis** (BRADY, 1866)

(Pl. 10, fig. 5)

**Dimensions:** 0.38, 0.26 mm (SG164).

**Distribution:** Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982), Gulf of Naples (MUELLER, 1894), Cyprus (ATHERSUCH, 1976); Late Pliocene: Kos (MOSTAFAWI, 1981), Peloponnesos (DANATSAS, 1989).
Remarks: Marine.

Occurrence: Steni: 9533, 9534; Dhrymou: 9908, 9908, 9922, 9925; Polemi: 10356; Pissouri: 9459, 9462, 9465, 9468, 9471; Mari: 9428, 9431, 9432, 9433, 9435, 9437, 9442.

**Loxoconcha (Loxoconcha)** _agilis_ **Ruggieri, 1967**

*(Pl. 10, fig. 6)*

Dimensions: 0.38, 0.26 mm (SG165).

Distribution: Recent: Evros Delta (Greece) (Stambolidis, 1982).

Remarks: Marine.

Occurrence: Steni: 9533, 9539; Dhrymou: 9926; Pissouri: 9473.

**Loxoconcha (Loxoconcha)** _aff. L. agilis_ **Ruggieri, 1967**

*(Pl. 11, fig. 6)*

Dimensions: 0.63, 0.40 mm (SG183).

Distribution: Recent: Adriatic (Bonaduce, Ciampo & Masoli, 1975).

Remarks: Marine.

Occurrence: Pissouri: 9468.

**Loxoconcha (Loxoconcha)** _alata_ **Brady, 1868b**

*(Pl. 10, fig. 7)*

Dimensions: 0.55, 0.32 mm (SG166).

Distribution: Recent: Evros Delta (Greece) (Stambolidis, 1982); Pliocene-Pleistocene: Crete (Sissingh, 1972); Late Pliocene: Karpathos (Sissingh, 1972); Pleistocene: Rhodos (Sissingh, 1972).

Remarks: Marine.

Occurrence: Dhrymou: 9923; Polemi: 10356; Pissouri: 9459, 9462, 9463, 9465, 9467; Mari: 9429, 9431, 9435, 9437, 9439, 9440.
Loxoconcha (Loxoconcha) bairdi MUELLER, 1912  
(Pl. 10, fig. 8)

**Dimensions:** 0.89, 0.63 mm (SG167).
**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975).
**Remarks:** Marine.
**Occurrence:** Pissouri: 9461, 9462, 9463, 9464, 9465, 9471; Dhrymou: 9926.

Loxoconcha (Loxoconcha) aff. L. bonaducei CIAMPO, 1971  
(Pl. 11, fig. 7)

**Dimensions:** 0.58, 0.36 mm (SG184).
**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975).
**Remarks:** Marine.
**Occurrence:** Pissouri: 9468, 9471, 9473.

Loxoconcha (Loxoconcha) cumsacui KRSTIC, 1972  
(Pl. 10, fig. 9)

**Dimensions:** 0.34, 0.20 mm (SG168).
**Distribution:** Upper Pontian: Serbia (SOKAC, 1989).
**Remarks:** Brackish.
**Occurrence:** Polemi: 10354.

Loxoconcha (Loxoconcha) exagona BONADUCE, CIAMPO & MASOLI, 1975  
(Pl. 10, fig. 10)

**Dimensions:** 0.61, 0.44 mm (SG169).
**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975).
**Remarks:** Marine.
**Occurrence:** Dhrymou: 9926; Pissouri: 9456.
Loxoconcha (Loxoconcha) moncharmonti CIAMPO, 1971a
(Pl. 10, figs. 11, 12)

Dimensions: 0.34, 0.20 mm / 0.35, 0.21 mm (SG170/SG171).


Remarks: Marine.

Occurrence: Steni: 9533; Dhrymou: 9914; Polemi: 10356; Pissouri: 9461, 9465; Mari: 9428, 9433, 9440.

Loxoconcha (Loxoconcha) muelleri (MEHES, 1908)
(Pl. 10, fig. 13)

Dimensions: 0.58, 0.35 mm (SG172).


Remarks: Brackish.

Occurrence: Amargeti: 10348.

Loxoconcha (Loxoconcha) napoliana PURI, 1963
(Pl. 10, fig. 14)

Dimensions: 0.68, 0.40 mm (SG173).

Distribution: Recent: Gulf of Naples (MUELLER, 1894), Algeria (YASSINI, 1979), Naxos (BARBEITO-GONZALEZ, 1971), Adriatic (BONADUCE, CIAMPO & MASOLI, 1975), Pleistocene: Zakynthos (TSAPRALIS, 1981); Late Miocene-Pliocene: Crete (SISSINGH, 1972); Late Pliocene: Peloponnesos (DANATSAS, 1989), Karpathos (SISSINGH, 1972).

Remarks: The forms that are illustrated by YASSINI (1979, Pl. 6, figs. 15,16) and DANATSAS (1989, Pl. 5, fig. 10), under the name of Loxoconcha mediterranea MUELLER, 1894, belong to this species. Marine.

Occurrence: Steni: 9535; Dhrymou: 9914, 9927.
Loxoconcha (Loxoconcha) ovulata (COSTA, 1835)
(Pl. 10, fig. 15)

Dimensions: 0.30, 0.19 mm (SG174).

Distribution: Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982), Adriatic (BONADUCE et al., 1975), Limski-Channel (UFFENORDE, 1972), Naxos (BARBEITO-GONZALEZ, 1971), Cyprus (ATHERSUCH, 1979); Pleistocene: Zakynthis (TSAPRALIS, 1981); Plio-Pleistocene: Crete, Karpathos, Rhodos (SISSINGH, 1972); Late Pliocene-Recent: Algeria (YASSINI, 1979); Late Pliocene: Peloponnesos (DANATSAS, 1989), Kos (MOSTAFAWI, 1989); Early Pliocene: S.Spain (ARANKI, 1987); Pliocene: Se. France (CARBONNEL & BALLESIO, 1982).

Remarks: Marine.

Occurrence: Steni: 9533, 9536, 9539, 9540; Dhrymou: 9908, 9909, 9914, 9916, 9919, 9920, 9921, 9922, 9925, 9928, 9930; Polemi: 10356, 10358; Pissouri: 9462, 9464, 9465, 9468, 9470, 9471, 9472, 9473; Mari: 9428, 9429, 9430, 9431, 9432, 9433, 9435, 9437, 9439, 9440, 9442, 9443.

Loxoconcha (Loxoconcha) parallela MUELLER, 1894
(Pl. 10, fig. 16)

Dimensions: 0.73, 0.38 mm (SG175).

Distribution: Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982), Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pleistocene: Rhodos (MOSTAFAWI, 1989); Late Miocene: Turkey (DORUK, 1973).

Remarks: Marine.

Occurrence: Dhrymou: 9927; Pissouri: 9464.

Loxoconcha (Loxoconcha) petasus LIVENTAL, 1929
(Pl. 10, fig. 17)

Dimensions: 0.44, 0.23 mm (SG176).
**Distribution:** Early-Middle Pontian: Turkey (TUNOGLU & GOKCEN, 1991); Pontian: Yugoslavia (SOKAC, 1989); Pliocene: Azerbaijan, Turkmenistan, N.Caucasus, Lower Volga Plain (SOKAC, 1989); Post-Pliocene: W.Turkmenistan (SOKAC, 1989); Recent: Caspian Sea (SOKAC, 1989).

**Remarks:** Brackish.

**Occurrence:** Polemi: 10354, 10355; Amargeti: 10347.

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**Laxoconcha (Laxoconcha) petkovicia KRSTIC, 1972**

**Distribution:** Pannonian: Yugoslavia (KRSTIC, 1985).

**Remarks:** Brackish.

**Occurrence:** Polemi: 10354, 10355.

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**Laxoconcha (Laxoconcha) rhomboidea (FISCHER, 1855)**

*(Pl. 10, fig. 18)*

**Dimensions:** 0.72, 0.48 mm (SG177).

**Distribution:** Miocene: Turkey (TUNOGLU & GOKCEN, 1991); Late Miocene-Pliocene: Turkey (DORUK, 1973); Pliocene-Pleistocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972), Peloponnesos (DANATSAS, 1989); Late Pliocene-Pleistocene: Rhodos (SISSINGH, 1972); Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982), Gulf of Naples, England, Norway, Sweden (MUELLER, 1894), Adriatic (BONADUCE et al., 1975), Limski-Channel (UFFENORDE, 1972), Naxos (BARBEITO-GONZALEZ, 1971); Pleistocene: Zakynthos (TSAPRALIS, 1981); Late Pliocene-Recent: Algeria (YASSINI, 1979); Early Pliocene: S.Spain (ARANKI, 1987); Pliocene: Egypt (BASSIOUNI, 1966).

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9919; Pissouri: 9459.
Loxoconcha (Loxoconcha) schw耶ri SUZIN, 1956
(Pl. 11, fig. 1)

**Dimensions:** 0.34, 0.21 mm (SG178).

**Distribution:** **Late Pontian:** Dacian Basin (OLTEANU, 1989); **Pontian:** Eastern Paratethys (NAIDINA, 1989), N.Caucasus, Bulgaria, Yugoslavia (SOKAC, 1989), USSR (Kuban, Western Georgia) (STANCHEVA, 1990); **Early-Middle Pontian:** N. Bulgaria, Yugoslavia (STANCHEVA, 1990); **Pliocene** (undivided): Romania (STANCHEVA, 1990). It is known from the Pannonian through the Caspian Basin as in the Aegean (KRSTIC & STANCHEVA, 1989).

**Remarks:** Characteristic of the Pontian according to NAIDINA (1989). According to KRSTIC & STANCHEVA (1989) this is one of the rare index-fossils for the Upper Pontian. Brackish.

**Occurrence:** Polemi: 10354, 10355.

*Loxoconcha (Loxoconcha) spinosa* SOKAC, 1972
(Pl. 11, fig. 2)

**Dimensions:** 0.42, 0.26 mm (SG179).

**Distribution:** **Lower Pontian:** Yugoslav part of Pannonian Basin.

**Remarks:** Brackish.

**Occurrence:** Dhrymou: 9906.

*Loxoconcha (Loxoconcha) stellifera* MUELLER, 1894
(Pl. 11, fig. 3)

**Dimensions:** 0.71, 0.52 mm (SG180).

**Distribution:** **Recent:** Evros Delta (Greece) (STAMBOLIDIS, 1982), Gulf of Naples (MUELLER, 1894), Adriatic (BONADUCE et al., 1975), Limski-Channel (UFFENORDE, 1972), Naxos (BARBEITO-GONZALEZ, 1971), Algeria (YASSINI, 1979), Cyprus & Tynisia (ATHERSUCH, 1977); **Late Pliocene:** Karpathos (SISSINGH,
1972), Peloponnesos (DANATSAS, 1989), Kos (MOSTAFawi, 1981); Pleistocene: Rhodos (SIISSINGH, 1972); Late Pliocene-Pleistocene: Rhodos (SIISSINGH, 1972); Pliocene: Crete (SIISSINGH, 1972).

Remarks: Marine.

Occurrence: Pissouri: 9470.

*Loxoconcha (Loxoconcha) turbida* MUELLER, 1912

(Pl. 11, fig. 4)

Dimensions: 0.30, 0.21 mm (SG181).

Distribution: Recent: Gulf of Naples (MUELLER, 1894), Adriatic (BONADUCE et al., 1975), Algeria (YASSINI, 1979); Pleistocene: Zakynthos (TSAPRALIS, 1981); Late Pliocene-Pleistocene: Rhodos (SIISSINGH, 1972), Peloponnesos (DANATSAS, 1989); Late Pliocene: Kos (MOSTAFawi, 1981).

Remarks: Marine.

Occurrence: Pissouri: 9461; Mari: 9429, 9430, 9431, 9432, 9433, 9439, 9440, 9443.

*Loxoconcha (Loxoconcha) cf. L. turbida* (MUELLER, 1912)

(Pl. 11, fig. 8)

Dimensions: 0.55, 0.39 mm (SG185).

Distribution: Marine.

Remarks: cf. because the reticulation is very indistinct due to transportation and erosion.

Occurrence: Pissouri: 9461.

*Loxoconcha (Loxoconcha) versicolor* MUELLER, 1894

(Pl. 11, fig. 5)

Dimensions: 0.38, 0.20 mm (SG182).

Distribution: Recent: Gulf of Naples (MUELLER, 1894), Adriatic (BONADUCE et al., 1975); Late Pliocene-Pleistocene: Peloponnesos (DANATSAS, 1989); Late Pliocene:

Remarks: Marine.

Occurrence: Steni: 9533; Dhrymou: 9908, 9909, 9911, 9912, 9916, 9930; Pissouri: 9462, 9464, 9468, 9473.

*Loxoconcha (Loxoconcha)* sp. 1

(Pl. 11, fig. 9)

**Dimensions**: 0.44, 0.30 mm (SG 186).

**Occurrence**: Amargeti: 10466.

*Loxoconcha (Loxoconcha)* sp. 2

**Occurrence**: Mari: 9435.

*Loxoconcha (Loxoconcha)* sp. 3

(Pl. 11, fig. 10)

**Dimensions**: 0.70, 0.50 mm (SG 187).

**Occurrence**: Pissouri: 9461, 9465.

*Loxoconcha (Loxoconcha)* sp. 4

**Occurrence**: Polemi: 10355.

*Loxoconcha (Loxoconcha)* sp. 5

**Occurrence**: Mari: 9428.
Loxoconcha (Loxoconcha) sp. 6

Occurrence: Pissouri: 9466.

Loxoconcha (Loxoconcha) sp. 7

(Pl. 11, fig. 11)

Dimensions: 0.54, 0.38 mm (SG188).

Occurrence: Polemi: 10355.

Loxoconcha (Loxoconcha) sp. 8

(Pl. 11, fig. 12)

Dimensions: 0.45, 0.32 mm (SG189).

Occurrence: Amargeti: 10347, 10342, 10351.

Loxoconcha (Loxoconcha) sp. 9

(Pl. 11, fig. 13)

Dimensions: 0.45, 0.28 mm (SG190).

Occurrence: Amargeti: 10347.

Loxoconcha (Loxoconcha) sp. 10

(Pl. 11, fig. 14)

Dimensions: 0.43, 0.28 mm (SG191).

Occurrence: Amargeti: 10351.

Loxoconcha (Loxoconcha) sp. 11

(Pl. 11, fig. 15)
Dimensions: 0.42, 0.29 mm (SG192).
Occurrence: Amargeti: 10351.

Loxoconcha (Loxoconcha) sp. 12
(Pl. 11, fig. 16)

Dimensions: 0.55, 0.34 mm (SG193).
Occurrence: Amargeti: 10346, 10348, 10351.

Loxoconcha (Loxoconcha) sp. 13
(Pl. 11, fig. 17)

Dimensions: 0.38, 0.23 mm (SG194).
Occurrence: Dhymiou: 9916.

Loxoconcha (Loxoconcha) sp. 14
(Pl. 11, fig. 18)

Dimensions: 0.38, 0.23 mm (SG195).
Occurrence: Polemi: 10354.

Loxoconcha (Loxoconcha) sp. indet.

Remarks: (broken).
Occurrence: Dhymiou: 9912.

Subgenus Loxocorniculina Krstic, 1972
Loxoconcha (Loxocorniculina) djaffarovi SCHNEIDER, 1956
(Pl. 12, figs. 2, 3)

**Dimensions:** 0.29, 0.17 mm / 0.31, 0.18 mm (SG197/SG198).


**Remarks:** According to SISSINGH (1976) and CARBONNEL (1978), *Loxoconcha hodonica* sensu SISSINGH, 1972 belongs to this species. However, KRSTIC & STANCHEVA (1989) disagree and believe that the species figured by SISSINGH (1972, Pl. 10, figs. 15, 16) is closer to *Loxoconcha ornata* SCHNEIDER, 1939 from the Sarmatian of the Paratethys. Non-marine.

**Occurrence:** Polemi: 10354, 10355.

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**Genus Hirschmania** Elofson, 1941

*Hirschmania* sp.
(Pl. 12, fig. 4)

**Dimensions:** 0.43, 0.31 mm (SG199).

**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975).

**Remarks:** Marine.

**Occurrence:** Pissouri: 9461.

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**Genus Phlyctocythere** Keij, 1958
Phlyctocythere pellucida MUELLER, 1894
(Pl. 12, fig. 5)

Dimensions: 0.45, 0.25 mm (SG200).

Distribution: Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975).

Remarks: Marine.

Occurrence: Pissouri: 9466.

FAMILY PARACYTHERIDEIDAE Puri, 1957

Genus Paracytheridea Mueller, 1894

Paracytheridea depressa MUELLER, 1894
(Pl. 12, fig. 6)

Dimensions: 0.48, 0.23 mm (SG201).

Distribution: Pleistocene: Turkey (DORUK, 1980); Late Pliocene: Peloponnnesos (DANATSAS, 1989), Kos (MOSTAFawi, 1981); Recent: Gulf of Naples (MUELLER, 1894), Adriatic (BONADUCE et al., 1975), Limski-Channel (UFFENORDE, 1972), Naxos (BARBEITO-GONZALEZ, 1971); Late Pliocene-Recent: Algeria (YASSINI, 1979).

Remarks: Marine.

Occurrence: Steni: 9534, 9539; Dhrymou: 9908, 9914, 9916, 9919, 9925, 9926, 9927; Polemi: 10356; Pissouri: 9458, 9461, 9462, 9467; Mari: 9430, 9433, 9439, 9440.

Paracytheridea inscita DORUK, 1980
(Pl. 12, fig. 7)

Dimensions: 0.39, 0.19 mm (SG202).

Distribution: Late Miocene: Turkey (DORUK, 1973); Late Pliocene: Peloponnnesos (DANATSAS, 1989).

Remarks: Marine.
**Occurrence:** Steni: 9533; Dhrymou: 9909, 9916, 9919; Polemi: 10356; Pissouri: 9461, 9467, 9768, 9473; Mari: 9432.

*Paracytheridea parallia* BARBEITO-GONZALEZ, 1971

(Pl. 12, fig. 8)

**Dimensions:** 0.61, 0.32 mm (SG203).

**Distribution:** Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982), Naxos (BARBEITO-GONZALEZ, 1971); Late Pliocene: Peloponnesos (DANATSAS, 1989).

**Remarks:** Marine.

**Occurrence:** Pissouri: 9459.

*Paracytheridea* sp.

**Remarks:** Marine.

**Occurrence:** Mari: 9431.

**FAMILY CYTHERURIDAE** Mueller, 1894

**SUBFAMILY CYTHERURINAE** Mueller, 1894

**Genus** *Pedicythere* Eagar, 1965

*Pedicythere mirabilis* SISSINGH, 1975

(Pl. 12, fig. 9)

**Dimensions:** 0.46, 0.19 mm (SG204).

**Distribution:** Recent: Adriatic (SISSINGH, 1975).

**Remarks:** Marine. The *Pedicythere* sp. in MALZ & JELLINEK (1985) belongs to this species.

**Occurrence:** Dhrymou: 9913, 9916; Polemi: 10356.
**Pedicythere phryne** BONADUCE, CIAMPO & MASOLI, 1975

(Pl. 12, fig. 10)

**Dimensions:** 0.40, 0.19 mm (SG205).

**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975).

**Remarks:** Marine.

**Occurrence:** Pissouri: 9908.

**Pedicythere polita** COLALONGO & PASINI, 1980

(Pl. 12, fig. 11)

**Dimensions:** 0.44, 0.26 mm (SG206).

**Distribution:** Quaternary: Atlantic Ocean (WHATLEY & COLES, 1987).

**Remarks:** *Pedicythere* sp. of MALZ & JELLINEK (1986, Pl. 1, fig 1) is *Pedicythere polita*. Marine.

**Occurrence:** Dhrymou: 9913.

**Pedicythere sp.**

(Pl. 12, fig. 12)

**Dimensions:** 0.42, 0.27 mm (SG207).

**Remarks:** Marine.

**Occurrence:** Polemi: 10356.

**Genus Cytherura** Sars, 1866

**Cytherura cf. C. cornuta** (BRADY, 1868)

(Pl. 12, fig. 13)

**Dimensions:** 0.43, 0.27 mm (SG208).

**Distribution:** Recent: (BRADY, 1868); Burdigalian: France (CARBONNEL, 1969).
Remarks: Marine.

Occurrence: Dhrymou: 9914.

Genus *Eucytherura* Mueller, 1894

*Eucytherura complexa* (BRADY, 1866)

(Pl. 12, fig. 14)

Dimensions: 0.27, 0.16 mm (SG209).

Distribution: Pleistocene: Italy (COLALONGO, 1965), Zakynthos (TSAPRALIS, 1981), Rhodos (MOSTAFawi, 1989); Late Pliocene-Pleistocene: Rhodos (SISSINGH, 1972); Pliocene: Crete (SISSINGH, 1972); Recent: France (GUILLAUME, PEYPOUQUET & TETART, 1985), Adriatic (BONADUCE, CIAMPO & MASOLI, 1975).

Remarks: In the specimen from Amargeti, the ornamentation and the position of the nodes on the lateral surface are very close to those of *E. complexa*, but in most of my species the two dorsal nodes are elongate and not circular as they appear to be in *E. complexa*. Marine.

Occurrence: Steni: 9531, 9534, 9535, 9536, 9537, 9539; Dhrymou: 9914; Amargeti: 10344; Polemi: 10355, 10356, 10357; Pissouri: 9458, 9465, 9468, 9472.

*Eucytherura gibbera* MUELLER, 1894

(Pl. 12, fig. 15)

Dimensions: 0.31, 0.17 mm (SG210).

Distribution: Pleistocene: Zakynthos (TSAPRALIS, 1981); Late Miocene-Pliocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972).

Remarks: Marine.

Occurrence: Steni: 9533, 9539; Dhrymou: 9908, 9909; Polemi: 10356; Pissouri: 9458, 9473; Mari: 9437.

*Eucytherura ex. gr. E. mediopunctata* COLES & WHATLEY, 1989

(Pl. 12, figs. 16, 17)
**Remarks:** This species presents some affinities to *E. mediopunctata* COLES & WHATLEY (1989, Pl. 3, figs. 2-4) in the position and arrangement of the nodes, the outline of the valve as well as the internal characteristics. It is differentiated, however, by the lack of median punctae and in having the posterodorsal node elongated and extended to the centre of the valve. Marine.

**Occurrence:** Amargeti: 10344.

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**Eucytherura mistrettai** (SISSINGH, 1972)

**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pleistocene: Rhodos (SISSINGH, 1972), Zakynthos (TSAPRALIS, 1981); Late Pliocene: Karpathos (SISSINGH, 1972), Late Miocene - Late Pliocene: Crete (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Steni: 9539; Dhrymou: 9913, 9919; Amargeti: 10344.

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**Eucytherura pseudoantipodum** COLES & WHATLEY, 1989

(Pl. 12, fig. 18)

**Dimensions:** 0.28, 0.17 mm (SG213).

**Distribution:** M.Eocene-Uppper Oligocene: N.Atlantic (COLES & WHATLEY, 1989); Miocene and ?Quaternary: SW Pacific (Ayress, MS, 1988).

**Remarks:** First report of this species from the Mediterranean. Marine.

**Occurrence:** Steni: 9531.

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**Eucytherura sp.**

(Pl. 18, fig. 15)

**Dimensions:** 0.31, 0.17 mm (SG213).

**Remarks:** Marine.

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Occurrence: Dhrymou: 9913, 9539.

Genus *Hemicytherura* Elofson, 1941

*Hemicytherura defiorei* RUGGERI, 1953c
(Pl. 13, fig. 1)

**Dimensions:** 0.36, 0.21 mm (SG 214).

**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pleistocene: Zakynthos (TSAPRALIS, 1981); Late Miocene-Pliocene: Crete (SISSINGH, 1972); Late Miocene: Gavdos (SISSINGH, 1972); Late Pliocene: Rhodos (SISSINGH, 1972); Burdigalian: France (CARBONNEL, 1969).

**Remarks:** Marine.

**Occurrence:** Mari: 9433, 9440, 9439.

*Hemicytherura gracilicosta* RUGGIERI, 1953c
(Pl. 13, fig. 2)

**Dimensions:** 0.40, 0.22 mm (SG 215).

**Distribution:** Recent: Adriatic (BONADUCE et al., 1975), Limski-Channel (UFFENORDE, 1972), Late Pliocene: Peloponnesos (DANATSAS, 1989); Pleistocene: Zakynthos (TSAPRALIS, 1981), Crete (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Steni: 9537, 9539, 9540; Dhrymou: 9916; Pissouri: 9468.

*Hemicytherura hellenica* SISSINGH, 1972
(Pl. 13, figs. 3, 6)

**Dimensions:** 0.32, 0.20 mm (SG 216).

**Distribution:** Pliocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972).
**Remarks:** Marine.

**Occurrence:** Steni: 9537, 9539; Dhrymou: 9916, 9919; Polemi: 10356, 10361; Amargeti: 10347, 10351; Pissouri: 9458, 9462, 9463, 9465; Mari: 9428, 9430, 9432, 9435.

*Hemicytherura videns* (MUeller, 1894)

(Pl. 13, fig. 4, 5)

**Dimensions:** 0.38, 0.22 mm (SG217).

**Distribution:** Recent: France (GUILLAUME, PEYROUQUET & TETART, 1985), Adriatic (BONADUCE et al., 1975), Limski-Channel (UFFENORDE, 1972), Balearic (BONADUCE, CILIBERTO, MASOLI, MINICHELLI & PUGLIESE, 1983), Gulf of Naples (MUeller, 1894, PURI et al., 1974), Naxos (BARBEITO-GONZALEZ, 1971), Cyprus (ATHERSUCH, 1981); Late Pliocene-Recent: Algeria (YASSINI, 1979); Tortonian: Italy (DIECI & RUSSO, 1964); Plio-Pleistocene: Italy (CIAMPO, 1971); Pleistocene: Italy (COLALONGO, 1965), Zakynthos (TSAPRALIS, 1981); Late Pliocene: Peloponnesos (DANATSAS, 1989), Kos (MOSTAFAWI, 1981), Karpathos & Rhodos (SISSINGH, 1972); Tortonian - Piacenzian: Crete (SISSINGH, 1972).

**Remarks:** Neritic to bathyal.

**Occurrence:** Polemi: 10356; Pissouri: 9468, 9469; Mari: 9433, 9435, 9442, 9443.

*Hemicytherura* sp.

**Remarks:** Marine.

**Occurrence:** Polemi: 10355.

*Genus Pseudocytherura* Dubowski, 1939

*Pseudocytherura calcarata* (SEGUENZA, 1880)

(Pl. 18, fig. 16)
**Dimensions:** 0.84, 0.52 mm (SG314).

**Distribution:** Recent: Adriatic (BONADUCE et al., 1975), Balearic (BONADUCE et al., 1983), Limski-Channel (UFFENORDE, 1972), Elafonisos (Greece) (MALZ & JELLINEK, 1984); Pleistocene: Italy (SEGUENZA, 1880, COLALONGO, 1965), Zakynthos (TSAPRALIS, 1981), Pliocene: Spain (ARANKI, 1987), Turkey (DORUK, 1973), Crete (SISSINGH, 1972), SE France (CARBONNEL & BALLESIO, 1982); Late Pliocene: Peloponnesos (DANATSAS, 1989), Karpathos (SISSINGH, 1972); Late Pliocene - Early Pleistocene: Rhodos (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Polemi: 10356, Pissouri: 9463; Mari: 9428, 9432, 9435.

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**Genus Semicytherura** Wagner, 1957

**Semicytherura acuminata** (MUeller, 1894)

(Pl. 13, fig. 7)

**Dimensions:** 0.55, 0.29 mm (SG218).


**Remarks:** Bathyal.

**Occurrence:** Dhrymou: 9927; Polemi: 10356.

**Semicytherura acuta** (MUeller, 1912)

**Distribution:** Late Pliocene: Peloponnesos (DANATSAS, 1989); Recent: Gulf of Naples (MUeller, 1894), Adriatic (BONADUCE et al., 1975), Limski-Channel (UFFENORDE, 1972), Paros & Naxos (BARBEITO-GONZALEZ, 1971).

**Remarks:** Marine.
Occurrence: Dhrymou: 9916; Pissouri: 9461, 9465, 9468; Mari: 9428, 9440.

_Semicytherura cf. S. acuta_ MUELLER, 1912

(Pl. 14, fig. 2)

**Dimensions:** 0.44, 0.25 mm (SG231).

**Remarks:** Marine.

**Occurrence:** Mari: 9433, 9435, 9443.

_Semicytherura acuticostata acuticostata_ (SARS, 1866)

(Pl. 13, fig. 8)

**Dimensions:** 0.46, 0.26 mm (SG219).

**Distribution:** Recent: Gulf of Naples (MUELLER, 1894), Adriatic (BONADUCE et al., 1975), Limski-Channel (UFFENORDE, 1972), Naxos (BARBEITO-GONZALEZ, 1971), Balearic & Sea of Crete (BONADUCE, CILIBERTO, MASOLI, MINICELLI & PUGLIESE, 1983), France (GUILLAUME, PEYPOUQUET & TETART, 1985); Pleistocene: Italy (COLALONGO, 1965), Zakynthos (TSAPRALIS, 1981); Piacenzian: Karpathos (SISSINGH, 1972), Peloponnesos (DANATSAS, 1989); Pliocene - Pleistocene: Crete, Rhodos (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Steni: 9533, 9534, 9535, 9539; Polemi: 10356.

_Semicytherura acuticostata ventricosa_ MUELLER, 1894

**Remarks:** Marine.

**Occurrence:** Mari: 9429, 9431, 9440, 9443.

_Semicytherura aenariensis_ BONADUCE, CIAMPO & MASOLI, 1975

(Pl. 13, fig. 9)

**Dimensions:** 0.56, 0.27 mm (SG220).
**Semicytherura alifera** RUGGIERI, 1959

(Pl. 13, fig. 10)

**Dimensions:** 0.37, 0.17 mm (SG221).

**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pleistocene: Zakynthos (TSAPRALIS, 1981).

**Remarks:** Marine.

**Occurrence:** Mari: 9439.

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**Semicytherura cf. S. diafora** BARBEITO-GONZALEZ, 1971

(Pl. 14, fig. 3)

**Dimensions:** 0.50, 0.24 mm (SG232).

**Remarks:** The posterior cardinal angle is broken and so that it looks as though the caudal process is a posterior extension of the dorsal margin. Marine.

**Occurrence:** Dhrymou: 9914.

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**Semicytherura dispar** (MUELLER, 1894)

(Pl. 13, fig. 11)

**Dimensions:** 0.36, 0.18 mm (SG222).

**Distribution:** Recent: Balearic, Tyrrhenian, Sea of Crete (BONADUCE, CILIBERTO, MASOLI, MINICHELLI & PUGLIESE, 1983), Gulf of Naples (MUELLER, 1894), Adriatic (BONADUCE et al., 1975), Limski-Channel (UFFENORDE, 1972), Naxos (BARBEITO-GONZALEZ, 1971); Pleistocene: Zakynthos (TSAPRALIS, 1981); Lower Miocene: Turkey (DORUK, 1973); Early Pliocene - Pleistocene: Crete, Rhodos

Remarks: Bathyal.

Occurrence: Steni: 9533, 9536, 9539; Dhrymou: 9908, 9914; Polemi: 10356; Pissouri: 9458, 9459, 9461, 9464, 9468, 9471; Mari: 9428, 9431, 9437, 9443.

Semicytherura cf. S. gibbera ARUTA, 1983
(Pl. 14, fig. 4)

Dimensions: 0.51, 0.27 mm (SG233).

Remarks: Marine.

Occurrence: Dhrymou: 9919, 9921.

Semicytherura incongruens (MUELLER, 1894)
(Pl. 13, fig. 12)

Dimensions: 0.31, 0.17 mm (SG223).


Remarks: Bathyal.

Occurrence: Polemi: 10356.

Semicytherura inversa (SEGUENZA, 1880)
(Pl. 13, fig. 13)

Dimensions: 0.43, 0.24 mm (SG224).

Distribution: Pliocene: Turkey (DORUK, 1973), Algeria (YASSINI, 1979), Crete (SISSINGH, 1972); Late Pliocene-Pleistocene: Zakynthos (TSAPRALIS, 1981), Rhodos
(SISSINGH, 1972), Peloponnesos (DANATSAS, 1989); Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982), Balearic, Tyrrenian, Sea of Crete (BONADUCE, CILIBERTO, MASOLI, MINICHELLI & PUGLIESE, 1983), Gulf of Naples (MUELLER, 1894), Adriatic (BONADUCE et al., 1975), Limski-Channel (UFFENORDE, 1972), Naxos (BARBEITO-GONZALEZ, 1971); Piacenzian: Karpathos (SISSINGH, 1972).

Remarks: Marine.

Occurrence: Dhrymou: 9908; Pissouri: 9459, 9461; Mari: 9430, 9437, 9439, 9435.

\textit{Semicytherura paradoxa} (MUELLER, 1894)

(Pl. 13, fig. 14)

Dimensions: 0.53, 0.28 mm (SG225).

Distribution: Recent: Gulf of Naples (MUELLER, 1894), Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pleistocene: Zakynthos (TSAPRALIS, 1981); Pliocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972); Late Pliocene-Pleistocene: Rhodos (SISSINGH, 1972).

Remarks: Marine.

Occurrence: Steni: 9533; Dhrymou: 9914.

\textit{Semicytherura punctata} (MUELLER, 1894)

(Pl. 13, fig. 15)

Dimensions: 0.46, 0.22 mm (SG226).

Distribution: Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pliocene: Crete (SISSINGH, 1972); Piacenzian: Karpathos (SISSINGH, 1972).

Remarks: Marine.

Occurrence: Steni: 9533; Dhrymou: 9914; Pissouri: 9458, 9464, 9465, 9467, 9468.

\textit{Semicytherura cf. S. punctata} (MUELLER, 1894)

Remarks: Marine.
Occurrence: Mari: 9430.

*Semicytherura quadridentata* (HARTMANN, 1953)
(Pl. 13, fig. 16)

Dimensions: 0.53, 0.29 mm (SG227).
Distribution: Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975).
Remarks: Marine.
Occurrence: Pissouri: 9471.

*Semicytherura rara* (MUELLER, 1894)
(Pl. 13, fig. 17)

Dimensions: 0.42, 0.19 mm (SG228).
Remarks: Bathyal.
Occurrence: Steni: 9539; Polemi: 10356; Pissouri: 9468; Mari: 9431, 9439.

*Semicytherura rarecostata* BONADUCE, CIAMPO & MASOLI, 1975

Distribution: Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975).
Remarks: Marine.
Occurrence: Mari: 9443.

*Semicytherura spratti* SISSINGH, 1972
(Pl. 13, fig. 18)
**Dimensions:** 0.35, 0.18 mm (SG229).

**Distribution:** Pleistocene: Zakynthos (TSAPRALIS, 1981); Pliocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Pissouri: 9458.

*Semicytherura tergestina* MASOLI, 1968

(Pl. 14, fig. 1)

**Dimensions:** 0.35, 0.18 mm (SG230).

**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975).

**Remarks:** Marine.

**Occurrence:** Steni: 9540; Mari: 9440.

*Semicytherura* sp. 1

(Pl. 14, fig. 5)

**Dimensions:** 0.31, 0.15 mm (SG234).

**Remarks:** Marine.

**Occurrence:** Amargeti: 10344.

*Semicytherura* sp. 2

**Remarks:** This form is identical to *Semicytherura B*. n. sp. MOSTAFAWI (1981, p. 169, figs. 1-3). Marine.

**Occurrence:** Amargeti: 10344; Mari: 9433.

*Semicytherura* sp. 3

**Remarks:** Marine.
Occurrence: Mari: 9433, 9439.

*Semicytherura* sp. 4

**Distribution:** Marine.
**Occurrence:** Pissouri: 9468.

*Semicytherura* sp. 5

(Pl. 14, fig. 6)

**Dimensions:** 0.38, 0.20 mm (SG235).
**Remarks:** Marine.
**Occurrence:** Pissouri: 9468.

*Semicytherura* sp. 6

(Pl. 14, fig. 7)

**Dimensions:** 0.45, 0.23 mm (SG236).
**Remarks:** Marine.
**Occurrence:** Pissouri: 9468, 9466.

*Semicytherura* sp. 7

(Pl. 14, fig. 8)

**Dimensions:** 0.44, 0.23 mm (SG237).
**Remarks:** Marine.
**Occurrence:** Pissouri: 9468.

*Semicytherura* sp. 8

(Pl. 14, fig. 9)
Dimensions: 0.35, 0.18 mm (SG238).
Remarks: Marine.
Occurrence: Pissouri: 9468.

*Semicytherura* sp. 9
(Pl. 14, fig. 10)

Dimensions: 0.47, 0.24 mm (SG239).
Remarks: Marine.
Occurrence: Pissouri: 9473.

Genus *Parahemingwayella* Dingle, 1984

*Parahemingwayella downingae* COLES & WHATLEY, 1989
(Pl. 14, fig. 11)

Dimensions: 0.31, 0.16 mm (SG240).
Remarks: This species is reported as "Cythereopteron" *tetrapteron* BONADUCE, CIAMPO & MASOLI, 1975, by BONADUCE, CIAMPO & MASOLI (1975) and TSAPRALIS (1981) and also as *Bythocythere* sp. by BENSON (1978). Marine.
Occurrence: Steni: 9531, 9532, 9540; Dhrymou: 9912; Pissouri: 9463.

SUBFAMILY CYTHEROPTERINAE Hanai, 1957

Genus *Cythereopteron* Sars, 1866

*Cythereopteron aemulum* CIAMPO, 1988
(Pl. 14, fig. 12)
**Cytheropteron alatum** SARS 1866

*(Pl. 14, fig. 13)*

**Dimensions:** 0.64, 0.47 mm (SG241).

**Distribution:** Pliocene: Calabria (Italy) (CIAMPO, 1988).

**Remarks:** Marine.

**Occurrence:** Amargeti: 10344; Pissouri: 9459, 9463, 9466.

**Cytheropteron apostoliensis** SISSINGH, 1972

*(Pl. 14, fig. 14)*

**Dimensions:** 0.42, 0.23 mm (SG242).

**Distribution:** Pliocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972); Pleistocene: Rhodos (SISSINGH, 1972); Quaternary: Atlantic Ocean (WHATLEY & COLES, 1987).

**Remarks:** Marine.

**Occurrence:** Steni: 9533; Dhrymou: 9911, 9923, 9926; Pissouri: 9465, 9471; Mari: 9442.

**Cytheropteron ascolii** CARBONNEL, 1969

*(Pl. 14, fig. 15)*

**Dimensions:** 0.40, 0.24 mm (SG244).

**Distribution:** Tortonian: France (CARBONNEL, 1969).

**Remarks:** Marine.

**Occurrence:** Steni: 9534; Dhrymou: 9916.
Cytheropteron boldi  CARBONNEL, 1969
(Pl. 14, fig. 16)

Dimensions: 0.21, 0.15 mm (SG 245).
Remarks: Marine.
Occurrence: Amargeti: 10344.

Cytheropteron cronini  DINGLE, LORD & BOOMER, 1989
(Pl. 14, fig. 17)

Dimensions: 0.45, 0.30 mm (SG 246).
Remarks: Bathyal.
Occurrence: Polemi: 10356.

Cytheropteron hamatum  SARS, 1869
(Pl. 14, fig. 18)

Dimensions: 0.45, 0.30 mm (SG 247).
Remarks: Marine.
Occurrence: Pissouri: 9463.

Cytheropteron inornatum  BRADY & ROBERTSON, 1872

Remarks: Marine.
Occurrence: Mari: 9432.
**Cytheropteron latum** MUELLER, 1894

(Pl. 15, fig. 1)

**Dimensions:** 0.35, 0.20 mm (SG248).
**Remarks:** Neritic to bathyal.
**Occurrence:** Steni: 9539; Dhrymou: 9908, 9914, 9925; Polemi: 10356.

**Cytheropteron lineoporosa** WHATLEY & COLES, 1987

(Pl. 15, fig. 2)

**Dimensions:** 0.59, 0.36 mm (SG249).
**Distribution:** Early Pliocene - Quaternary: Atlantic Ocean (WHATLEY & COLES, 1987).
**Remarks:** Marine.
**Occurrence:** Steni: 9540; Dhrymou: 9913.

**Cytheropteron monoceros** BONADUCE, CIAMPO & MASOLI, 1975

(Pl. 15, fig. 3)

**Dimensions:** 0.50, 0.33 mm (SG250).
**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pleistocene: Zakynthos (TSAPRALIS, 1981).
**Remarks:** Marine.
**Occurrence:** Dhrymou: 9925; Polemi: 10356; Pissouri: 9462, 9471.

**Cytheropteron patagoniensis** BRADY, 1880

(Pl. 15, fig. 4)
Cytheropteron porterae WHATLEY & COLES, 1987

Distribution: Late Miocene - Quaternary: Atlantic Ocean (WHATLEY & COLES, 1987).
Remarks: Marine.
Occurrence: Pissouri: 9458.

Cytheropteron punctatum BRADY, 1868
(Pl. 15, fig. 5)

Dimensions: 0.41, 0.26 mm (SG252).
Remarks: Marine.
Occurrence: Dhrymou: 9916; Pissouri: 9462.

Cytheropteron cf. C. punctatum BRADY, 1868
(Pl. 15, fig. 9)

Dimensions: 0.36, 0.22 mm (SG256).
Remarks: Marine.
Occurrence: Dhrymou: 9925.

Cytheropteron ruggieri PUCCI, 1955
(Pl. 15, fig. 6)

Dimensions: 0.47, 0.31 mm (SG253).
Distribution: Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975).
Remarks: Marine.
Occurrence: Pissouri: 9462.

_Cytheropteron sulcatum_ BONADUCE, CIAMPO & MASOLI, 1975

**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pleistocene: Zakynthos (TSAPRALIS, 1981).

Remarks: Marine.
Occurrence: Dhrymou: 9925; Polemi: 10356; Pissouri: 9462, 9463, 9466, 9468, 9471, 9473; Mari: 9430.

_Cytheropteron trifosata_ WHATLEY & COLES, 1987

(Pl. 15, fig. 7)

**Dimensions:** 0.40, 0.26 mm (SG254).
**Distribution:** Late Quaternary: Atlantic (WHATLEY & COLES, 1987).

Remarks: Marine.
Occurrence: Dhrymou: 9913.

_Cytheropteron venustum_ BONADUCE, CIAMPO & MASOLI, 1975

(Pl. 15, fig. 8)

**Dimensions:** 0.48, 0.29 mm (SG255).
**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975).

Remarks: Marine.
Occurrence: Dhrymou: 9916.

_Cytheropteron 2914_ DINGLE, LORD & BOOMER, 1990

(Pl. 15, figs. 10, 11)

**Dimensions:** 0.38, 0.21 mm (SG257).
**Distribution:** Quaternary: SE Atlantic Ocean (DINGLE, LORD & BOOMER, 1990).

**Remarks:** Bathyal.

**Occurrence:** Steni: 9534, 9539; Dhrymou: 9916; Pissouri: 9458.

_Cytheropteron_ sp. 1

**Remarks:** Marine.

**Occurrence:** Mari: 9430.

_Cytheropteron_ sp. 2

**Remarks:** Marine.

**Occurrence:** Pissouri: 9458, 9468.

_Cytheropteron_ sp. 3

(Pl. 15, figs. 14, 15)

**Dimensions:** 0.51, 0.29 mm (SG260).

**Remarks:** Very similar to _C_. sp. 2914 of DINGLE et al. (1990) but differs:
- in bearing the secondary spine almost at the middle of the dorsal part of the ala and not at the top as in _C_. sp. 2914;
- in the structure of the ala and the surface ornamentation behind it; in _C_. sp. 2914 the ala is directed posteriorly, ending up almost vertically on the surface. In the specimens of _C_. sp. 3 the ala is inclined posteriorly, forming a slightly extended ridge which bears a rounded button-like node on it. Marine.

**Occurrence:** Steni: 9539.

_Cytheropteron_ sp. 4

**Remarks:** Marine.

**Occurrence:** Pissouri: 9458, 9468.
Genus *Aversovalva* Hornibrook, 1952

*Aversovalva lancei* CARBONNEL, 1969

(Pl. 15, fig. 12)

**Dimensions:** 0.35, 0.23 mm (SG258).

**Distribution:** Burdigalian: Rhone Basin (CARBONNEL, 1969); Late Miocene - Pliocene: Crete (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Steni: 9533; Dhrymou: 9908, 9909, 9914, 9916, 9925; Amargeti: 10344; Pissouri: 9473.

*Aversovalva hydrodynamica* WHATLEY & COLES, 1987

(Pl. 15, fig. 13)

**Dimensions:** 0.46, 0.26 mm (SG259).

**Distribution:** Late Miocene - Quaternary: Atlantic Ocean (WHATLEY & COLES, 1987).

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9908, 9911.

*Aversovalva* cf. *A. hydrodynamica* WHATLEY & COLES, 1987

(Pl. 15, fig. 16)

**Dimensions:** 0.29, 0.18 mm (SG262).

**Remarks:** The outline shape of the specimens found in this study is almost identical to that of *A. hydrodynamica*. It is differentiated however in two points:

1) the spine and its anterior ridge are not so developed, and

2) the vertical sulcae of the lateral surface are not present.

**Occurrence:** Steni: 9532; Dhrymou: 9912, 9916.
Genus *Kangarina* Coryell & Fields, 1937

*Kangarina abyssicola* MUELLER, 1894

**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pliocene: Crete (SISSINGH, 1972); Late Miocene: Turkey (DORUK, 1973); Burdigalian: France (CARBONNEL, 1969); Pleistocene: Zakynthos (TSAPRALIS, 1981), Rhodos (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Mari: 9428, 9431, 9440.

Genus *Rimacytheropteron* Whatley & Coles, 1987

*Rimacytheropteron longipunctata* (BREMAN, 1976)

**Distribution:** Recent: Adriatic (BONADUCE et al., 1975); Pleistocene: Zakynthos (TSAPRALIS, 1981); Pliocene: SW. Pacific (DOWNING, 1985); Quaternary: SW. Pacific (SMITH, 1983); Pliocene-Recent: Atlantic (WHATLEY & COLES, 1987).

**Remarks:** This species is referred as “*Pedicythere tesselata*” BONADUCE, CIAMPO & MASOLI, 1975, by BONADUCE, CIAMPO & MASOLI (1975) and TSAPRALIS (1981), and also as *Monoceratina longipunctata* BREMAN, 1975 by BREMAN (1975). Marine.

**Occurrence:** Pissouri: 9465.

**FAMILY XESTOLEBERIDIDAE** Sars, 1928

Genus *Xestoleberis* Sars, 1866

Subgenus *Pontoleberis* Krstic & Stancheva, 1967

*Xestoleberis (Pontoleberis) atilata* STANCHEVA, 1964

(Pl. 16, fig. 6)
**Dimensions:** 0.48, 0.36 mm (SG270).

**Distribution:** Late Maetian: N. Bulgaria & Romania (STANCHEVA, 1990); Portaferrian: Yugoslavia (STANCHEVA, 1990); Late Pannonian: Paratethys (JIRICEK, 1985); Pontian: Romania (OLTEANU, 1989); Latest Pannonian: (SOKAC, 1972).

**Remarks:** Brackish.

**Occurrence:** Polemi: 10355.

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**Subgenus** *Xestoleberis* Sars, 1866

*Xestoleberis (Xestoleberis) communis* MUELLER, 1894

*(Pl. 15, fig. 17)*

**Dimensions:** 0.92, 0.67 mm (SG263).

**Distribution:** Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982), Gulf of Naples (MUELLER, 1894), Adriatic (BONADUCE et al., 1975), Cyprus (ATHERSUCH, 1976), Algeria (YASSINI, 1979), Naxos (BARBEITO-GONZALEZ, 1971); Pleistocene: Corinth Channel (KRSTIC & DERMITAKIS, 1981); Late Pliocene - Pleistocene: Peloponnesos (DANATSAS, 1989); Piacenzian: Kos (MOSTAFAWI, 1981); Pliocene: S.Spain (ARANKI, 1987), Egypt (BASSIOUNI, 1965); Sarmatian-Pontian: Strymon Basin (GRAMMAN, 1969).

**Remarks:** It seems to the present author that *X. rhodiensis* of MOSTAFAWI (1989) belongs to *X. communis*.

**Occurrence:** Steni: 9534, 9535; Dhrymou: 9914, 9919, 9920, 9921, 9925, 9930; Polemi: 10358; Amargeti: 10344, 10347; Pissouri: 9458, 9464, 9470, 9471, Mari: 9429, 9430, 9431, 9433, 9435, 9437, 9442.

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*Xestoleberis (Xestoleberis) decipiens* MUELLER, 1894

*(Pl. 15, fig. 18)*

**Dimensions:** 0.29, 0.18 mm (SG264).

Remarks: Marine.

Occurrence: Dhrymou: 9914, 9930; Polemi: 10356; Amargeti: 10347; Pissouri: 9459, 9461; Mari: 9431, 9435, 9443.

_Xestoleberis (Xestoleberis) dispar_ MUELLER, 1894

(Pl. 16, figs. 1, 2)

Dimensions: 0.29, 0.15 mm / 0.51, 0.34 mm (SG265/SG266).

Distribution: Recent: Evros Delta (Greece) (STAMBOLIDIS, 1982), Gulf of Naples (MUELLER, 1894), Adriatic (BONADUCE et al., 1975); Pleistocene: Zakynthos (TSAPRALIS, 1981); Early Pliocene: Spain (ARANKI, 1987); Pleistocene: Italy (CIAMPO, 1971), Late Pliocene-Pleistocene: Peloponnese (DANATSAS, 1989).

Remarks: Marine.

Occurrence: Steni: 9534, 9535, 9539; Dhrymou: 9916, 9923, 9928, 9930; Polemi: 10356, 10365, 10358; Amargeti: 10344, 10347; Pissouri: 9462, 9463, 9466, 9468, 9470, 9471; Mari: 9431, 9432, 9433, 9435, 9439, 9442, 9443.

_Xestoleberis (Xestoleberis) margaritea_ BRADY, 1866

(Pl. 16, figs. 3, 4)

Dimensions: 0.40, 0.27 mm / 0.72, 0.40 mm (SG267/SG268).

Distribution: Recent: Mediterranean (DORUK, 1973); Pliocene-Pleistocene: Turkey & Cyprus (DORUK, 1973).

Remarks: Marine.

Occurrence: Steni: 9534, 9537; Dhrymou: 9920, 9930; Amargeti: 10347, 10344; Pissouri: 9458, 9464, 9467; Mari: 9429, 9430, 9431, 9433, 9442.
**Xestoleberis (Xestoleberis) ventricosa穆勒, 1894**

(Pl. 16, fig. 5)

**Dimensions:** 0.29, 0.21 mm (SG269).

**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pliocene: Crete (SISSINGH, 1972).

**Remarks:** Marine.

**Occurrence:** Steni: 9533, 9539, 9540; Dhrymou: 9916, 9919; Polemi: 10356, 10361; Amargeti: 10351, 10344; Pissouri: 9458, 9462, 9464, 9468; Mari: 9428, 9430, 9432, 9439, 9440.

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**Xestoleberis (Xestoleberis) sp. 1**

**Occurrence:** Polemi: 10354.

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**Xestoleberis (Xestoleberis) sp. 2**

**Occurrence:** Polemi: 10354, 10355.

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**FAMILY BYTHOCYTHERIDAE** Sars, 1866

**Genus Monoceratina** Roth, 1928

**Monoceratina mediterranea** SISSINGH, 1972

**Distribution:** Late Pliocene: Karpathos (SISSINGH, 1972); Late Miocene: Crete (SISSINGH, 1972); Recent: Adriatic Sea (ASCOLI, 1965, BONADUCE, CIAMPO & MASOLI, 1975), Gulf of Naples (PURI & DICKAU, 1969), Peloponnesos (Greece) (MALZ & JELLINEK, 1984), Balearic, Tyrrenian (BONADUCE, CILIBERTO, MASOLI, MINICHELLI & PUGLIESE, 1983).

**Remarks:** Upper-middle bathyal.
Occurrence: Steni: 9533; Amargeti: 10351; Mari: 10356.

*Monoceratina* cf. *M. Mediterranea* SISSINGH, 1972

Remarks: Marine.

Occurrence: Mari: 9442.

*Monoceratina* sp.

Remarks: Marine.

Occurrence: Mari: 9429.

Genus *Pseudocythere* Sars, 1866

*Pseudocythere caudata* (SARS, 1866)

(Pl. 16, fig. 7)

Dimensions: 0.64, 0.31 mm (SG271).

Distribution: Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975); Pliocene: Crete (SISSINGH, 1972); Late Pliocene: Karpathos (SISSINGH, 1972); Pleistocene: Zakyntos (TSAPRALIS, 1981), Rhodos (SISSINGH, 1972 & MOSTAFAYI, 1989)

Remarks: Marine.

Occurrence: Steni: 9534; Polemi: 10356; Dhrymou: 9925.

Genus *Profundohythere* Coles & Whatley, 1989

*Profundohythere splendidia* COLES & WHATLEY, 1989

(Pl. 16, figs. 8, 9, 10)

Dimensions: 0.43, 0.26 mm (SG272).
Distribution: Recent: Atlantic (BONADUCE et al., 1983); M.Eocene-Upper Miocene: N. Atlantic (COLES & WHATLEY, 1989); Pliocene-Recent: Atlantic (WHATLEY & COLES, 1987).
Remarks: This is the first record of this species from the Mediterranean. In BONADUCE et al. (1983) it is reported as ?Atlanticicythere sp., while in WHATLEY & COLES (1987) it is given the name Bythocythere bathytatos WHATLEY & COLES, 1987. Marine.
Occurrence: Dhrymou: 9909, 9912, 9913, 9914; Amargeti: 10344; Pissouri: 9458, 9473.

FAMILY PARADOXOSTOMATIDAE Brady & Norman, 1889

Genus Paradoxostoma Fischer, 1855

Paradoxostoma normani BRADY, 1868

(Pl. 16, fig. 11)

Dimensions: 0.73, 0.40 mm (SG273).
Remarks: Marine.
Occurrence: Steni: 9534.

Paradoxostoma triste MUELLER, 1894

(Pl. 16, fig. 12)

Dimensions: 0.54, 0.30 mm (SG274).
Remarks: Marine.
Occurrence: Steni: 9534.

Genus Paracytherois Mueller, 1894

Paracytherois mediterranea BONADUCE, CIAMPO & MASOLI, 1975

(Pl. 16, fig. 13)
**Dimensions:** 0.45, 0.16 mm (SG275).

**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975).

**Remarks:** Marine.

**Occurrence:** Polemi: 10356.

*Paracythereis aff. P. mediterranea* BONADUCE, CIAMPO & MASOLI, 1975

(Pl. 16, fig. 14)

**Dimensions:** 0.46, 0.17 mm (SG276).

**Remarks:** This form is considered to have affinities to *P. mediterranea* but it is more elongated. It is also similar to *Paradoxostoma simile* MUELLER, 1894 but it is lower anteriorly. Marine.

**Occurrence:** Steni: 9531; Dhrymou: 9912, 9914, 9916; Pissouri: 9458; Mari: 9430, 9442.

Genus *Sclerochilus* Sars, 1866

*Sclerochilus* sp.

**Remarks:** Marine.

**Occurrence:** Polemi: 10354.

SUPERFAMILY CYPRIDACEA Baird, 1845

FAMILY MACROCYPRIDIDAE Mueller, 1912

Genus *Macrocypris* Brady, 1868

*Macrocypris* sp. 1

**Remarks:** Marine.

**Occurrence:** Mari: 9433.
*Macrocypsis* sp. 2

**Remarks:** Marine.

**Occurrence:** Polemi: 10356, 10358.

*Macrocypsis* sp. 3

**Remarks:** Marine.

**Occurrence:** Polemi: 10356.

Genus *Macrocypris* Maddocks, 1990

*M. rhodana* Mattocks, 1990

**Remarks:** Differs from *M. rhodana* in having the greatest height slightly posteriorly of the middle of the valve. Marine.

**Occurrence:** Mari: 9428, 9430.

Genus *Macroscapha* Maddocks, 1990

*M. tensa* Mattocks, 1990

**Remarks:** Marine.

**Occurrence:** Mari: 9428.

**FAMILY ILYOCYPRIDIDAE** Kaufmann, 1900

Genus *Ilyocypris* Brady & Norman, 1889

*Ilyocypris biplicata* (Koch, 1838)

(Pl. 16, fig. 15)
**Dimensions:** 0.78, 0.43 mm (SG277).

**Distribution:** Recent: NW. France (van HARTEN, 1979); M. Pleistocene: Weimar (DIEBEL & PIETRZENIUK, 1969).

**Remarks:** Non-marine to Brackish.

**Occurrence:** Dhrymou: 9927.

*Ilyocypris bradyi* SARS, 1890

(Pl. 16, fig. 16)

**Dimensions:** 0.86, 0.50 mm (SG278).

**Remarks:** Non-marine to Brackish.

**Occurrence:** Steni: 9540.

**FAMILY PONTOCYPRIDAE** Mueller, 1894

**Genus Argilloecia** Sars, 1866

*Argilloecia acuminata* (MUELLER, 1894)

(Pl. 16, fig. 17)

**Dimensions:** 0.48, 0.20 mm (SG279).

**Distribution:** Pleistocene: Zakyntos (TSAPRALIS, 1981); Recent: Adriatic (BONADUCE et al., 1975).

**Remarks:** Marine.

**Occurrence:** Steni: 9531, 9532, 9533, 9534, 9535, 9536, 9539, 9540; Dhrymou: 9909, 9912, 9914, 9916, 9919, 9925, 9926; Polemi: 10356; Amargeti: 10344, 10351; Pissouri: 9462, 9463, 9465, 9466, 9468, 9469, 9471; Mari: 9429, 9433.

*Argilloecia cylindrica* MUELLER, 1894

(Pl. 16, fig. 18)

**Dimensions:** 0.51, 0.24 mm (SG280).
**Distribution:** Pliocene - Pleistocene: Italy (Calabria) (COLALONGO, 1965); Recent: Atlantic, Balearic Sea, Tyrrhenian Sea, Sea of Crete (BONADUCE, CILIBERTO, MASOLI, MINICHELLI & PUGLIESE, 1983).

**Remarks:** Bathyal.

**Occurrence:** Steni: 9534; Dhrymou: 9908, 9909, 9912, 9914, 9916; Polemi: 10356; Amargeti: 10344; Pissouri: 9461, 9463, 9468; Mari: 9428, 9429, 9433, 9443.

*Argilloecia kissamovensis* SISSINGH, 1972

(Pl. 17, fig. 1)

**Dimensions:** 0.50, 0.26 mm (SG281).

**Distribution:** Late Miocene (Tortonian): Crete (SISSINGH, 1972).

**Remarks:** Marine. The form PAVLAKELLI (1986) names as *Argilloecia* sp. 1 is *A. kissamovensis* which is, however, more elongated due to dimorphism (males are more elongate than females). PAVLAKELLI (1986) has divided *A. kissamovensis* R from L valves and considers them two separate species naming them as following: LV=sp.1 of PAVLAKELLI (1986) and RV=sp.2 of PAVLAKELLI (1986).

**Occurrence:** Steni: 9532, 9533, 9534, 9535, 9536, 9537, 9539, 9540; Dhrymou: 9911, 9912, 9913, 9914, 9916, 9925; Polemi: 10356, 10361; Amargeti: 10465, 10344; Pissouri: 9459; Mari: 9430, 9431, 9433, 9442, 9443.

*Argilloecia* cf. *A. acuminata* (MUELLER, 1894)

**Remarks:** Marine.

**Occurrence:** Mari: 9442.

*Argilloecia* sp.

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9919.
Genus *Pontocypris* Sars, 1866

*Pontocypris acuminata* (MEYER, 1894)

(Pl. 17, fig. 2)

**Dimensions:** 0.76, 0.38 mm (SG282).

**Distribution:** Pleistocene: Zakynthos (TSAPRALIS, 1981); Recent: Adriatic (BONADUCE et al., 1975).

**Remarks:** Marine.

**Occurrence:** Amargeti: 10344.

*Pontocypris* *cf.* *P. acuminata* (MEYER, 1894)

**Remarks:** Marine.

**Occurrence:** Pissouri: 9473.

*Pontocypris mytiloides* (NORMAN, 1862)

(Pl. 20, fig. 6)

**Dimensions:** 0.51, 0.29 mm (SG334).

**Remarks:** Marine.

**Occurrence:** Pissouri: 9468.

*Pontocypris* sp.

(Pl. 17, fig. 3)

**Dimensions:** 0.55, 0.36 mm (SG283).

**Remarks:** Marine.

**Occurrence:** Pissouri: 9473.
Genus *Propontocypris* Sylvester-Bradley, 1947

*Propontocypris intermedia* (MÜLLER, 1894)

(Pl. 17, fig. 4)

**Dimensions:** 0.75, 0.39 mm (SG284).

**Distribution:** Recent: Adriatic (BONADUCE, CIAMPO & MASOLI, 1975).

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9923.

*Propontocypris* sp. 1

(Pl. 20, fig. 7)

**Dimensions:** 0.74, 0.44 mm (SG335).

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9923.

*Propontocypris* sp. 2

(Pl. 17, fig. 5)

**Dimensions:** 0.76, 0.25 mm (SG285).

**Remarks:** Marine.

**Occurrence:** Mari: 9429, 9437.

*Propontocypris* sp. 3

**Remarks:** Marine.

**Occurrence:** Mari: 9439.

Genus *Australoecia* Mckenzie, 1967
*Australoecia posteroacuta* COLES & WHATLEY, 1989

(Pl. 17, fig. 6)

**Dimensions:** 0.43, 0.17 mm (SG286).

**Distribution:** Upper Eocene-Upper Oligocene: N. Atlantic (COLES & WHATLEY, 1989).

**Remarks:** Marine.

**Occurrence:** Pissouri: 9462, 9463, 9466, 9467, 9468.

**Genus** *Pontocyprella* Liubimova, 1955

*Pontocyprella* sp.

(Pl. 17, fig. 7)

**Dimensions:** 0.62, 0.33 mm (SG287).

**Remarks:** Marine.

**Occurrence:** Amargeti: 10344.

**FAMILY CANDONIDAE** Kaufmann, 1900

**SUBFAMILY PARACYPRIDINAE** Sars, 1923

**Genus** *Paracypris* Sars, 1866

*Paracypris* aff. *P. prima* MANDELSTAM, 1958

**Remarks:** Non-marine.

**Occurrence:** Amargeti: 10344.

*Paracypris* sp. 1

(Pl. 17, fig. 8)

**Dimensions:** 0.78, 0.43 mm (SG288).
Remarks: Non-marine.
Occurrence: Polemi: 10356.

*Paracypris* sp. 2
(Pl. 17, fig. 9)

Dimensions: broken, 0.48 mm (SG289).
Remarks: Non-marine.
Occurrence: Polemi: 10356.

**SUBFAMILY CANDONINAE Kaufmann, 1900**

Genus *Candona* Baird, 1845
Subgenus *Candona* Baird, 1845

*Candona (Candona) cf. C. altoides* PETKOVSKI, 1961
(Pl. 17, fig. 10)

Dimensions: 0.57, 0.29 mm (SG290).
Remarks: Fresh-water.
Occurrence: Dhrymou: 9913.

*Candona (Candona) sp. 1*

Remarks: Fresh-water.
Occurrence: Polemi: 10364.

*Candona (Candona) sp. 2*

Remarks: Fresh-water.
Occurrence: Amargeti: 10468.
Subgenus *Camptocypria* Zalanyi, 1959

The name *Caspiolla* Mandelstam, 1960 is a synonym of *Camptocypria* Zalanyi, 1959 (KRSTIC & STANCHEVA, 1989). The name *Camptocypria* Zalanyi, 1959 is used here as it is the older.

*Candona (Camptocypria) sp.*

(Pl. 17, fig. 11)

**Dimensions:** 0.74, 0.34 mm (SG291).

**Remarks:** Fresh-water.

**Occurrence:** Polemi: 10354.

*Candona (Camptocypria) balcanica* ZALANYI, 1929

(Pl. 17, fig. 12)

**Dimensions:** 0.35, 0.19 mm (SG292).


**Remarks:** Fresh-water.

**Occurrence:** Polemi: 10354.

*Candona (Camptocypria) flectimarginata* SOKAC, 1967

(Pl. 17, fig. 13)

**Dimensions:** 0.43, 0.23 mm (SG293).

**Distribution:** Late Pontian: Pannonian Basin (SOKAC, 1989), Slovenia (STEVANOVIC & SKERLI, 1989), Croatia (SOKAC, 1989).

**Remarks:** Fresh-water.

**Occurrence:** Polemi: 10354.
Subgenus *Fabaeformiscandona* Krstic, 1972

*Candona (Fabaeformiscandona)* sp.
(Pl. 20, fig. 8)

**Dimensions:** 0.81, 0.61 mm (SG336).

**Remarks:** Fresh-water.

**Occurrence:** Amargeti: 10466.

Subgenus *Pontoniella* Mandelstam, 1960

*Candona (Pontoniella) acuminata acuminata* ZALANYI, 1929
(Pl. 17, fig. 14)

**Dimensions:** 0.49, 0.26 mm (SG294).


**Remarks:** Fresh-water.

**Occurrence:** Polemi: 10354.

*Candona (Pontoniella) paracuminata* KRSTIC, 1968
(Pl. 17, fig. 15)

**Dimensions:** 0.66, 0.33 mm (SG295).

**Distribution:** Late Pontian: Croatia (SOKAC, 1989); Pontian: Eastern Paratethys (NAIDINA, 1989), Pannonian Basin & E. Slovenia (SOKAC, 1989).

**Remarks:** Fresh-water.

**Occurrence:** Polemi: 10354.
Candona (Pontoniella) sitovoensis STANCHEVA, 1981

(Pl. 17, fig. 16)

Dimensions: 0.92, 0.46 mm (SG296).
Distribution: Late Pontian (Bosphorian): NE. Bulgaria (KRSTIC & STANCHEVA, 1989), NW Bulgaria; Middle-Late Pontian (Portaferrian - Bosphorian): NE. Bulgaria (STANCHEVA, 1990).
Remarks: Fresh-water.
Occurrence: Polemi: 10355.

Candona (Pontoniella) cf. C. (P.) sitovoensis STANCHEVA, 1981

(Pl. 17, fig. 18)

Dimensions: 0.40, 0.20 mm (SG298).
Remarks: Fresh-water.
Occurrence: Polemi: 10354.

Candona (Pontoniella) truncata SOKAC, 1972

(Pl. 17, fig. 17)

Dimensions: 0.73, 0.33 mm (SG297).
Distribution: Late Pontian: Pannonian Basin (SOKAC, 1989).
Remarks: Fresh-water.
Occurrence: Polemi: 10354.

Candona (Pontoniella) sp. 1

Remarks: Fresh-water.
Occurrence: Polemi: 10354.
Candona (Pontoniella) sp. 2

Remarks: Fresh-water.
Occurrence: Polemi: 10354.

Candona (Pontoniella) sp. 3

(Pl. 18, fig. 1)

Dimensions: 0.48, 0.25 mm (SG299).
Remarks: Fresh-water.
Occurrence: Amargeti: 10466.

Candona (Pontoniella) sp. 4

(Pl. 18, fig. 2)

Dimensions: 0.66, 0.36 mm (SG300).
Remarks: Fresh-water.
Occurrence: Polemi: 10355.

Candona (Pontoniella) sp. 5

(Pl. 18, fig. 3)

Dimensions: 0.78, 0.36 mm (SG301).
Remarks: Fresh-water.
Occurrence: Polemi: 10354, 10355.

Candona (Pontoniella) sp. 6

(Pl. 18, fig. 4)

Dimensions: 0.39, 0.20 mm (SG302).
Remarks: Fresh-water.
Occurrence: Polemi: 10354.

Subgenus *Typhlocyprella* Krstic, 1972

*Candona (Typhlocyprella) annae* KRSTIC, 1972

(Pl. 18, fig. 5)

**Dimensions:** 0.94, 0.46 mm (SG303).

**Remarks:** Fresh-water.

Occurrence: Polemi: 10355.

Genus *Cavernocandona* Hartmann, 1964

*Cavernocandona rouixensis* CARBONNEL, 1969

(Pl. 18, fig. 6)

**Dimensions:** 0.51, 0.33 mm (SG304).


**Remarks:** Fresh-water.

Occurrence: Dhrymou: 9913.

**FAMILY CYPRIDIDAE** Baird, 1845

**SUBFAMILY CYPRINOTINAE** Bronstein, 1947

Genus *Cyprinotus* Brady, 1866

*Cyprinotus salinus* (BRADY, 1868)

(Pl. 18, fig. 7)

**Dimensions:** 0.72, 0.50 mm (SG305).
**Distribution:** Recent: Europe, E. Asia, N. Africa, N. America (KLIE, 1938); Holocene-Interglacial: Germany (LUTTIG, 1955); Pliocene-Pleistocene: Turkey (FREELS, 1980); Tortonian: France (CARBONNEL, 1969); Late Pliocene-Pleistocene: Peloponnesos (DANATSAS, 1989).

**Remarks:** Marine.

**Occurrence:** Dhrymou: 9906, 9912, 9927; Polemi: 10354, 10355; Amargeti: 10344.

**SUBFAMILY EUCYPRIDINAE Bronstein, 1947**

Genus *Stanchevia* Krstic, 1968

*Stanchevia* sp.

(Pl. 18, fig. 8)

**Dimensions:** 0.44, 0.22 mm (SG306).

**Remarks:** Fresh-water.

**Occurrence:** Polemi: 10354.

**SUBFAMILY CYPRIDINAE Baird, 1845**

Genus *Cypris* Mueller, 1776

*Cypris* sp.

(Pl. 20, fig. 11)

**Dimensions:** 0.39, 0.25 mm (SG339).

**Remarks:** Non-marine.

**Occurrence:** Pissouri: 9462.

**FAMILY CYPRIDOPSISIDAE Kaufmann, 1960**

**SUBFAMILY CYPRIDOPSISINAE Bronstein, 1947**

Genus *Potamocypris* Brady, 1870

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Potamocypris fulva (BRADY, 1868)
(Pl. 18, fig. 9)

Dimensions: 0.48, 0.29 mm (SG307).


Remarks: Non-marine.

Occurrence: Dhrymou: 9916.

Potamocypris sp.

Remarks: Non-marine.

Occurrence: Dhrymou: 9914.

ORDER UNCERTAIN

Species represented by only one individual which lack diagnostic characters to help their classification.

FAMILY UNCERTAIN

SUBFAMILY UNCERTAIN

Genus et sp. indet. 1

Occurrence: Mari: 9430.

Genus et sp. indet. 2
(Pl. 20, fig. 9)

Dimensions: 0.61, 0.37 mm (SG337).

Occurrence: Amargeti: 10347.
Genus et sp. indet. 3

(Pl. 18, fig. 10)

Dimensions: 0.34, 0.20 mm (SG308).

Occurrence: Dhrymou: 9912.

Genus et sp. indet. 4

Occurrence: Steni: 9531.

Genus et sp. indet. 5

Occurrence: Steni: 9531; Dhrymou: 9912.

Genus et sp. indet. 6

Remarks: (broken).

Occurrence: Mari: 9442.

Genus et sp. indet. 7

Occurrence: Polemi: 10358.

Genus et sp. indet. 8

Occurrence: Steni: 9534.

Genus et sp. indet. 9

(Pl. 18, fig. 11)

Dimensions: 0.76, 0.43 mm (SG309).
Occurrence: Dhrymou: 9920.

Genus et sp. indet. 10

(Pl. 18, fig. 12)

Dimensions: 0.55, 0.29 mm (SG310).
Occurrence: Steni: 9540; Polemi: 10356; Pissouri: 9462.

Genus et sp. indet. 11

Occurrence: Steni: 9540.

Genus et sp. indet. 12

Occurrence: Steni: 9540.

Genus et sp. indet. 13

(Pl. 18, fig. 13)

Dimensions: 1.10, 0.55 mm (SG311).
Occurrence: Dhrymou: 9921
CHAPTER 5

BIOSTRATIGRAPHY

5.A. Introduction

This chapter contains ostracod data and results that can be of biostratigraphic interpretative value. Although ostracods are believed to be in general of limited biostratigraphical value, it was still thought useful to combine the ecological with biostratigraphical data for the ostracods. The first step towards the stratigraphic evaluation of the ostracod data for the samples of this study was the presentation of the stratigraphical ranges of all the identified taxa. This information is first given for all the species of all the sections together (Fig. 20), and then for the species of each section separately (Figs. 21-26). The range data for these charts have been collected from the literature. In all the charts the species have been arranged according to their first appearance order and then in order of their duration of existence. The ranges of the species in the present study are showed in the distribution charts (Figs. 31-36) and the ages of the samples in the sample schedule table (see end of this chapter).

Due to the nature of the ostracod assemblages found during the course of this study, a diagram that correlates both marine and non-marine stages of Mediterranean and Paratethyan Neogene had to be used in these charts. The one used (Fig. 19), that has been put next to the ranges of the species in the charts, was basically that of ROEGL & STEININGER (1984) and has been modified in the part concerning the Pontian Stage, which according to more recently published palaeomagnetic data (TRUBIKHIN, 1989) is placed higher than it appears to be in the table published by the first two authors. Concerning this diagram, it should also be kept in mind that there are many local modifications (or subdivisions) related to specific Neogene conditions that existed locally in various Paratethyan areas.

On the main range chart (Fig. 20) the most striking observation that can be made is that (looking at the first appearances) 9 groups can clearly be distinguished. These are, according to their first appearance datums (FADs):
<table>
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<tr>
<th>TIME IN MILLION YEARS</th>
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|          |          | CALABRIAN |
|          |          | ROMANIAN  |

Fig. 19: Correlation of Mediterranean and Paratethys stages (modified, after ROEGL and STEININGER, 1984)

- **group 1**: Middle Miocene - N12 (Serravalian) or older, 40 species/subspecies
- **group 2**: Late Miocene - middle N15 (Tortonian), 29 species/subspecies
- **group 3**: Late Miocene - middle N17 (Messinian), 5 species/subspecies
- **group 4**: Latest Miocene - upper N17 (Pontian = Latest Messinian), 15 species/subspecies
group 5: Earliest Pliocene - N18 (Early Zanclean = Late Pontian), 43 species/subspecies

group 6: Early Pliocene - N19 (?Middle-Zanclean), 10 species/subspecies

group 7: Late Pliocene - N20 (Piacenzian), 51 species/subspecies

group 8: Early Pleistocene - N22 (Calabrian), 30 species/subspecies

group 9: Late Pleistocene - upper N22 (Late Calabrian), 4 species/subspecies

The distinction of these groups was based on the occurrence of at least four species with the same FAD. Further, as can be seen in the diagram there are groups of three or less species but they were not reliable or biostratigraphically important (for example, the group consisting of the species *Argilloecia kissamovensis* and *Parakrithe dactylomorpha* indicative of the N16 planktonic foraminiferal biozone). Also, this poor representation may indicate reworking in certain cases.

A major characteristic of the above groups is that (as can be seen from the biostratigraphic base-limits in the parentheses) they consist of Mediterranean or Paratethyan assemblages. The only exception in this rule is group 5 which includes ostracod assemblages from both the above geographical areas. This means (if there is no mixing of faunas) that in the beginning of the Pliocene (where group 5 appears) some areas of Cyprus were characterized by Paratethyan-like environments (with brackish or freshwater species) and others by Mediterranean-like conditions (with full marine species). This pattern will be more thoroughly examined and discussed for each section separately in order to have more precise and geographically restricted interpretations.

For all the sections, the existence of representatives of group 1 indicates a pre-Messinian age with a base that starts in or before the Middle Miocene (planktonic foraminiferal zones N12 or earlier - lowest N15). Group 2 species start from the base of the Late Miocene and indicate a Tortonian age. Groups 1 & 2 combined, give a Tortonian age when there is co-existence of ostracods from both the groups, while the existence of only species from group 1 would indicate a pre-Tortonian age. In the same sense, combining groups 3, 4 and 5 (partly) the age ranges are in correspondence: Early Messinian (pre-Pontian), Late Messinian-Early Zanclean (Early Pontian) and Early Zanclean (Late Pontian). The ostracods of these
three groups cannot normally co-exist with later or previous groups (e.g. group 2) due to their paratethyan character. The obvious characteristic of these species in this chart is (with few exceptions) their very short durations. For the rest of group 5 the durations start to increase again (as in groups 1 and 2) indicating a Pliocene age for this Mediterranean-like assemblage. Further, combining this part of group 5 with group six, an Early Zanclean age (N18 planktonic foraminiferal zone) can be given to this part of group 5. Consequently, the combination of the rest of the groups gives the following ages for each one of them:

- group 6: Mid-Late Zanclean (N19)
- group 7: Piacenzian (N20-N21)
- group 8: Early Calabrian (lower N22)
- group 9: Late Calabrian (upper N22)

KRSTIC & STANCHEVA (1989) point out that according to studies of BENSON (1972a) and CARBONNEL (1978) Cyprus had no real Pontian ostracods, but this is probably due to the fact that they studied samples from off-shore cores, while the present study examines land sections and is the first time that characteristic Pontian ostracods are reported from Cyprus.

A species worthy of attention is *Loxoconcha (Loxocorniculina) djaffarovi*, around which much discussion has taken place. This is basically due to the usefulness of this species for the biostratigraphy of the Late Miocene and the fact that many researchers have used it in order to establish biozonation systems in different areas of the Mediterranean. For this species, CARBONNEL (1978) uses the co-existence of planktonic foraminifera for dating of the *L. (L.) djaffarovi* zone and gives a N17 age for Spain and Italy, N17 - before the end of Messinian for Crete, top N17/base N18 for Corsica, and lower N19 (with questionable base) for southern France.

Another important component of the Cyprus ostracod assemblages is *Callistocythere montana*. In all previous references (e.g. Tunisia, Sicily and Turkey) this species is reported as being characteristic of the Late Miocene, while in Cyprus it was
range for this section is from Middle Miocene (N1) or earlier to Early Pleistocene
I: *Leptocythere multipunctata* (SEG UENZA, 1884)
*Paracytheridea depressa* MUELLER 1894
*Mytilus retiformis* (TERQUEME, 1878)

I: *Candona* (Cataptocypria) halcarctica ZALANEK
*Tyrrhenocythere pignatii* RUGGERI, 1955
*Buntonia (Quasibuntonia) scguenziana* (ROGER, 1958)
*Pokomyclla deformis* (REUSSE)
*Cyclotherella (Cyctercellda) terquejni SISINCE, 1972
*Cyctercropteron actinulum*
*Cyctercellda (Cyctercelloidca) beckmanni BARBEITO-GONZALEZ, 1971
*Aurila cruciata* (ROGER, 1950)
*Pontocypris mytiloides* (NOREMAN, 1862)
*Loxoconcha ovulata* (COSTA, 1835)
*Falunia (Hiltermannicythere) rugosa* (COSTA, 1853)
*Cistacythereis pokorrenyi hellenica* UUCZNY, 1969
*Aurila convexa emathiae* UUCZNY, 1969
*Aurila vena* (SEGUENZA, 1883)

I: *Monoceratina mediterranea* SISINCE, 1972
*Aurila lanceaeformis* UUCZNY, 1969
*Aurila loboides* UUCZNY, 1969
*Pseudocytherura calcarata* (SEGUENZA, 1880)
*Hemicytherura hellenica* SISINCE, 1972
*Leptocythere (Amnicythere) affinis* (BRADY, 1869)
*Semicytherura acuticostata* (SARS, 1866)

I: *Buntonia multicornata* (ROGER, 1894)
*Cytheromorphareticulata* COLALONGO-APASINI, 1980
*Cartnocythereis antiquata* (BAIRD, 1850a)
*Elexus obtuaa* ROGER, 1962b

I: *Paracytheridea parallia* BARBETO-GONZALEZ, 1971
*Neonesidea formosa* (BRADY, 1868)
*Krithe praetexta* (SARS, 1866)
*Kroemmehideinella coae* (MOSTAWIA, 1983)
*Semicytherura incongruens* (MUELLER, 1894)
*Semicytherura spratti* SISINCE, 1972
*Semicytherura paradoxa* (MUELLER, 1894)
*Semicytherura inversa* (SEGUENZA, 1880)

I: *Cytheropilidella (Eqtapholera) malaensis KINGMA, 1948
*Rocythereis favosa* (ROEMER, 1838)
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<td>Mediterranean</td>
<td>Eastern Paratethys</td>
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- **Middle Eocene**
  - Tethys:...
  - Atlantic:...
  - Mediterranean:...
  - Eastern Paratethys:...

- **Late Eocene**
  - Tethys:...
  - Atlantic:...
  - Mediterranean:...
  - Eastern Paratethys:...

- **Early Oligocene**
  - Tethys:...
  - Atlantic:...
  - Mediterranean:...
  - Eastern Paratethys:...

- **Late Oligocene**
  - Tethys:...
  - Atlantic:...
  - Mediterranean:...
  - Eastern Paratethys:...

- **Early Miocene**
  - Tethys:...
  - Atlantic:...
  - Mediterranean:...
  - Eastern Paratethys:...

- **Late Miocene**
  - Tethys:...
  - Atlantic:...
  - Mediterranean:...
  - Eastern Paratethys:...

- **Early Pliocene**
  - Tethys:...
  - Atlantic:...
  - Mediterranean:...
  - Eastern Paratethys:...

- **Late Pliocene**
  - Tethys:...
  - Atlantic:...
  - Mediterranean:...
  - Eastern Paratethys:...

- **Pleistocene**
  - Tethys:...
  - Atlantic:...
  - Mediterranean:...
  - Eastern Paratethys:...

- **Holocene**
  - Tethys:...
  - Atlantic:...
  - Mediterranean:...
  - Eastern Paratethys:...

**Key species**
- *Cytherella (Cytherella)*...
also found in Pliocene samples. So, the range of this species should probably be extended in the Pliocene.

Some purely continental (freshwater) ostracods (*Pontoniella, Camptocypria, Euxinocythere*) form a group that is clearly distinguishable in the range chart as indicating a Pontian age. In Yugoslavia (SOKAC, 1972) the *Pontoniella* fauna is one of the major ingredients characterizing the Late Pontian age deposits. Concerning *Pontoleberis attilata*, SOKAC (1972) has found it in the uppermost part of the Pannonian in Yugoslavia while OLTEANU (1989a) found it only in the Pontian of the Dacic Basin. The age range of *Amnicythere litica* is considered to be N17/base N18 in France (CARBONNEL, 1978) or Late Pontian in other areas (Pannonian and Dacic Basin). Concerning the age of *Tyrrhenocythere pannonicum*, it is thought by OLTEANU (1989b) to be restricted to the upper part of Lower Pontian, while the same author suggests that the appearance of the genus *Tyrrhenocythere* marks always the base of the Lower Pontian.

*Agrenocythere pliocenica* first appeared in the Mediterranean in the *Globorotalia margaritae* zone (Middle Zanclean). In Crete it does not range above the *G. margaritae - G. puncticulata* concurrent-range zone (Upper Zanclean), while in Italy it ranges up into the lower Pleistocene (BENSON, 1972b; VAN HARTEN, 1984).

5.B. Biostatigraphical analysis of the sections

Information of biostratigraphical value from the study of each one of the sections is given here, together with their dating based on the recognition of the above groups in their range charts. The ranges in the charts are total ranges from literature sources.

5.B.i. Steni (Fig. 21)

Groups 1, 2, 5, 6, 7 and 8 are recognized in the range chart of this section. So, combining the age information that was given above for these groups, the age range for this section is from Middle Miocene (N12 or earlier) to Early Pleistocene.
Fig. 2: Range chart presenting the age-ranges of the species recovered from the sediments. The chart includes various species from the MIOCENE to the PLIOCENE, with a focus on the species distribution across different time periods. The chart is labeled with different epochs and shows a timeline from MIOCENE to PLIOCENE.
(lower N22) with a gap during the whole Messinian (upper N17). The age range that foraminifera gave for this section (WEST, 1988) is Latest Miocene-Late Pliocene (Piacenzian). The character of all the section is Mediterranean-like.

5.B.ii. Dhrymou (Fig. 22)

Groups 1, 2, 5, 6, 7 and 8 are recognized in the range chart of this section, while there are also signs of the groups 3 (Potamocypris fulva), 4 (Loxoconcha muelleri and Loxoconcha spinosa) and 9 (Ilyocypris biplicata and Buntonia multicostata). So, combining the age information that was given above for these groups, the age range for this section is from Middle Miocene (N12 or earlier) to Early Pleistocene (lower N22). The age range based on foraminiferal results for this section (NASIB, 1986) is Latest Miocene - (at least) Late Pliocene (Piacenzian). There is no foraminiferal record in the above M.Sc. report for the three top samples of the section (9928, 9929, 9930).

In this section, the existence of Paratethyan-like conditions (groups 3 and 4) characterizes the Messinian equivalent time-span. The existence on the other hand of only three paratethyan representatives could palaeogeographically mean that:
- either the Paratethyan-like conditions lasted for very short period (and so there was not enough time for other species to appear) or they were geographically very restricted (and so the specific ecological conditions did not allow to other species to develop);
- or the other species (if ever present) were eroded away with their contemporary sediments.

The character of the rest of the section is Mediterranean-like.

5.B.iii. Polemi (Fig. 23)

Groups 1, 2, 3, 4, 5, 6, 7 and 8 are recognized in the range chart of this section, while there are also signs of group 9 (Callistocythere gilva). So, combining the age information that was given above for these groups, the age range for this
section is from Middle Miocene (N12 or earlier) to Pleistocene (N22). In this section, the existence of Paratethyan-like conditions (groups 3, 4 and partly 5) characterizes the equivalent to Messinian time-span, separating clearly Mediterranean (long ranged) from Paratethyan (short ranged) giving in this way representatives for all the transitional stages from the Middle Miocene till the Pleistocene. The age range based on foraminiferal and calcareous nannofossil results for this section (OUTRAM & McCARTHY, 1990) is generally Tertiary - Recent.

5.B.iv. Amargeti (Fig. 24)

Groups 1, 2, 3, 4, 5, 6, 7 and 8 are recognized in the range chart of this section. So, combining the age information that was given above for these groups, the age range for this section is from Middle Miocene (N12 or earlier) to Early Pleistocene (lower N22). The age range based on foraminiferal and calcareous nannofossil results for this section (RADLEY & MONTEJAR, 1990) is Middle Miocene - Quaternary.

In this section, the existence of Paratethyan-like conditions (groups 3 and 4) characterizes the equivalent to Messinian time-span. As in Dhrymou section, the existence of only three paratethyan representatives could mean that:
- either the Paratethyan-like conditions lasted for very short period (and so there was not enough time for other species to appear) or they were geographically very restricted (and so the specific ecological conditions did not allow to other species to develop);
- or the other species (if existed) were eroded away.

The existence of only one Paratethyan representative in group 5 (Cyprideis triangulata) most probably indicates that Pliocene was initiated in this area with freshwater conditions (which continued from Miocene) and then transformed rapidly to deep marine ones.

The rest of the section shows a Mediterranean-like character.
<table>
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<th>PLEISTOCENE</th>
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<td>EARLY</td>
<td>LATE</td>
<td>MIDDLE</td>
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**PLANKTONIC FORAMINIFERA**
Kivity compessa (dertonensis) RUGGIERI, 1962b
Kivity cistae OERTLI, 1961
Cythereella (Cythereella nassa) SISLINGH, 1972
Cythereella (Cythereella postdentica) OERTLI, 1961
Buntonia (Buntonia) nubecula (dertonensis) RUGGIERI, 1954
Annularia lancea CARBONNEL, 1969
Xestoleberis ventricosa MÜLLER, 1944
Bythocypris buquetiana BRADY, 1866
Henrykowella superba REUSS, 1849
Costa base (BRADY, 1866)
Aurila species BRADY, 1866
Cythereella (Cythereella: valgata) RUGGIERI, 1962
Kivity mordovensis: CRESTI, 1954
Kivity anapudosa CLAMPS, 1853
Profoundotheure: splendidula COLES & WHITLE, 1899
Caudice valensima CRESTI, 1954
Calliscythere montana DORUK, 1960
Calliscythere macularia CLAMPS, 1853
Bythocypris lucida SEGURGA, 1898
Incongruellina: Leonorina: kaapi SISLINGH, 1972
Parastera dactylomorph RUGGIERI, 1962
Cyprea torosa JONES, 1857
Xestoleberis communis MÜLLER, 1844
Custumadina elongata (BRADY, 1866a)
Argilloecia tonisinae: SISLINGH, 1972
Tornocythere sp. (RUGGIERI, 1953
Lesorooncha petala LITENTAL, 1929
Lesorooncha malbergi MEHE, 1898
Cyprea redux: triangularis KRESTIC, 1963
Obtacythereis mediterranea BENSON
Cytheropteron semilunum
Kyoroecia deforme REUSS, 1850
Cythereella (Cythereella: ternata) SISLINGH, 1972
Xestoleberis margarita BRADY, 1866
Xestoleberis dissect MÜLLER, 1844
Aurila pigadiana SISLINGH, 1972
Aurila preussia ULCZENY, 1869
Hemicytherea balanica SISLINGH, 1972
Pentacythereis chrysocephala DERJAVET, 1852
Monacosmina mediterranea SISLINGH, 1972
Bythocypris obtusa SARS, 1866
Aurila fuscolactis ULCZENY, 1869
Argilloecia caudata MÜLLER, 1844
Neocythereis fusca (BRADY & ROBERTSON, 1854)
Carnucythereis antiqua: (BAINDE, 1857a)
Polycope orbicularis SARS, 1866
Argilloecia aequinoctialis MÜLLER, 1844
Lenaecythereis decipiens MÜLLER, 1846
Pontocythereis aequinoctialis MÜLLER, 1844
Cytheromorpha fusca (BRADY, 1866)
5.B.v. Pissouri (Fig. 25)

Groups 1, 2, 5, 6, 7 and 8 are recognized in the range chart of this section. So, combining the age information that was given above for these groups, the age range for this section is from Middle Miocene (N12 or earlier) to Early Pleistocene (lower N22) with a gap during the whole Messinian (upper N17). According to the Planktonic Foraminiferal and Calcareous Nannoplankton biostratigraphical data of the MSc reports for this area, there are no pre-Pliocene markers. The age range of the M.Sc results for this section (PEARCE, 1985 and LI, 1985) is Late Zanclean - Pleistocene. The character of all the section is Mediterranean-like.

5.B.vi. Mari (Fig. 26)

Groups 1, 2, 5, 6, 7 and 8 are recognized in the range chart of this section. The whole Mari section is of Pliocene age. The age range based on ostracod results for this section (PAVLAKELLI, 1986) is Early Pliocene (Zanclean). The character of all the section is Mediterranean-like.

5.C. Conclusions

It is noteworthy that the ostracod range charts give a clear indication of Serravalian - Tortonian marine conditions, which stopped during the Messinian. This is indicated in most of the charts from the absence of ostracod associations indicative of that age. On the other hand, whenever an assemblage exists indicative of that age (i.e. Amargeti, Polemi, Dhrymou) this consists of Paratethyan representatives. Later, in the Pliocene, there is a distinct re-establishment of marine conditions which was rapid in the areas where Messinian assemblages were “missing”. When they are present, however, in the form of Pontian palaeo-faunas, then a transition from the Early Pontian freshwater conditions to the marine ones can be observed.

An interesting point observed in this chapter is that in all the sections where calcareous nannofossils and/or foraminifera were recovered (Steni, Dhrymou, Polemi,
Amargeti, Pissouri) ostracods were able to give more precise biostratigraphical ranges than the studies based on the former organisms due to:

- very poor preservation of the former (being the result of transportation and/or unfamiliar environment)
- complete missing of any record of the former (as a result of unfamiliar environment).
MEDITERRANEAN OECULAR PARATETHYS

EASTERN PARATETHYS

Cystocythereis (Cystocythareis) possumita (REUSSE 1961)

Atrangilinae (BRADT 1830)

Eucytherura scabrum (MÜLLER 1830)

Hemicytherea anomala (REUSSE 1849)

Acanthocythereis hystricata (REUSSE 1849)

Costa bavarica (BRADT 1866)

Kriegerina (KRIEGERINA) sublimis (COLES. WHATELEY 1989)

Loxoeancha rhodoides (FISCHER 1835)

Cyctocythereis (Cystocythereis) perlata (REUSSE 1830)

Xestoleberis decipiens (FULLER 1894)

Pragia triloba (SEGUEZ 1880)

Pseudocyctocythereis pheboides (COLES. WHATELEY 1989)

Costa sdavarda (ROEMER 1838)

UaUa fissata (UAUATA) subdilata (COLES. WHATELEY 1989)

Loxoeancha retiformis (TERQUEM 1878)

Microcytherea angulosa (SEGUEZ 1880)

Falteria (Falteria) sphaerulata (FOKES 1836)

Eucytherura gibbera (EDEL 1894)

Calystocythereis palula (MÜLLER 1894)

Aurila cruciata minor (UUCZNY. 1969)

Cytheropteron punctatum (BRADT 1868a)

Paracythereidea parallia (BARBETTO-GONZALEZ 1971)

Paracythereidea depressa (MÜLLER 1894)

Neocythereidea fasciata (BRADY-A.ROBERTSON 1874)

Loxoeancha stellifera (MÜLLER 1894)

Microcytherea angulosa (SEGUEZ 1880)

Falteria (Falteria) sphaerulata (FOKES 1836)

Eucytherura gibbera (EDEL 1894)

Calystocythereis palula (MÜLLER 1894)

Aurila punctata retilensis (BASSIOUNI. 1966)

Argilloecia ktsstuaavensis (SISSINGH. 1972)

Pachycaudites ungeri

Semicytherea rarata (MÜLLER 1894)

Senticytherea inversa (SEGUEZ. 1880)

Bosquetina rhodiensis (SISSINGH. 1972)

Aurila vertihae (UUCZNY. 1969)

Aurila aspidoides (UUCZNY. 1969)

Xestoleberis margaritea (BRADY. 1866)

Xestoleberis dispar (MÜLLER 1894)

Aurila pigadiana (SISSINGH. 1972)

Quadracythere (Quadracythere) prava (BAIRD. 1850b)

Oraptocythere h-scripta (CAPEDE 1900)

Hemicytherea gracilicosta (RUGGIERI. 1933c)

Bairdopila (Bairdopila) supradentata (TERQUEM. 1878)

Argilloecia cylindrica (MÜLLER 1894)

Hemicytherea hellertica (SISSINGH. 1972)

Eucytherura campleri (BRADY. 1866)

Semicytherea ptmctata (MÜLLER. 1894)

Btm sortia (Btm sortia) sestrodena (TERQUEM. 1878)

Aurila loboides (UUCZNY. 1969)

Aurila lanceaeformis (UUCZNY. 1969)

Aurila lanceaeformis (UUCZNY. 1969)

Bythocypris obtusata (SARS. 1869)

Larvacea ovulata (COSTA. 1833)

Falteria (Falteria) rugosa (COSTA. 1833)

Buntonia textilis (BONADUCE CIA MPO 1973)

Bairdopila (Bairdopila) appala (SISSINGH. 1938)

Hemicytherea videns (MÜLLER 1894)

Cystacythereis (Cystacythereis) beckmanni (BARBETTO-GONZALEZ 1971)

Cystacythereis (Cystacythereis) terquemi (SISSINGH. 1972)

Obhtacythereis medkterritea (BENSON.

Cystacythereis (Cystacythereis) cenucola (COLES. WHATELEY 1989)

Cytherella (Cytherella) beckmanni (BARBETTO-GONZALEZ 1971)

Cytherella (Cytherella) terquemi (SISSINGH. 1972)

Obhtacythereis medkterritea (BENSON.

Cystacythereis (Cystacythereis) cenucola (COLES. WHATELEY 1989)

Cytherella (Cytherella) beckmanni (BARBETTO-GONZALEZ 1971)

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Obhtacythereis medkterritea (BENSON.

Cystacythereis (Cystacythereis) cenucola (COLES. WHATELEY 1989)

Cytherella (Cytherella) beckmanni (BARBETTO-GONZALEZ 1971)

Cytherella (Cytherella) terquemi (SISSINGH. 1972)

Obhtacythereis medkterritea (BENSON.
Sample Schedule: localities, locations, sample numbers, fractions analyzed and ages.

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<td>150</td>
</tr>
<tr>
<td>PO 12</td>
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CHAPTER 6

PALAEOECOLOGY

6.A. Introduction

For the palaeoecological interpretation of the sections studied in this work, the numbers of adult and juvenile carapaces, right valves and left valves of the ostracod assemblages found in the samples were counted and are given in the distribution charts (Figs. 31-36). The dataset comprises 110 samples from 6 sections from west and southwest Cyprus. From these samples, 6148 valves of ostracods belonging to 105 genera and 410 species were picked and examined. In all the charts the species have been arranged according to their first appearance level (FAD = First Appearance Datum), and then according to their duration in the samples.

For each section, the samples containing ostracods are given below, accompanied by information concerning other co-existing organisms and transportation of sediment and/or ostracods. Finally, the information that was extracted from the ostracod distribution charts is interpreted palaeoenvironmentally.

6.B. Palaeoecological interpretation of the sections

Before the palaeoecological interpretation of the sections and samples is given, it is thought useful to discuss certain ostracods whose abundance and/or ecological characters are of importance for this study.

Agrenocythere pliocenica is a psychrosphaeric ostracod species quite common in many of the samples of the sections studied here, and it is treated as one of the most trustworthy species for hydrological conditions. The fossil record of Agrenocythere pliocenica, extends from Burdigalian (Spain) up to Lower Pleistocene (Italy). Its geographical occurrence includes only two areas outside the Mediterranean (Spain & along the Atlantic coast of Africa), while inside the Mediterranean, it appears frequently in both the West and East basins, with the eastern record limited up to now to the island of Crete (Greece). The age distribution of Agrenocythere pliocenica in
the Mediterranean, was thought to be from the early Pliocene (*Globorotalia margaritae* zone) up to the early Pleistocene in the Western Basin, and not younger than the *Gbt. margaritae-Gbt. puncticulata* zone (Pliocene) in the Eastern basin. In the samples from Cyprus in the present study, *Agrenocythere pliocenica* appears well into the *Gbt. puncticulata* zone and possibly even survives into the early Pleistocene.

Before the ecological significance of *Agrenocythere pliocenica* will be examined, it was thought to be useful to give some introductory information for the oceanography of the present Mediterranean Sea. The Mediterranean Sea is vertically divided into thermic zones (layers) whose temperature decreases with the depth. A major division shows a deep cold water (<10 °C) layer (psychrosphaere), which is usually found in dense bottom water-masses of the oceans (depth >500m) and a shallower, less stable and warmer layer (thermosphaere). So, the species living above this level are called thermosphaeric, while the ones living below are called psychrosphaeric. The circulation of the present-day Mediterranean (Fig. 27) consists of an incoming surface warm-water layer from the Atlantic, which extends throughout the sea then goes deeper and is directed again to the Gibraltar straits, forming a large deeper Mediterranean water-mass that exits to the Atlantic. The bottom temperature of the present-day Mediterranean is about 13 °C which means that it is not cold enough for the psychrosphaeric species to live there (i.e. it is entirely thermosphaeric).

![Fig. 27: Schematic generalized circulation of the present day Mediterranean (after PERNETTA, 1994).](image)

Ecologically, the existence of *Agrenocythere pliocenica* in the Mediterranean during the Pliocene and possibly also the Pleistocene, can only be explained by accepting that during the early Pliocene (after the Messinian Salinity Event) there was
an influx to the Mediterranean of deep, cold water from the Atlantic, which requires a completely reversed Mediterranean circulation (Fig. 28) from the present day one (VAN HARTEN, 1984). The existence of this species in both the Western and Eastern Basins of the Mediterranean also means that the psychrosphaeric conditions lasted until the Pleistocene in the whole of the Mediterranean.

Fig. 28: Schematic diagram showing the circulation of the Mediterranean Sea during the Early Pliocene. Light sea color: Thermosphaere; Dark sea color: Psychrosphaere (from VAN HARTEN, 1984).

Depth distribution information that will be useful for the interpretation of the most important ostracods of this study is given below.

<table>
<thead>
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<th>GENUS / SPECIES</th>
<th>DEPTH RANGE (m)</th>
<th>Optimum depth (m)</th>
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</tr>
<tr>
<td>Aurila</td>
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</tr>
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</tr>
<tr>
<td>Buntonia</td>
<td>&lt;100</td>
<td>NK</td>
</tr>
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<td>Neocytherideis</td>
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<td>Urocythereis</td>
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<td>Quadracythere</td>
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<td>NK</td>
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<tr>
<td>Eucythere</td>
<td>&lt;100</td>
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<td>NK</td>
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<td>Species</td>
<td>Range</td>
<td>NK</td>
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<tr>
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<td>Loxoconcha</td>
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<td>Argilloecia</td>
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<tr>
<td>Acanthocythereis</td>
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<tr>
<td>Bosquetina</td>
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<td>120-170</td>
</tr>
<tr>
<td>Bythocypris</td>
<td>&gt;800</td>
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(NK = Not Known)

The data for the above table have been taken from BONADUCE et al. (1975); BENSON (1975, 1976, 1978); ASCOLI (1965); SISSINGH (1972, 1975, 1976); PEPOUQUET (1979); PURI et al. (1965, 1969); and BENSON & SYLVESTER-BRADLEY (1971).

As will be seen later in this chapter, there is on some occasions a mixing of deep with shallow water ostracods. In such cases the assemblages are not both in situ. The reason for that mixing can be tectonic activity or hydrological conditions (such as currents). The ecological terms used to characterize autochthonous and allochthonous assemblages are Biocoenosis, Thanatocoenosis and Taphocoenosis.

There seems to be confusion concerning the meaning of the terms thanatocoenosis and taphocoenosis which many authors in the past 10-15 years have suggested as synonyms, meaning in general the post-mortem assemblage. Both thanatocoenosis and taphocoenosis are derivatives of the Greek words thanatos=death + coenosis=community and taphos=grave + coenosis=community respectively. Following this, the term thanatocoenosis should be used for a death assemblage of animals which died together (apparently from the same reason). So this term actually fully corresponds to the dead biocoenosis (= the living assemblage). Further, the term taphocoenosis should be used for a death assemblage of animals that have been found in the same grave (i.e. were buried together), without this meaning that they necessarily
lived or even died together. A *taphocoenosis* may consist of either purely transported or untransported organisms or of mixed transported and untransported ones. The only case when *thanatocoenosis* and *taphocoenosis* can be of the same meaning (but are not synonyms) is when the *taphocoenosis* consists entirely of untransported organisms (i.e. organisms that lived, died and were fossilized together).

Indications of whether an assemblage is transported or not can be extracted from the ratio of valves to carapaces (see distribution charts for this study), from the ratio of left-right valves (also in distribution charts for this study), from the ostracod shell preservation and colour in relation to that of the host sediment (see text here and Chapter 2), from the species composition of the sample (see distribution charts and Fig. 37), from the abundance of certain species to the overall ostracod content of the sample (see various sections here) and from the study of the ontogenetic stages of ostracods present (see example with *Cyprideis torosa* from Amargeti below).

This latter technique is based on the suggestion that (under normal circumstances) a biocoenosis will consist of both larval and adult representatives with the larval ones being clearly the dominant. This model is modified immediately with the death of the biocoenosis depending on the hydrological conditions of the environment in which the biocoenosis lived. When the biocoenosis dies, its particles are either deposited on the bottom of that water environment and so a thanatocoenosis is formed, or they can be wholly or partially transported away (usually by currents) from their initial living environment, forming a taphocoenosis. If the currents are of low velocity (=low transportation ability) and the morphology allows it, then a segregation will occur with the loss of the parts that are more likely to be transported due to their shape (e.g. carapaces) and/or weight (e.g. early ontogenetic stages and juveniles of small-sized species). Depending then on the substrate morphology and the current velocity the segregation will be of smaller or larger scale. Following this logic, WHATLEY (1983) suggests three population age structure diagrams (Fig. 29) trying to model the ostracod assemblages. More specifically, he suggests that a "low-energy biocoenosis" (Type A) is composed of adults of both sexes and a large number of juveniles, ranging well back into ontogeny. A "high-energy biocoenosis" (Type B) will consist of adults still present, together with some of the larger juveniles. Type B diagram could also represent a "high-
energy thanatocoenosis”. Finally, a “low-energy thanatocoenosis” (Type C) assemblage would consist of only juvenile representatives.

To demonstrate the above technique, the population age-structures of *Cyprideis torosa* from the samples of the Amargeti section were plotted (Fig. 30). For samples 10468, 10348 and 10346 no diagrams were plotted due to the insignificant numbers of *Cyprideis* specimens. According to the above suggestions of WHATLEY (1983), low-energy biocoenosis environments are suggested for samples 10351, 10347 and possibly 10342, while for samples 10466 and 10467 low-energy thanatocoenosis environments indicated.

6.B.1. Steni (Fig. 31)

From the sixteen samples that have been examined, nine have been found to contain ostracods. These are: 9531, 9532, 9533, 9534, 9535, 9536, 9537, 9539 and 9540 from bottom in stratigraphical order. All these samples were also found to contain
Fig. 30: ONTOGENETIC STAGES OF CYPRIDEIS TOROSA IN THE SAMPLES OF AMARGETI

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LEGEND TO ALL THE CHARTS

A) LITHOLOGY

- **Conglomerate**
- **Marl**
- **Sand**
- **Clay**
- **Silt**
- **Gypsum**
- **Limestone**

B) SAMPLES

- **Barren**

Specimens = Valves + Carapaces
Fig. 3: Distribution of elements in the samples of the Third section.
Planktonic and/or Benthic foraminifera. 966 valves of ostracods were picked from the samples and their distribution is shown in Fig. 31. As can be seen in the diagram, the samples contain almost equal amounts of ostracods, all of marine nature. In all the samples, it is noteworthy that there is a good balance between left/right valves (indicative of more or less autochthonous assemblages) as well as the almost complete absence of carapaces (indicative of less stable environmental conditions, in which currents were able to transport the carapaces but not the majority of the single shells).

Looking at the vertical distribution of ostracods to the samples, the first (stratigraphically) sample containing ostracods is 9531. It contains very few ostracod representatives (11 valves in total) some of which are also distributed in younger samples but in minor quantities. This assemblage is indicative of deep marine (upper bathyal) conditions. Further up the section, one can observe a distinct assemblage of five species throughout the rest of the section. These are: Henryhowella asperrima, Argilloecia kissamovensis, Bythocypris lucida, Kriste producta and Kriste sp. 5, all characteristic of deep-marine environments. In addition to those, Agrenocythere pliocenica is also a component of these samples but it disappears at the top (sample 9539) of the section. The vertical distribution of the above ostracods is only disrupted in sample 9538 which was found barren in all kinds of organisms. All the above species are known to have lived in deep water environments and since they form the major element of all the samples in which they occur, these are the depth conditions that are suggested to have existed in this area for Pliocene time. For the part of the section covered by samples 9536-9539, psychrophaeric conditions are thought to have existed from the good evidence of Agrenocythere pliocenica.

6.B.2. Dhrymou (Fig. 32)

Twenty one out of twenty seven samples examined from this section have been found to contain ostracods. These are 9904, 9906-9914, 9916, 9919-9923, 9925-9928 and 9930 from bottom in stratigraphical order. 1139 valves of ostracods were picked from the samples and their distribution is shown in Fig. 32. In that figure considerable variation in abundance and occurrence can be observed, probably reflecting alternations of favourable-unfavourable conditions (stable/unstable environments?) for the ostracods.
Some of the samples were found to have very noticeable signs of transportation. More specifically, the sediment of the samples 9904, 9921, 9922, 9927, 9928 and 9930 looks reworked. In 9904, the amount of fossils in general is very small with Planktonic and benthic forams, ostracods and bryozoans present; in 9930 recrystallized gastropods, transported benthic forams and bryozoans are present and it is suggested that the material in both samples is probably transported from shallow warm waters. Sample 9913 contains numerous *Agrenocythere pliocenica in situ*, while the rest of the ostracods look eroded and may be transported. In sample 9914 almost 25% of the grains and fossils look to be transported (yellowish colour) and so the environment was probably open sea with currents.

Further to this, other information was obtained from the distribution chart to help to confirm or reject the transportation idea for the samples. A good balance can be seen in the distribution chart between left-right valves with very few carapaces. The exception to this pattern, is sample 9930 in which a dominance of carapaces is observed with very few valves present, while in 9928 there are no single valves present at all. This confirms the suggestion made above for transportation effects in these samples. In addition to the above, sample 9907 is also suggested to be transported since it only contains one recrystallized ostracod carapace. For the rest of the samples whose sediment had signs of possible transportation no additional information can be extracted from the distribution diagram.

A noteworthy observation in the distribution chart is the sudden increase of the number of species per sample after sample 9907, while higher up another increase in both number of species per sample (see also Fig. 37) and amount of individuals per species and sample becomes obvious (after sample 9911).

An overview of the assemblage components of these samples shows that there is a transition from neritic with brackish influence conditions (pre-9907 samples with *Cyprideis, Loxoconcha* and *Basslerites*) to deep marine (thermosphaeric) (9908-9911 with *Krithe, Parakrithe, Patjenborchella, Semicytherura, Argilloecia, Bythocypris, Loxoconcha, Cytheropteron, Paracytheridea, Urocycythereis, Aversovalva, Occultocythereis, Profundobytghere, Graptocythere, Eucytherura and Pedicythere*) and then to deep marine (psychrosphaeric) (post-9912 samples where the dominant assemblage components are the psychrosphaeric species association of *Agrenocythere pliocenica, Oblitarythereis mediterranea, Henryhowella asperrima* and *Argilloecia kissamovensis*. The psychrosphaeric
conditions were temporarily interrupted by thermosphaeric and were later re-established (samples 9919 and 9921 are lacking the above species assemblage). Finally, from sample 9927 upwards, the psychrosphaeric conditions cease to exist and are replaced by thermosphaeric conditions.

6.B.3. Polemi (Fig. 33)

From the fifteen samples that have been examined, nine have been found to contain ostracods. These are: 10354, 10355, 10357, 10356, 10362, 10361, 10364, 10365 and 10358 from bottom in stratigraphical order. In all the above samples, calcareous nannofossils and benthic and planktonic foraminifera have been reported as co-occurring organisms with the exception of sample 10354 where no forams have been found. 741 valves of ostracods were picked from the samples and their distribution is shown in Fig. 33.

As can be seen from that chart, there are (with the exception of 10354 and 10355) very few common ostracods in any two adjacent samples. This fact clearly indicates the vertical development of different environments through the section. The less species two adjacent samples have in common, the more likely these samples represent different environments. Using this principle, one environment should be accepted for sample 10354, which is then slightly differentiated in sample 10355 with the development of a population consisting of many of the species appearing in 10354 plus some new species. The major components of these samples are species of Candona, Leptocythere, Cyprideis, Tyrrhenocythere, Loxocauda and Loxoconcha. The MSc students (OUTRAM and McCARTHY, 1990) gave in their study (based on foraminifera) a "crisis" environment for sample 10354 of uncertain age and an open ocean continental slope environment (with more inner shelf influences) for sample 10355 of Zanclean-Early Piacenzian (N19-N21) age. Since they did not give any further explanation of "crisis" it is taken here that they meant non-marine conditions for sample 10354 which is supported by the ostracods. Further, for sample 10355 ostracods give a much shallower environment (littoral) with brackish conditions and freshwater (continental) influences. These freshwater signs may very well be the remains of an earlier or adjacent continental environment (sample 10354). The option of an adjacent continental environment is adopted here since sample 10355 was collected from the same level as 10354 but further to north-east. This means that two types of ecosystems
existed at the same time but in different locations, i.e. one ecosystem rich in *Pontoniella*, *Camptocypria*, *Euxinocythere* (sample 10354) in one place, and another with *Tyrrhenocythere*, *Amnicythere*, *Pontoleberis* further north-east (sample 10355). *Loxocorniculina*, various species of *Loxoconcha* and *Cyprideis torosa* were living in both ecosystems, increasing in number in the one with more favourable conditions for each one of the species. The two ecosystems were two warm, saline "lakes" with that of 10354 being less saline (dominance of *Candona*). The existence of planktonic foraminifera in sample 10355 as reported in the MSc study of the area, may reflect the possibility that either i) the ecosystem of this sample was a lagoon connected with the open sea, or ii) it was a lake but something rapid happened, (e.g. eustatic rise of the sea-level or tectonic activity) and there was temporary influx of open marine water. If this happened, the rise of sea-level did not have any influence in sample 10354 probably because it was situated as at the present day higher than 10355. Also the fact that no Pontian ostracods have been recovered from off-shore samples DSDP west of Cyprus (BENSON, 1972a & CARBONNEL, 1978) probably indicates that the sampling area was completely dried-up at that time, which means that the Polemi "lakes" were closed to the west (where the DSDP cores were collected). Concerning the ages of these two samples, their species composition indicates (based to the range chart for this section; Fig. 23) a Pontian age for both the samples.

Going further up in the distribution chart of the Polemi section, sample 10357 contains ostracods indicating a thermosphaeric environment with representatives of *Euxinocythere*, *Eucytherura*, *Pontoleberis* and *Krithe*. Then, in sample 10356, a sudden strong appearance of fully marine (psychrosphaeric) species is shown which are thought to be of Pliocene age. This association has many similarities with both the assemblages of the same age from neighbouring areas (Steni and Dhrymou) and the assemblages that have been recovered from the off-shore DSDP drillings of the.

The genus *Tyrrhenocythere* first appears in sample 10355 with a large number of specimens. SISSINGH (1982) suggested *Tyrrhenocythere* as an immigrant when he found it in an assemblage which is very similar to the one of the present study, but its quantity here is far higher (showing also a good balance between left/right valves) and therefore it should be indigenous to that environment, together with *Loxocorniculina djaffarovi* and *Amnicythere litica*. The favourite environment of the latter is a stenohaline one (salinity about 12-13 %o) with a temperature of 15.5-16 °C (CARBONNEL, 1978).
One of the most dominant species of the post-10355 association in the distribution chart is *Agrenocythere pliocenica*, indicative of psychrosphaeric conditions (i.e. Atlantic cold, dense bottom-waters with temperatures < 8-10°C).

This sudden faunal transition from warm non-marine (15.5-16 °C) to deep cold marine (< 8-10°C) species at the beginning of the Pliocene, shows a rapid change in the environment of the Levantine Basin which is in full accordance with what happened in the Western Mediterranean basins (Balearic, Tyrrhenian) at the same time (BENSON, 1972b). This transition happened possibly as a result of an influx of oceanic waters (with the opening of Gibraltar), which filled up the pre-existing Messinian "lakes" and re-established the marine communication between the Polemi area and the sites of the off-shore drilling west of Cyprus, allowing development of a uniform cold, deep-water ostracod biocomunity.

After the influx of oceanic water, a phase of shallowing occurred in the Late Pliocene (10364) probably causing the mixing of shallow marine (forams in MSc study) and freshwater (ostracods in this and MSc study) faunas, which indicates a shallow near-shore environment. In the beginning of the Pleistocene there was a warm, shallow marine environment (sample 10365) (bioclastic limestones and chalks) while slightly later a deepening (sample 10358), with relatively cooler water seems to have occurred.

6.B.4. Amargeti (Fig. 34)

Eleven out of twenty samples that were examined have been found to contain ostracods among other microfossils. These are 10468, 10347, 10342, 10467, 10348, 10351, 10345, 10465, 10344, 10466 and 10346 and the distribution of the ostracod species in them is presented in Fig. 34. In most of the above samples, ostracods were associated with variable ratios of calcareous nannofossils, benthic and/or planktonic foraminifera accompanied in some cases with fragments of other fossils like bryozoans (sample 10342), echinoid spines (samples 10351,10347 & 10348) and charophytes (sample 10347).

The oldest sample for this section is 10468 showing a very poor ostracod assemblage consisting of *Candona* and *Cyprideis*. The sample does not show any signs of transportation or redeposition and so it is thought to be *in situ*. The environment for this sample is suggested to be fresh-water.
The next sample up the section is 10347 which, compared with the previous one, shows a rapid increase in number of species and specimens. *Cyprideis torosa* dominates this sample representing the 86.5% of the specimens. So, the most probable depositional environment for this sample would be a brackish one with weak marine influence.

In sample 10342, a big reduction of the *C. torosa* is observed, followed by the “dissappearance” of the marine species giving the impression of an environment similar to that of sample 10468 (at the beginning of the section) but more saline (from lack of *Candona* and presence of *Loxoconcha*).

More saline conditions apply to sample 10467 (from the presence of *Cytherelloidea* and *Cytherella*) which later becomes limnic (in sample 10348 with presence of *Cyprideis* and the Paratethyan *Loxoconcha muelleri*).

Next, in sample 10351 an important increase in *Cyprideis* is observed (indicating brackish conditions) accompanied by *Loxoconcha, Callistocythere, Monoceratina, Argilloecia, Xestoleberis* (indicating marine influence). So, the conditions represented by this sample are brackish with marine influence.

For sample 10345 the only ostracods present are *Henryhowella, Carinocythereis* and *Krithe*, indicating the establishment of a deep marine environment in which these species are the first inhabitants. Later, this environment is gradually transformed (through sample 10465) into an environment (10344) with almost psychrosphaeric conditions (*Oblitacythereis mediterranea, Henryhowella asperrima, Argilloecia kisseamovensis*). Not a single valve of the characteristic psychrosphaeric ostracod species *Agrenocythere pliocenica* was found.

Then, in sample 10466, again the disappearance of full-marine species is observed giving place to an assemblage consisting of mainly *Cyprideis* and representatives of *Xestoleberis, Loxoconcha* and *Candona*.

Finally, a slightly marine environment is established at the top of the section (sample 10346) with a very few representatives of *Cyprideis, Loxoconcha, Neocytherideis, Tyrrenocythere* and *Annicythere* indicating mixed brackish (littoral) and shallow marine (inner neritic) conditions.
|--------|---------|-------|

- **Pissouri**
  - Fig. 35

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### Table of Contents

<table>
<thead>
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### Diagram

- Diagram includes various sections labeled with letters (A to I).
- Each section contains specific details such as text labels and number indicators.
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TOTAL SPECIMENS: 17
6.B.5. Pissouri (Fig. 35)

From the eighteen samples that have been examined, sixteen have been found to contain ostracods. These are: 9456, 9458, 9459, 9461, 9462, 9463, 9464, 9465, 9466, 9467, 9468, 9469, 9470, 9471, 9472 and 9473 from the bottom in stratigraphical order. In most of the above samples, ostracods were associated with calcareous nannofossils and benthic and/or planktonic foraminifera. 904 valves of ostracods were picked from the samples and their distribution is shown in Fig. 35.

The distribution chart shows in general a richness of species for all the samples of this section with only exception sample 9456 which is the oldest stratigraphically sample of the section.

The most abundant species are *Acanthocythereis hystrix*, *Bosquetina carinella*, *Loxoconcha aff. L. bonaducei* and *Oblitacythereis mediterranea* but their first appearances in the samples vary and so they don’t form a distinct assemblage. Again, a good balance exists between left-right valves with few carapaces in the populations.

An alternation of shallow/deep thermosphaeric environmental conditions is observed through all the section from the earliest Pliocene to the Pleistocene.

6.B.6. Mari (Fig. 36)

Mari is the only one of the sections studied here that has been previously examined from the point of view of ostracods (PAVLAKELLI, 1986). From the sixteen samples that have been examined, twelve have been found to contain ostracods. These are: 9428, 9429, 9430, 9431, 9432, 9433, 9435, 9437, 9439, 9440, 9442 and 9443. 949 valves of ostracods were picked from the samples and their distribution is shown in Fig. 36. Although the samples contain more or less equal numbers of left/right ostracod valves which are very uniformly distributed, again the phenomenon of few carapaces was observed.

In general in this section there is an almost uniform distribution of the ostracods in the samples indicating probably relatively stable conditions through the time that the sampled sequence was deposited.

The association of *Graptocythere hscripta*, *Cytherella terquemi*, *Aurila convexa* and *Loxoconcha ovulata* forms a very distinct group throughout the whole section. *Aurila* and
Fig. 36: Distribution of ostracods in the samples of the Mari section.

- Callinocythere crupata
- Cytherella tenuis
- Cythereus antiquus
- Cythereus antiquus (Tavolozocyon sp.)
- Paracypris bathormes
- Buxtonia (Buxtonia) miranda
- Aotila sp.
- Hybocypris obtusa
- Cytheridea nordesi
- Inoceramus (Incus) buji
- Paracypris sp.
- Centropyge punctatissima
- Hybocypris incisa
- Haploleurodes aquilonia
- Leptocythere distans
- Leptocythere sparva
- Callinocythere sp. 2
- Sacamocyon sphaeroides
- Leptocythere distans
- Cytherina elongata
- Nematocyon inexactus
- Clanoscytherus pokornyi italonicus
- Cytheroporus isorotani
- Incus (Inoceramus) seminigrocerus
- Paracypris sp.
- Microcypridina angulosa
- Pachycypris angulosa
- Xyloocythere sp.
- Boyadjitina curvata
- Harpocythere deflori
- Aotila sp.
- Macrocypris sp. 1
- Parabrochis dimorpha
- Parabrochis sp. 1
- Eucythereis jovae
- Cythereilla pennancticetosa
- Sacamocyon cf. S. scutata
- Harpocythere parvula
- Eucythereis martini
- Sacamocyon sp. 3
- Cytherella nasunai
- Cytheroporus alatus
- Cytheroporus sp. 1
- Macroleurodes cf. M. Mediterraneus
- Zuma sp. 2
- Syntypeleus of A. australicus
- Buxtonia (Buxtonia) sublaticosta dornemanni
- Eichinocythere is (Rhodocythereis) sp. 1
- Laesocyclops sp. 2
- Aotila sp. A. laeocyclops
- Aotila sp. 2
- Sacamocyon ruscarnia
- Leptocythere oblonga
- Eucythereis hybrida
- Eucythereis cf. E. keyseri
- Exocythere gibbosa
- Nautilites rafinesquianus
- Leptocythere sp. 2
- Propontocypris sp. 3
- Sacamocyon nassariensis
- Sacamocyon alpina
- Sacamocyon acuta
- Eucythereis megentaides
- Callinocythere sp. 2
- Falaxia (Filthworkocythere) sphaerolimosa
- Falaxia (Filthworkocythere) turrita

TOTAL SPECIMENS
Fig 37: Comparison between specimen numbers and species diversities in the samples.
Fig 37 (Continued)

**Angola**

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</tr>
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</tr>
<tr>
<td>9428</td>
<td>0</td>
<td>18</td>
<td>26</td>
<td>50 28</td>
</tr>
</tbody>
</table>
Loxoconcha are known to inhabit shallow marine environments while Cytherella and Graptocythere deeper ones. The explanation for this phenomenon is the transportation of the shallow water species into deeper water either by currents, tectonic disturbance (turbidity currents, etc.). What is, however, seen in the distribution chart is the quantitative supremacy and best right/left valve balance of the shallow water species rather than of the deeper water ones, indicative of the autochthony of the shallow water species. So, what is suggested (at least for samples 9428 and 9429) is the existence of outer neritic conditions.

In later samples (9430, 9435, 9436, 9433, 9435, 9442 and 9443) the presence of additional deep-water species is observed like Oblitacythereis mediterranea, Henryhowella asperrima, Argilloecia kissamovensis, Parakrithe dactylomorpha, etc., indicating as an assemblage a depth of approximately 500 m but not psychrosphaeric due to the absence of clearly psychrosphaeric species like Agrenocythere pliocenica.

Further up the section (samples 9437, 9439 and 9440) a dominance of shallower water ostracods is observed (Aurila, Loxoconcha, Xestoleberis) with sporadic occurrences of Graptocythere, Cytherella and Krithe which are thought to have been transported, apart from sample 9437 where they show a stronger presence and for this reason this sample is thought to indicate an environment characterized by transitional conditions from deep (bathyal) to shallow (neritic) water depths.

The palaeogeographic setting for the Mari section as concluded from the above information, fits with that proposed by PAVLAKELLI (1986) according to which the region was a small faulted basin during the Pliocene (samples 9430, 9435, 9436, 9433, 9435, 9442 and 9443), with shallow calcareous platforms immediately adjacent to it (samples 9428, 9429, 9437, 9439 and 9440). MCALLUM (1989) also suggests an eastward shallowing of the Mari Basin in the Pliocene, followed by erosion.

6.C. Conclusions

From the interpretation of the ostracod assemblages of the sections that presented above, it is concluded that the environment (and consequently the palaeogeography) was not uniformly changing with time at different places along the west, southwest and south Cyprus.

A composite palaeoecological history for all the sections together (and consequently for the west and south of Cyprus) would start from the Messinian with alternations of limnic
and brackish water conditions up to and including the earliest stages of the Pliocene. In the Polemi region the section starts later in the Messinian with limnic conditions which became brackish just before the Pliocene. At the end of the Messinian the Dhrymou area entered the story with inner neritic conditions and brackish influences.

The beginning of the Pliocene finds the Dhrymou, Pissouri and Mari areas all with inner neritic conditions, while at the same time brackish conditions dominate the Polemi and Amargeti areas and only at the northern seaward end of Polis Graben (data from NASIB, 1986 for the Steni section) open marine conditions were already established.

A little later (Early Zanclean), marine conditions (thermosphaeric) dominate all the sections. Progressively, towards the mid Pliocene, a deepening of the sections is observed, which in Steni and Dhrymou is the result of the influx of cold oceanic water establishing psychrosphaeric conditions. The same deepening occurred in the Amargeti and Mari areas but it has to be the result of local tectonic activity since no occurrence of clearly psychrosphaeric species has been noticed.

There is then a shallowing at Dhrymou and Amargeti leading to thermosphaeric conditions, while the same shallowing at Pissouri and Mari leads gradually to the establishment of neritic conditions. At the same time Steni remained at great depth but a temperature increase is observed resulting to the disappearance of the clearly psychrosphaeric species *Agroocythere pliocenica*.

At the end of the Zanclean the neritic conditions continue to exist at Pissouri and Mari. In Amargeti the thermosphaeric conditions gave their place to brackish ones with freshwater influence, while in Dhrymou, an influx of oceanic water seems to be existed re-establishing the psychrosphaeric conditions.

The beginning of the Late Pliocene started with thermosphaeric conditions at Dhrymou and Polemi, with neritic at Pissouri and brackish with marine influences at Amargeti. The alternation of psychrosphaeric/thermosphaeric conditions continued at Dhrymou and Polemi until almost the mid Late Pliocene, where the data stop for the Dhrymou section leaving it with thermosphaeric conditions. At the same time as the Dhrymou section ends, there were also thermosphaeric conditions at Polemi and Pissouri. This situation changed to freshwater conditions with marine influence at Polemi and this is the end of the preserved Pliocene sequence for this area. At Pissouri, after the thermosphaeric conditions of the mid Late Pliocene a period of alternations of shallow
(neritic) and deeper thermosphaeric conditions followed until the Pleistocene. Finally, neritic conditions were also established at the Polemi area during the Pleistocene.

All the above information, being the result of this study and the MSc projects, led to the creation of the following palaeoecological table (Fig. 38) showing the changes of the palaeoenvironments through time in all the sections together. For this table, the ages of the samples were taken basically from the MSc reports (based on planktonic foraminifera and calcareous nannoplankton) using also the ostracods wherever necessary and possible. The palaeoecological data were first extracted from the ostracods and then compared with those of the MSc studies.

The correspondence of the terms used in the table to the palaeoecological conditions (depth and temperature) are as following:

<table>
<thead>
<tr>
<th>TERM</th>
<th>DEPTH</th>
<th>TEMPERATURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>neritic</td>
<td>&lt; 200 m</td>
<td>variable</td>
</tr>
<tr>
<td>Thermosphaeric</td>
<td>&lt; 500 m</td>
<td>&gt; 10 °C</td>
</tr>
<tr>
<td>Deep thermosphaeric</td>
<td>&gt; 500 m</td>
<td>&gt; 10 °C</td>
</tr>
<tr>
<td>Psychrosphaeric</td>
<td>&gt; 500 m</td>
<td>&lt; 8-10 °C</td>
</tr>
</tbody>
</table>
Fig. 38 Palaeoenvironmental reconstruction of the sections.

<table>
<thead>
<tr>
<th>MIOCENE</th>
<th>PLIOCENE</th>
<th>PLEISTOCENE</th>
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<tr>
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<td>Zanclean</td>
<td>Panatanian</td>
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</tbody>
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<table>
<thead>
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<th>STEMI</th>
<th>DHIYMOU</th>
<th>POLEMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner neritic with brackish influence (9904-9877)</td>
<td>Thermopsamnia (6432, 9353, 9354, 9356, 9359)</td>
<td>Thermopsamnia (6423)</td>
</tr>
<tr>
<td></td>
<td>Pyrophoebus (9357, 9359)</td>
<td>Pyrophoebus (6425)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| AMARGET: | BACULUS | LIMIC |}

<table>
<thead>
<tr>
<th>MISSOURI</th>
<th>MARI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner neritic (9408)</td>
<td>Neritic (9428, 9430)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend:**
- Thermopsamnia
- Pyrophoebus
- Neritic
- Deep Thermopsamnia
- Psychrophobus
- Transitiona
- Samples

**Table Notes:**
- Inner neritic
- Middle neritic
- Transitional neritic
- Upper neritic
CHAPTER 7

DISCUSSION, CONCLUSIONS AND FUTURE WORK

7.A. Discussion

The present author is aware of the fact that many shortcomings of the earlier chapters could appear in this work. Although this is a normal expectation when dealing with such a large number of species and such a long time-span, an attempt will be made in this chapter to rectify the shortcomings and fill some gaps.

Although in Chapter 6, some techniques were presented that help us to find out whether an assemblage is transported or not, it was judged later, that some of them were worthy of further discussion, such as the valves/carapaces ratio. The basis for this approach is the fact that (under normal circumstances) a biocoenosis will consist of carapaces (counting only the hard parts of the animals). This model tends to be modified immediately after the death of the biocoenosis resulting from the hydrological conditions of the environment in which the biocoenosis lived (such as currents and the density of water mass) and also on the nature of the dead ostracods (strength and structure of hinge, shape of carapaces, kind of adductor muscles etc). When the biocoenosis dies, its remains (influenced by all the above factors) are either deposited on the bottom of that water body and so a thanatocoenosis is formed, or they may be wholly or partially transported away (usually by currents) from their initial living environment, forming a taphocoenosis.

At this first stage (without any currents existing), a carapace (due to its shape and weight) has more possibilities to “touch bottom” faster than a single valve (of the same size and species as the carapace) which will normally go downwards slowly, floating and will often be deposited away from the carapace. If there are currents, then the shape of the valve (reducing the transportation ability of the current) may give it greater possibilities to be deposited closer to the carapace whose shape will make easier for the current to transport it further than the original death position.
After the deposition of both the carapace and the valve, their transportation possibilities also depend, upon the bottom surface, its sediment type and the floral development. However, the major role in transportation is played by the currents. If the currents are of low velocity (=low transportation ability) and the morphology allows it, then a segregation will occur with the loss of the assemblage elements that are more likely to be transported due to their shape (e.g. carapaces) and/or weight (e.g. early ontogenetic stages and juveniles of small-sized species). Depending then on the substrate morphology and the current velocity, the segregation will be of smaller or larger scale. WHATLEY'S (1983) population age structure diagrams (Chapter 6, fig. 29) could possibly represent these assemblages but to make sure that we are closer to the actual conditions of transportation, the diagrams should be drawn taking into account only the carapaces of each ontogenetic stage of an assemblage first and then only the single valves. Such diagrams would answer questions concerning (at least for the specific assemblage) the transportation potential between valves and carapaces and would further let us be more certain whether the characterization of our assemblage as thanatocoenosis or taphocoenosis is valid or not. The problem is, that for such diagrams to be drawn, the researcher should have in his disposal enough material (carapaces/valves, adults/juveniles) to get reliable results.

In this study, population age structure diagrams (Chapter 6, fig. 30) were drawn for *Cyprideis torosa* from all the samples of the Amargeti section. Unfortunately, in this study, there was not sufficient material to allow drawing of such diagrams for other species.

In the previous chapters, enough space has been dedicated to the biostratigraphic importance of the ostracods of this study. So, it was thought important to focus here on some palaeoecological information so that a balance would be kept between palaeoecology and biostratigraphy. In Chapter 4, generalized palaeoecological information is given for each species (usually in one word) of this study under the "remarks" section. Later on, however, in Chapter 6, when the interpretation of the faunas took place, it was based on more precise information for the genera and species and this procedure is going to be explained here.

Ostracods are able to inhabit almost all kinds of aquatic environments. This enriches them in forms since each species/genus/family can have its own environmental
preferences related to substrate, salinity, temperature, depth, water-movement etc. The most vital of the above environmental factors seem to be the salinity and according to that, ostracodologists have divided ostracods in three large groups: Fresh-water, Brackish and Marine, although some species or genera can survive in more than one of these environments.

From the present study the families Cyprididae, Candonidae and Cypridopsidae belong to the fresh-water biofacies. Assemblages of such ostracods are usually being found in fine, organic-rich muds, freshwater marls and freshwater limestones. They sometimes are able to change their ecological niches with the seasons or the conditions of the weather.

In the brackish water biofacies, usually belong species or genera, that are able to withstand the wide variations in salinity, that occur in this kind of environments. Species of the genera *Cyprideis* and *Loxoconcha* can typically live in such conditions although they both are able to extend their salinity ranges; *Loxoconcha* towards the marine ones, while *Cyprideis* can inhabit waters of all degrees of salinity, from fresh to marine. *Cyprideis torosa* can often develop nodes on the lateral surface of the valves; these characters appear to be growing in a certain pattern and following a certain sequence. The same nodation phenomenon appears in other species as well (e.g. *Cytherissa lacustris*) and what makes the story even more interesting, is that again, the nodes form the same pattern and follow the same sequence as in *Cyprideis torosa*. Long discussions have taken place among the researchers trying to study, explain and analyze this phenomenon. According to them, this nodation may occur and be controlled, either environmentally, or genetically or even both.

Although fresh-water and brackish ostracods are a really interesting subject to be studied, the ones however, that are represented by the greatest diversity of forms throughout the fossil record are the marine ostracods. Most of the ostracod families of this study belong to this category. The marine ostracods can be grouped according to their depth preferences in littoral, neritic, bathyal and abyssal (see fig. 18, p. 44). They also can be grouped according to their preferences for a specific substrate. An example of such grouping is given in Fig. 39.
For the extraction of the palaeoecological conclusions in this work, the first step was to try and distinguish the autochthonous (thanatocoenoses) from the allochthonous (taphocoenoses) assemblages. Then, the numerically dominant autochthonous species and its accompanying (autochthonous) fauna could be ecologically interpreted. The palaeoecological conditions that resulted from this analysis for each sample, were believed to represent as closely as possible the conditions of the initial environment. This was easier, when there were large assemblages of one or more species *in situ*, as it often happened in our samples, with *Agrenocythere pliocenica, Oblitacythereis mediterranea, Henryhowella asperrima, Cyprideis torosa, Loxoconcha (Loxocorniculina) djaffarovi, Callistocythere montana, Loxoconcha aff. L. bonaducei* etc. In many other cases however, we had to deal with faunas consisting of a high number of individuals, belonging to many different species of only few genera. This, for example, was very often the case with most (autochthonous) species of the genera *Krithe, Loxoconcha* and *Aurila*. In such cases, the determination of the ecological conditions was based on the composition (and overlapping) of the ecological preferences of the genera.
7.B. Notes on some useful taxa in this work

Some discussion will take place here, involving the species or genera judged by the author to be of some importance for this work.

*Agrenocythere plicenica* (SEGUNZA, 1880): As quite extensively demonstrated in Chapters 5 and 6, this psychrosphaeric species stands out amongst those recognised for their usefulness in reconstructing palaeoenvironments. This is due to its sensitivity to the ecological conditions (mainly temperature and depth). Apart from its ecology, one other fact that is interesting about this species is that before the Pliocene it only appears outside the Mediterranean (Atlantic coasts of Africa and Europe), while from the Early Pliocene up to the Pleistocene, it appears inside it.

*Cyprideis torosa* JONES, 1857: Many representatives of the genus *Cyprideis* have been studied from the Mediterranean the last 35 years. It was a common policy of many authors up to now, to name the monospecific *Cyprideis* representatives that they would find in Late Miocene deposits as *Cyprideis pannonica*. In this work it is concluded, by comparing various previous works and opinions of experts on this matter, that the species *Cyprideis pannonica* does not exist in the Mediterranean. The Mediterranean representatives of this genus that were called *Cyprideis pannonica* by previous authors should in fact all be named *Cyprideis torosa*. This species has been strong or ecologically flexible enough to be able to go into the Messinian Salinity Crisis (where it formed the well-known monospecific *Cyprideis* faunas), to survive that and to later continue living normally, together with the other post-Messinian ostracod faunas of the Mediterranean.

*Callistocythere montana* DORUK, 1980: This very characteristic species which in some cases appeared to exist in good numbers in our samples, was thought by previous authors to have existed only in the Late Miocene and so was treated as characteristic for that period. However, in many of the samples of this work it appears to range into the Pliocene and so the suggestion is made that the range of this species has to be extended into the Pliocene.

*Loxoconcha (Loxocorniculina) djaffarovi* SCHNEIDER, 1956: According to SISSINGH (1976) and CARBONNEL (1978), *Loxoconcha hodonica* sensu SISSINGH, 1972 belongs to this species. However, KRSTIC & STANCHEVA (1989) disagree and
believe that the species figured by SISSINGH (1972, Pl. 10, figs. 15, 16) is closer to
Loxoconcha ornata SCHNEIDER, 1939 from the Sarmatian of the Paratethys.

Qblicitacrythereis mediterranea BENSON, 1977: A very characteristic ostracod,
commonly associated with Agrenocythere pliocenica. The specimen reported by
SISSINGH (1972, p. 122, pl. 9, fig. 13) as Bradleya? sp. belongs to this species.

In addition to the above single species, during the course of this work, there were
also groups of species of great biostratigraphical and palaeoecological importance. More
specifically, representatives of Candona (Pontoniella) acuminata acuminata
ZALANYI, 1929, Leptocythere (Amnicythere) litica LIVENTAL, 1935,
Leptocythere (Amnicythere) microlata (LIVENTAL, 1961), Leptocythere
(Amnicythere) sinegubi KRSTIC, 1975, Leptocythere (Euxinocythere) bisaltiana
GRAMANN, 1969, Leptocythere (Euxinocythere) quinquetuberculata SCHWEYER,
1949, Loxocauda azeri (AGALAROVA, 1961), Loxocauda limata SCHNEIDER,
1949, Loxocauda stevanovici KRSTIC, 1972, Loxoconcha (Loxoconicularina)
djaflarovi SCHNEIDER, 1956, Tyrhenocythere filipesquii HANGANU, 1962 and
Tyrhenocythere pignattii RUGGIERI, 1955 indicate with certainty the existence of
the Pontian stage of the Paratethys. Then, species like Candona (Camptocyria)
balconica ZALANYI, 1929, Candona (Camptocyria) flectimarginata SOKAC,
1967, Candona (Pontoniella) paracuminata KRSTIC, 1968, Candona (Pontoniella)
sitovoensis STANCHEVA, 1981, Candona (Pontoniella) truncata SOKAC, 1972,
Cyprideis triangulata KRSTIC, 1963, Loxoconcha (Loxoconcha) cumacui
KRSTIC, 1972 and Tyrhenocythere pannonicum OLTEANU, 1989 are coming to
indicate the upper Pontian, while Leptocythere (Amnicythere) multituberculata
(LIVENTAL, 1929), Loxoconcha (Loxoconcha) muelleri (MEHES, 1908) and
Loxoconcha (Loxoconcha) spinosa SOKAC, 1972 characterize the Lower Pontian.

7.C. Summary of conclusions

• The ostracod content of 110 samples from 6 sections of West and South Cyprus
was studied. From these samples, 6148 valves of ostracods belonging to 105 genera
and 410 species were picked and identified. The present study comprises the largest
record of ostracods from Cyprus and it is also the first to investigate Neogene faunas of the island.

- For each identified species extensive distribution information (in time and space) is given. Also, in certain cases (e.g. *Callistocythere montana*) the known age ranges of the species concerned are extended.

- Paratethyan (Pontian) ostracods were for the first time reported from Cyprus in this study, being the southernmost record of this kind of assemblage.

- A review of the taxonomic validity of species belonging to the genus *Cyprideis* in the Mediterranean has been made leading to the conclusion that the Mediterranean representatives of this genus that were called *Cyprideis pannonica* are in fact all *Cyprideis torosa*.

- Combining all the available biostratigraphical data (ostracods, calcareous nannofossils, planktonic and benthic foraminifera), ostracod groups (changing with time and environment) were recognized for Cyprus, corresponding to the planktonic foraminifera zones, as follows:

  - group 9: Late Pleistocene - upper N22 (Late Calabrian), 4 species/subspecies
  - group 8: Early Pleistocene - N22 (Calabrian), 30 species/subspecies
  - group 7: Late Pliocene - N20 (Piacenzian), 51 species/subspecies
  - group 6: Early Pliocene - N19 (?Mid Zanclean), 10 species/subspecies
  - group 5: Earliest Pliocene - N18 (Early Zanclean = Late Pontian), 43 species/subspecies
  - group 4: Latest Miocene - late N17 (Pontian = Latest Messinian), 15 species/subspecies
  - group 3: Late Miocene - mid N17 (Messinian), 5 species/subspecies
  - group 2: Late Miocene - mid N15 (Tortonian), 29 species/subspecies
  - group 1: Mid Miocene - N12 (Serravalian) or older, 40 species/subspecies
Combining all the available palaeoecological data (ostracods, calcareous nannofossils, planktonic and benthic foraminifera) together with the biostratigraphical information, it was possible to reconstruct the changes in palaeoenvironmental and palaeogeographical conditions of the Neogene of western and southern Cyprus.

In Cyprus, in most of the areas studied here, there were marine conditions during the Late Cenozoic, except from the Messinian where the changes are represented in the sections either by the absence of ostracod assemblages (Steni, Pissouri, Mari) or, if there are any ostracods, they are of limnic, brackish (Polemi, Amargeti) or brackish-influenced (Dhrymou) character.

7.D. Future work

Further work that should be carried out includes more detailed sampling from the studied sections as well as sampling from other localities inbetween the sections, study of their ostracod content and comparison with those of the present work.

Also, integrated faunal, floral and isotopic work has to be carried out and the results compared with old (DSDP, 1973 & 1978) and latest (e.g. ODP, 1995) offshore drilling material.

The use of statistics (e.g. cluster analysis and principal component analysis) to test the validity of the palaeoecological information presented here could be more extensively demonstrated. This could be succeeded, as well, by separating adult from juvenile valves and carapaces, extracting more information on the autochthony of the assemblages for refined palaeoenvironmental and biostratigraphical analyses.

Finally, based on the study of additional material (e.g. non-ostracod results), the “groups” recognized in this study could be tested and possibly lead to the identification of ostracod biozones or ecozones (with at least local utility).
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<tr>
<th>SPECIES</th>
<th>Cat. Nr.</th>
<th>MAG</th>
<th>scale (20mm)</th>
<th>POSITION</th>
<th>L(mm)</th>
<th>H(mm)</th>
</tr>
</thead>
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<td>Pl. 1, fig. 6: Cytherelloidea beckmanni BARBEITO-GONZALEZ, 1971</td>
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<td>Pl. 1, fig. 11: Bairdopileta supradentata (TERQUEM, 1978)</td>
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<td>SG 47, RV. 130</td>
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<td>Neocythereidea fasciata</td>
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<td>Pseudopsammocytrea reniformis</td>
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<td>(BRADY, 1866)</td>
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<td>(BRADY, 1866)</td>
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<td>(SEGUENZA, 1880)</td>
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<td>Agrenocythere pliocenica</td>
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<td>COLALONGO &amp; PASINI, 1988</td>
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<td>(BOSQUET, 1852)</td>
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<td>(VON MUNSTER, 1830)</td>
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<td>Buntonia (Buntonia) textilis BONADUCE, CIAMPO &amp; MASOLI, 1975</td>
<td>110</td>
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<td>Ruggeria tetrapera (SEGUENZA, 1880)</td>
<td>112</td>
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<td>113</td>
<td>RV</td>
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<td>118</td>
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<td>Pl. 8, fig. 28</td>
<td>Mutilus retiformis (TERQUEM, 1878)</td>
<td>145</td>
<td>LV</td>
<td>120</td>
<td>0.67</td>
<td>PI3/17A</td>
<td>0.75</td>
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<td>Pl. 8, fig. 29</td>
<td>Mutilus retiformis (TERQUEM, 1878)</td>
<td>146</td>
<td>RV</td>
<td>120</td>
<td>0.67</td>
<td>DH25/24</td>
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<td>Plate 9, fig. 6</td>
<td>Quadracythere (Tenedocythere) prava (BAIRD, 1850b)</td>
<td>SG 147</td>
<td>LV, 84 x</td>
<td>0.96</td>
<td>DH 15/14</td>
<td>1.05</td>
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<td>Quadracythere (Tenedocythere) prava (BAIRD, 1850b)</td>
<td>SG 148</td>
<td>RV, 86 x</td>
<td>0.89</td>
<td>DH 18/25</td>
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<td>Urocythereis distinguenda (NEVIAN, 1928)</td>
<td>SG 149</td>
<td>RV, 105 x</td>
<td>0.80</td>
<td>DH 16/4</td>
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<td>Urocythereis favosa (ROEMER, 1836)</td>
<td>SG 150</td>
<td>RV, 74 x</td>
<td>1.08</td>
<td>DH 15/18</td>
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<td>Plate 9, fig. 10</td>
<td>Caudites calceolatus (COSTA, 1853)</td>
<td>SG 151</td>
<td>LV, 150 x</td>
<td>0.53</td>
<td>AM 13/2</td>
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<td>Plate 9, fig. 11</td>
<td>Pachycaudites ungeri (REUSS, 1849)</td>
<td>SG 152</td>
<td>LV, 82 x</td>
<td>1.00</td>
<td>DH 19/26</td>
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<td>Plate 9, fig. 12</td>
<td>Tyrrhenocythere filipesqui HANGANU, 1962</td>
<td>SG 153</td>
<td>LV, 125 x</td>
<td>0.67</td>
<td>AM 2/5</td>
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<td>Tyrrhenocythere pannonicum OLTEANU, 1989</td>
<td>SG 154</td>
<td>RV, 135 x</td>
<td>0.63</td>
<td>PO 4/5</td>
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<td>Tyrrhenocythere cf. T. pannonicum OLTEANU, 1989</td>
<td>SG 155</td>
<td>RV, 120 x</td>
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<td>Tyrrhenocythere sp. 2</td>
<td>SG 156</td>
<td>RV, 185 x</td>
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<td>DH 5/14</td>
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<td>Hexusobtusa RUGGIERI, 1962b</td>
<td>SG 160</td>
<td>LV, 98 x</td>
<td>0.82</td>
<td>PI 6/11A</td>
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<td>Loxoconcha affinis (BRADY, 1866)</td>
<td>SG 161</td>
<td>RV, 220 x</td>
<td>0.34</td>
<td>ST3/23</td>
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<td>Plate 10, fig. 3</td>
<td>Loxoconcha alata BRADY, 1868b</td>
<td>SG 162</td>
<td>RV, 195 x</td>
<td>0.42</td>
<td>PO 2/14</td>
<td>0.49</td>
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<td>Plate 10, fig. 4</td>
<td>Loxoconcha cumsecui KRISTIC</td>
<td>SG 163</td>
<td>RV, 195 x</td>
<td>0.42</td>
<td>PO 2/14</td>
<td>0.49</td>
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<td>Plate 10, fig. 5</td>
<td>Loxoconcha affinis CIAMPO, 1971a</td>
<td>SG 167</td>
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<td>Loxoconcha affinis CIAMPO, 1971a</td>
<td>SG 168</td>
<td>RV, 260 x</td>
<td>0.31</td>
<td>PO 1/26</td>
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<td>Loxoconcha affinis CIAMPO, 1971a</td>
<td>SG 169</td>
<td>RV, 145 x</td>
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<td>DH 24/7</td>
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<td>Loxoconcha affinis CIAMPO, 1971a</td>
<td>SG 170</td>
<td>RV, 260 x</td>
<td>0.31</td>
<td>ST 3/4</td>
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<td>Loxoconcha affinis CIAMPO, 1971a</td>
<td>SG 171</td>
<td>LV, 240 x</td>
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<td>ST 3/26</td>
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<td>Plate 10, fig. 10</td>
<td>Loxoconcha affinis CIAMPO, 1971a</td>
<td>SG 172</td>
<td>C, 160 x</td>
<td>0.50</td>
<td>AM 8/2</td>
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<td>Loxoconcha affinis CIAMPO, 1971a</td>
<td>SG 173</td>
<td>RV, 130 x</td>
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<td>Loxoconcha affinis CIAMPO, 1971a</td>
<td>SG 174</td>
<td>RV, 270 x</td>
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<td>ST 3/19</td>
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<td>Loxoconcha affinis CIAMPO, 1971a</td>
<td>SG 175</td>
<td>RV, 125 x</td>
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<td>DH 25/17</td>
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<td>Loxoconcha affinis CIAMPO, 1971a</td>
<td>SG 176</td>
<td>RV, 200 x</td>
<td>0.40</td>
<td>PO 1/11</td>
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<td>Plate 10, fig. 15</td>
<td>Loxoconcha affinis CIAMPO, 1971a</td>
<td>SG 177</td>
<td>LV, 120 x</td>
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<td>DH 16/6</td>
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<td>Plate 10, fig. 16</td>
<td>Loxoconcha affinis CIAMPO, 1971a</td>
<td>SG 178</td>
<td>RV, 250 x</td>
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<td>PO 2/8</td>
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<td>Loxoconcha affinis CIAMPO, 1971a</td>
<td>SG 179</td>
<td>RV, 210 x</td>
<td>0.40</td>
<td>DH 21/1</td>
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<td>Plate 10, fig. 18</td>
<td>Loxoconcha affinis CIAMPO, 1971a</td>
<td>SG 180</td>
<td>LV, 120 x</td>
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<td>PI 14/12</td>
<td>0.71</td>
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<td>Plate 10, fig. 19</td>
<td>Loxoconcha affinis CIAMPO, 1971a</td>
<td>SG 181</td>
<td>RV, 260 x</td>
<td>0.29</td>
<td>MA 2/27</td>
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<td>Plate 10, fig. 20</td>
<td>Loxoconcha affinis CIAMPO, 1971a</td>
<td>SG 182</td>
<td>RV, 220 x</td>
<td>0.36</td>
<td>ST 3/6</td>
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<td>Loxoconcha affinis CIAMPO, 1971a</td>
<td>SG 183</td>
<td>LV, 135 x</td>
<td>0.57</td>
<td>PI 12/9</td>
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<td>Plate 10, fig. 22</td>
<td>Loxoconcha affinis CIAMPO, 1971a</td>
<td>SG 184</td>
<td>RV, 155 x</td>
<td>0.51</td>
<td>PI 11/29</td>
<td>0.58</td>
<td>0.36</td>
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<td>Pl. 11, fig. 8: Loxoconcha cf. L. turbida (MUELLER, 1912)</td>
<td>SG 185 RV, 160 x</td>
<td>0.50 PI4/22B</td>
<td>0.55 0.39</td>
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<td>Pl. 11, fig. 9: Loxoconcha sp. 1</td>
<td>SG 186 RV, 200 x</td>
<td>0.40 AM4/5</td>
<td>0.44 0.30</td>
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<td>Pl. 11, fig. 10: Loxoconcha sp. 3</td>
<td>SG 187 LV, 130 x</td>
<td>0.63 PI4/8</td>
<td>0.70 0.50</td>
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<td>Pl. 11, fig. 11: Loxoconcha sp. 7</td>
<td>SG 188 LV, 150 x</td>
<td>0.51 POS/12</td>
<td>0.54 0.38</td>
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<td>Pl. 11, fig. 12: Loxoconcha sp. 8</td>
<td>SG 189 LV, 200 x</td>
<td>0.40 AM4/20</td>
<td>0.45 0.32</td>
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<td>Pl. 11, fig. 13: Loxoconcha sp. 9</td>
<td>SG 190 RV, 200 x</td>
<td>0.40 AM4/4</td>
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<td>Pl. 11, fig. 14: Loxoconcha sp. 10</td>
<td>SG 191 RV, 195 x</td>
<td>0.41 AM10/17</td>
<td>0.43 0.28</td>
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<td>Pl. 11, fig. 15: Loxoconcha sp. 11</td>
<td>SG 192 LV, 210 x</td>
<td>0.40 AM10/22</td>
<td>0.42 0.29</td>
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<td>Pl. 11, fig. 16: Loxoconcha sp. 12</td>
<td>SG 193 LV, 165 x</td>
<td>0.50 AM8/1</td>
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<td>Pl. 11, fig. 17: Loxoconcha sp. 13</td>
<td>SG 194 RV, 220 x</td>
<td>0.30 DH13/9</td>
<td>0.38 0.23</td>
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<td>Pl. 11, fig. 18: Loxoconcha sp. 14</td>
<td>SG 195 LV, 260 x</td>
<td>0.35 PO2/20</td>
<td>0.38 0.23</td>
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<td>Pl. 12, fig. 1: Loxoconcha (Loxocasapia) cf. L. (L.) kelicki LUBIMOVA, 1981</td>
<td>SG 196 RV, 160 x</td>
<td>0.50 AM2/16</td>
<td>0.58 0.34</td>
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<td>Pl. 12, fig. 2: Loxoconcha (Loxocorniculina) djaffarovii SCHNEIDER, 1956</td>
<td>SG 197 RV, 290 x</td>
<td>0.26 PO3</td>
<td>0.29 0.17</td>
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<td>Pl. 12, fig. 3: Loxoconcha (Loxocorniculina) djaffarovii SCHNEIDER, 1956</td>
<td>SG 198 LV, 270 x</td>
<td>0.29 PO3</td>
<td>0.31 0.16</td>
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<td>Pl. 12, fig. 4: Phyllocythere pelucida MUELLER, 1894</td>
<td>SG 200 RV, 180 x</td>
<td>0.40 PI9/6</td>
<td>0.45 0.25</td>
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<td>Pl. 12, fig. 5: Paracytheidida depressa MUELLER, 1894</td>
<td>SG 201 LV, 185 x</td>
<td>0.43 PO10</td>
<td>0.48 0.23</td>
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<td>Pl. 12, fig. 6: Paracytheidida insita DORUK, 1980</td>
<td>SG 202 LV, 220 x</td>
<td>0.37 DH14/29</td>
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<td>Pl. 12, fig. 7: Paracytheidida paralia BARBEITO-GONZALEZ, 1971</td>
<td>SG 203 RV, 150 x</td>
<td>0.53 PI3/26</td>
<td>0.61 0.32</td>
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<td>Pl. 12, fig. 8: Pedicythere mirabilis SISSINGH, 1975</td>
<td>SG 204 RV, 185 x</td>
<td>0.44 DH10/3</td>
<td>0.46 0.19</td>
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<td>Pl. 12, fig. 9: Pedicythere phryne BONADUCE, CIAMPO &amp; MASOLI, 1975</td>
<td>SG 205 LV, 200 x</td>
<td>0.40 DH4/3</td>
<td>0.40 0.19</td>
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<td>Pl. 12, fig. 10: Pedicythere polita COLALONGO &amp; PASINI, 1988</td>
<td>SG 206 LV, 180 x</td>
<td>0.44 DH10/20</td>
<td>0.44 0.26</td>
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<td>SG 207 RV, 200 x</td>
<td>0.40 PO11/30</td>
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<td>Pl. 12, fig. 12: Pedicythere sp.</td>
<td>SG 208 LV, 185 x</td>
<td>0.44 DH11/23</td>
<td>0.43 0.27</td>
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<td>Pl. 12, fig. 13: Cytherura cf. C. cornuta (BRADY, 1868)</td>
<td>SG 209 RV, 310 x</td>
<td>0.25 PI6/5</td>
<td>0.27 0.16</td>
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<td>SG 210 RV, 270 x</td>
<td>0.29 ST3/2</td>
<td>0.31 0.17</td>
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<td>Pl. 12, fig. 15: Eucytherura gibbera MUELLER, 1894</td>
<td>SG 211 RV, 310 x</td>
<td>0.29 PO3</td>
<td>0.29 0.17</td>
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<td>Pl. 12, fig. 16: Eucytherura ex.gr. E. mediopunctata COLES &amp; WHATLEY, 1989</td>
<td>SG 212 LV, 340 x</td>
<td>0.24</td>
<td>0.26 0.00</td>
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<td>Pl. 12, fig. 17: Eucytherura ex.gr. E. mediopunctata COLES &amp; WHATLEY, 1989</td>
<td>SG 213 LV, 315 x</td>
<td>0.26 ST1/7</td>
<td>0.28 0.17</td>
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<td>Pl. 12, fig. 18: Eucytherura pseudoantipodum COLES &amp; WHATLEY, 1989</td>
<td>SG 214 LV, 200 x</td>
<td>0.33 MA5/6B</td>
<td>0.36 0.21</td>
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<td>Pl. 13, fig. 1: Hemicytherura dflorei RUGGIERI, 1953c</td>
<td>SG 215 RV, 220 x</td>
<td>0.40 ST9/15A</td>
<td>0.40 0.22</td>
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<td>Pl. 13, fig. 2: Hemicytherura gracilicosta RUGGIERI, 1953c</td>
<td>SG 216 RV, 500 x</td>
<td>0.16 PO10</td>
<td>0.00 0.00</td>
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<td>Pl. 13, fig. 3: Hemicytherura helenica SISSINGH, 1972</td>
<td>SG 217 LV, 500 x</td>
<td>0.16 PO10</td>
<td>0.00 0.00</td>
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<td>Pl. 13, fig. 4: Hemicytherura videns (MUELLER, 1884)</td>
<td>SG 218 RV, 240 x</td>
<td>0.33 PO10</td>
<td>0.38 0.22</td>
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<td>Pl. 13, fig. 5: Hemicytherura videns (MUELLER, 1884)</td>
<td>SG 219 LV, 260 x</td>
<td>0.29 PO10</td>
<td>0.32 0.20</td>
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<td>Pl. 13, fig. 6: Hemicytherura helenica SISSINGH, 1972</td>
<td>SG 220 RV, 155 x</td>
<td>0.50 DH25/29</td>
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<td>Pl. 13, fig. 7: Semicytherura acuminata (MUELLER, 1894)</td>
<td>SG 221 LV, 175 x</td>
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<td>Pl. 13, fig. 8: Semicytherura acuticostata (SARS, 1866)</td>
<td>SG 222 LV, 160 x</td>
<td>0.51 MA8/31B</td>
<td>0.56 0.27</td>
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<td>Semicytherura dispar (Müller, 1894)</td>
<td>SG 222</td>
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<td>Plate 13, Fig. 12:</td>
<td>Semicytherura incongruens (Müller, 1894)</td>
<td>SG 223</td>
<td>RV</td>
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<td>SG 224</td>
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<td>SG 225</td>
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<td>Semicytherura punctata (Müller, 1894)</td>
<td>SG 226</td>
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<td>190 x</td>
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<td>Plate 13, Fig. 16:</td>
<td>Semicytherura quadridentata (Hartmann, 1953)</td>
<td>SG 227</td>
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<td>Semicytherura spratti Sissingh, 1972</td>
<td>SG 229</td>
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<td>SG 230</td>
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<td>SG 236</td>
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<td>Semicytherura sp. 8</td>
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<td>Semicytherura sp. 9</td>
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<td>Parahemingwayella downingae Coles &amp; Whatley, 1989</td>
<td>SG 240</td>
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<td>Cytheropteron semulum</td>
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<td>Plate 14, Fig. 13:</td>
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<td>SG 242</td>
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<td>Cytheropteron cronini Dingle, Lord &amp; Boomer, 1999</td>
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<td>Cytheropteron monoceros Bonaduce, Ciampo &amp; Masoli, 1975</td>
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<td>Cytheropteron trifosata Whatley &amp; Coles, 1987</td>
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<td>SG 286</td>
<td>RV. 200</td>
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<td>Cassidulina (Camptocypris) flectimarginata</td>
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<td>Pl.</td>
<td>Fig.</td>
<td>Species Description</td>
<td>Author</td>
<td>SG</td>
<td>RV</td>
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<td>SG 295</td>
<td>RV</td>
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<td>STANCHEVA, 1981</td>
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<td>Krithe pernoides calcarata</td>
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<td>BONADUCE, CIAMPO &amp; MASOLI, 1975</td>
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<td>RV</td>
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**Notes:**
- SG: Specimen Group
- RV, LV: Reference Volumes, Reference Numbers
- D, H: Measures (in mm)
<table>
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<th>Pl. 20, fig. 4:</th>
<th>Parakrithe sp. 1</th>
<th>SG 332</th>
<th>LV, 100 x</th>
<th>DH23/24</th>
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<td>Pl. 20, fig. 5:</td>
<td>Parakrithe sp. 2</td>
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<td>Pl. 20, fig. 6:</td>
<td>Pontocypris mytiloides (NORMAN, 1862)</td>
<td>SG 334</td>
<td>RV, 160 x</td>
<td>PI11/17</td>
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<td>Pl. 20, fig. 7:</td>
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<td>Pl. 20, fig. 8:</td>
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<td>Pl. 20, fig. 9:</td>
<td>Genus et sp. indet. 2</td>
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<td>Pl. 20, fig. 10:</td>
<td>Pseudosammocytthea similis (MUELLER, 1894)</td>
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<td>Pl. 20, fig. 12:</td>
<td>Cyprideis torosa (JONES, 1850)</td>
<td>SG 340</td>
<td>RV, 125 x</td>
<td>PI5/10A</td>
<td>0.44</td>
<td>0.22</td>
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</table>
PLATES

Plates 19-20: Transmitted Light Micrographs.

Each illustration includes the following:
i) name of species followed by author and date;
ii) catalogue number with which the illustrated specimen is deposited in the Postgraduate Unit of Micropaleontology, University College, London. More details concerning the age and fractions of the samples are given in the samples schedule at the end of Chapter 5.
iii) part of the ostracod figured i.e. Right Valve, Left Valve or Carapace;
iv) magnification;
v) length of scale bar on right bottom corner = number of mm cited for each illustration;
vi) location of specimen (section/slide);
vii) Dimensions in mm (Length and Height).

The actual length of the scale is 20mm in all the plates.
<table>
<thead>
<tr>
<th>Plate 1</th>
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<tbody>
<tr>
<td>1: <em>Polycope orbicularis</em> SARS, 1928 / SG 1, LV, 200x, 0.40, DH10/13, L= 0.37, H= 0.30.</td>
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<tr>
<td>2: <em>Cytherella postdenticulata</em> OERTLI, 1961 / SG 2, RV, 82x, 0.89, ST8/9A, L= 0.91, H= 0.56.</td>
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<td>3: <em>Cytherella russoi</em> SISSINGH, 1972 / SG 3, RV, 100x, 0.80, AM15, L= 0.84, H= 0.59.</td>
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<td>4: <em>Cytherella terquemi</em> SISSINGH, 1972 / SG 4, RV, 135x, 0.57, AM15, L= 0.64, H= 0.44.</td>
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<tr>
<td>5: <em>Cytherella vulgata</em> RUGGIERI, 1962 / SG 5, RV, 96x, 0.80, AM15, L= 0.89, H= 0.59.</td>
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<td>6: <em>Cythereilloidea beckmanni</em> BARBEITO-GONZALEZ, 1971 / SG 6, RV, 115x, 0.67, PI6/15, L= 0.73, H= 0.47.</td>
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<td>7: <em>Cythereilloidea sordida</em> MUELLER, 1894 / SG 7, RV, 115x, 0.71, MA4/28, L= 0.77, H= 0.43.</td>
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<td>8: <em>Bairdia subdeltoidea</em> (von MUNSTER, 1830) / SG 8, RV, 110x, 0.74, DH22/10, L= 0.78, H= 0.54.</td>
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<td>9: <em>Bairdia sp. 1</em> / SG 9, RV, 72x, 1.14, DH18/1, L= 1.23, H= 0.91.</td>
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<td>10: <em>Bairdia sp. 2</em> / SG 10, LV, 98x, 0.40, ST9/27, L= 0.41, H= 0.31.</td>
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<tr>
<td>11: <em>Bairdopilata supradentata</em> (TERQUEM, 1878) / SG 11, LV, 92x, 0.89, DH13/1, L= 0.96, H= 0.68.</td>
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<td>12: <em>Neonesidea formosa</em> (BRADY, 1868) / SG 12, RV, 180x, 0.44, MA8/13, L= 0.50, H= 0.31.</td>
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<td>13: <em>Neonesidea longevaginata</em> (MUELLER, 1894) / SG 13, RV, 240x, 0.33, MA2/6, L= 0.36, H= 0.21.</td>
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<td>14: <em>Neonesidea mediterranea</em> MUELLER, 1894 / SG 14, RV, 155x, 0.50, PI6/20, L= 0.53, H= 0.35.</td>
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<tr>
<td>15: <em>Neonesidea sp. 1</em> / SG 15, LV, 160x, 0.48, DH14/9, L= 0.51, H= 0.36.</td>
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<td>16: <em>Neonesidea sp. 3</em> / SG 16, LV, 86x, 0.89, PI6/26, L= 1.00, H= 0.67.</td>
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<td>17: <em>Neonesidea sp. 4</em> / SG 17, LV, 145x, 0.53, PO16/18, L= 0.62, H= 0.39.</td>
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<tr>
<td>18: <em>Anchistrocheles tenera</em> (BREMAN, 1975) / SG 18, LV, 110x, 0.80, ST5/6A, L= 0.86, H= 0.42.</td>
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PLATE 2

1: *Bythocypris bosquetiana* (BRADY, 1866) / SG 19, LV, 90x, 0.89, ST4/14, L = 0.96, H = 0.64.

2: *Bythocypris compressa* BRADY, 1880 / SG 20, RV, 220x, 0.34, PI6/5A, L = 0.36, H = 0.22.

3: *Bythocypris lucida* (SEGUENZA, 1880) / SG 21, LV, 86x, 0.95, ST5/3, L = 1.07, H = 0.58.

4: *Bythocypris obtusata* (SARS, 1869) / SG 22, LV, 80x, 1.00, AM15, L = 1.13, H = 0.60.

5: *Cytheromorpha fuscata* (BRADY, 1868) / SG 23, RV, 175x, 0.44, AM2/19, L = 0.49, H = 0.32.

6: *Microcytherura angulosa* (SEGUENZA, 1880) / SG 24, LV, 200x, 0.40, MA5/20, L = 0.45, H = 0.23.

7: *Kroenmelbeinella coae* (MOSTAFAWI, 1983) / SG 25, RV, 135x, 0.57, DH25/26, L = 0.64, H = 0.40.

8: *Paijenborchella (Paijenborchella) iocosa* KINGMA, 1948 / SG 26, LV, 150x, 0.77, DH4/4, L = 0.86, H = 0.32.

9: *Paijenborchella (Eopaijenborchella) malaiensis* KINGMA, 1948 / SG 27, LV, 150x, 0.53, DH8/25, L = 0.53, H = 0.29.

10: *Leptocythere salebrosa* MOSTAFAWI, 1986 / SG 28, RV, 190x, 0.41, MA1/4, L = 0.44, H = 0.23.

11: *Leptocythere aff. L. caspia* (LIVENTAL, 1938) / SG 29, RV, 270x, 0.29, PO2/4B, L = 0.32, H = 0.17.

12: *Leptocythere aff. L. nostrata* LIVENTAL, 1962 / SG 30, RV, 200x, 0.40, PO2/4A, L = 0.47, H = 0.24.

13: *Leptocythere sp. 1* / SG 31, LV, 200x, 0.40, MA2/12, L = 0.45, H = 0.23.

14: *Leptocythere sp. 2* / SG 32, LV, 260x, 0.31, MA9/19, L = 0.34, H = 0.20.

15: *Leptocythere sp. 4* / SG 33, RV, 165x, 0.50, AM4/39, L = 0.54, H = 0.30.

16: *Leptocythere (Amnicythere) cymbula* (LIVENTAL, 1929) / SG 34, RV, 200x, 0.40, PO2/28B, L = 0.43, H = 0.25.

17: *Leptocythere (Amnicythere) litica* LIVENTAL, 1935 / SG 35, LV, 155x, 0.51, POS5/10, L = 0.56, H = 0.35.

18: *Leptocythere (Amnicythere) microlata* (LIVENTAL, 1961) / SG 36, RV, 220x, 0.36, PO2/28A, L = 0.37, H = 0.23.

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PLATE 3

1: *Leptocythere (Amnicythere) multituberculata* (LIVENTAL, 1929) / SG 37, LV, 190x, 0.41, PO4/12, L= 0.47, H= 0.27.

2: *Leptocythere (Amnicythere) sinegubi* KRSTIC, 1975 / SG 38, LV, 200x, 0.40, PO4/13, L= 0.45, H= 0.25.

3: *Leptocythere (Amnicythere) stanchevae* KRSTIC, 1973 / SG 39, RV, 200x, 0.40, PO5/18B, L= 0.46, H= 0.26.

4: *Leptocythere (Euxinocythere) bisaltiana* GRAMANN, 1969 / SG 40, LV, 145x, 0.57, PO5/5, L= 0.64, H= 0.34.

5: *Leptocythere (Euxinocythere) quinquetuberculaia* SCHWEYER, 1949 / SG 41, RV, 250x, 0.33, PO1/10, L= 0.38, H= 0.23.

6: *Leptocythere (Euxinocythere) schwayeri* (SCHNEIDER, 1949) / SG 42, LV, 200x, 0.40, PO1/18, L= 0.44, H= 0.23.

7: *Callistocythere crispata* (BRADY, 1868) / SG 43, LV, 145x, 0.57, DH16/12B, L= 0.66, H= 0.36.

8: *Callistocythere folliculosa* BONADUCE, CIAMPO & MASOLI, 1975 / SG 44, RV, 185x, 0.44, PI2/16A, L= 0.49, H= 0.27.

9: *Callistocythere gilva* BONADUCE, CIAMPO & MASOLI, 1975 / SG 45, RV, 220x, 0.37, PO10/21A, L= 0.42, H= 0.28.

10: *Callistocythere littoralis* (MUELLER, 1894) / SG 46, LV, 160x, 0.50, DH16/12A, L= 0.56, H= 0.33.

11: *Callistocythere lobiancoi* (MUELLER, 1912) / SG 47, LV, 130x, 0.61, PI4/15, L= 0.66, H= 0.35.

12: *Callistocythere macilenta* CIAMPO, 1971 / SG 48, RV, 170x, 0.50, PO10/15A, L= 0.57, H= 0.28.

13 -14: *Callistocythere montana* DORUK, 1980 / 13: SG 49, RV, 210x, 0.40, AM10/5, L= 0.45, H= 0.25; 14: SG 50, LV, 210x, 0.40, ST3/15, L= 0.42, H= 0.25.

15: *Callistocythere pallida* (MUELLER, 1894) / SG 51, RV, 220x, 0.36, PI5/6B, L= 0.40, H= 0.22.

16: *Callistocythere sp. 2* / SG 52, LV, 190x, 0.41, MA4/21, L= 0.45, H= 0.29.

17: *Ionicicythere golnarae* YASSINI, 1979 / SG 53, LV, 200x, 0.40, MA1/2, L= 0.43, H= 0.26.

18: *Microceratina reticulata* BONADUCE, CIAMPO & MASOLI, 1975 / SG 54, LV, 220x, 0.33, ST5/21B, L= 0.36, H= 0.18.
PLATE 4

1: *Cyprideis torosa* JONES, 1857 / SG 55, RV, 74x, 1.08, AM7/1, L = 1.16, H = 0.61.

2: *Cyprideis torosa* JONES, 1857 / SG 56, LV, 70x, 1.08, AM7/9, L = 1.16, H = 0.68.

3: *Cyprideis torosa* JONES, 1857 / SG 57, RV, 180x, 0.44, PI5/10A, L = 0.48, H = 0.26.

4: *Cyprideis torosa* JONES, 1857 / SG 57, RV, 180x, 0.44, AM7/1.

5: *Cyprideis torosa* JONES, 1857 / SG 57, RV, 150x, 0.51, AM7/1.

6: *Cyprideis torosa* JONES, 1857 / SG 57, RV, 400x, 0.20, AM7/1.

7: *Cyprideis aff. C. versiliaensis* DECIMA, 1964 / SG 58, LV, 100x, 0.80, DH1/2, L = 0.80, H = 0.52.

8: *Cytherissa aff. C. bogatschovi* (LIVENTAL, 1938) / SG 59, LV, 320x, 0.25, PO3, L = 0.28, H = 0.19.

9: *Cytherissa aff. C. bogatschovi* (LIVENTAL, 1938) / SG 60, RV, 330x, 0.25, PO3, L = 0.28, H = 0.18.

10: *Cyprideis triangulata* KRSTIC, 1963 / SG 61, LV, 145x, 0.57, AM2/31, L = 0.65, H = 0.42.

11: *Cushmanidea cf. C. lithodomoides* (BOSQUET, 1852) / SG 62, RV, 98x, 0.82, DH16/14, L = 0.92, H = 0.41.

12: *Cushmanidea cf. C. turbida* (MUELLER, 1894) / SG 63, RV, 100x, 0.80, PI15/16, L = 0.78, H = 0.31.

13: *Krithe aequabilis* CIAMPO, 1986 / SG 64, RV, 130x, 0.57, AM15, L = 0.63, H = 0.29.

14: *Krithe citae* OERTLI, 1961 / SG 65, RV, 130x, 0.67, AM15, L = 0.73, H = 0.36.

15: *Krithe compressa dertonensis* RUGGIERI, 1962b / SG 66, LV, 115x, 0.69, DH13/20, L = 0.71, H = 0.34.

16: *Krithe hyalina* BRADY, 1880 / SG 67, RV, 150x, 0.51, DH10/12, L = 0.50, H = 0.31.

17: *Krithe monosteracensis* (SEGUENZA, 1880) / SG 68, LV, 160x, 0.50, AM15, L = 0.55, H = 0.31.

18: *Krithe morkhoveni ayressi* COLES, WHATLEY & MOGUILEVSKY, 1994 / SG 69, RV, 120x, 0.67, AM15, L = 0.75, H = 0.38.
**PLATE 5**

1. *Krithe producta* BRADY, 1880 / SG 70, LV, 210x, 0.40, ST2/5, L= 0.43, H= 0.26.

2. *Krithe sp. 1* / SG 71, LV, 120x, 0.67, AM15, L= 0.71, H= 0.35.

3. *Krithe sp. 3* / SG 72, RV, 115x, 0.69, DH13/13, L= 0.71, H= 0.33.

4. *Krithe sp. 3* / SG 73, LV, 120x, 0.67, DH13/13, L= 0.67, H= 0.32.

5. *Parakrithe dimorpha* BONADUCE, CIAMPO & MASOLI, 1975 / SG 74, RV, 175x, 0.44, PO10, L= 0.51, H= 0.21.

6. *Parakrithe dimorpha* BONADUCE, CIAMPO & MASOLI, 1975 / SG 75, RV, 170x, 0.44, PO10, L= 0.49, H= 0.19.

7. *Neocyprideis pseudadonta* HANAI, 1959 / SG 76, LV, 145x, 0.51, AM14/32, L= 0.57, H= 0.28.

8. *Neocytherideis fasciata* (BRADY & ROBERTSON, 1874) / SG 77, RV, 220x, 0.37, ST5/22A, L= 0.40, H= 0.17.

9. *Neocytherideis foveolata* COLALONGO & PASINI, 1988 / SG 78, LV, 230x, 0.34, ST6/10A, L= 0.36, H= 0.14.

10. *Neocytherideis fusiformis* YASSINI, 1979 / SG 79, RV, 125x, 0.67, PI15/10, L= 0.77, H= 0.28.

11. *Pseudopsammocythere reniformis* (BRADY, 1868) / SG 80, LV, 200x, 0.40, DH14/18, L= 0.41, H= 0.21.

12. *Carinocythereis antiquata* (BAIRD, 1850a) / SG 81, RV, 140x, 0.57, MA3/25, L= 0.64, H= 0.34.

13. *Carinocythereis carinata* (ROEMER, 1838) / SG 82, LV, 145x, 0.54, ST4/8, L= 0.59, H= 0.36.

14. *Costa batei* (BRADY, 1866) / SG 83, RV, 88x, 0.89, DH16/28, L= 1.02, H= 0.50.

15. *Costa edwardsii* (ROEMER, 1838) / SG 84, LV, 135x, 0.57, PI11/21, L= 0.64, H= 0.39.


17. *Agrenocythere pliocenica* SEGUENZA / SG 86, LV, 60x, 1.33, ST2/25, L= 1.45, H= 0.80.

18. *Cytheromorpha reticulata* COLALONGO & PASINI, 1988 / SG 87, RV, 195x, 0.42, PI11/11C, L= 0.47, H= 0.25.
PLATE 6

1: *Cistacythereis pokornyi hellenica* ULICZNY, 1969 / SG 88, LV, 120x, 0.67, PI6/23B, L= 0.75, H= 0.42.

2: *Falunia* (*Falunia*) *plicatula* (REUSS, 1850) / SG 89, RV, 125x, 0.63, DH16/1, L= 0.69, H= 0.39.

3: *Falunia* (*Falunia*) *sphaerulolineata* (JONES, 1856) / SG 90, LV, 135x, 0.57, PI11/13B, L= 0.64, H= 0.37.

4: *Falunia* (*Hiltermanicythere*) *cephalonica* (ULICZNY, 1969) / SG 91, RV, 120x, 0.67, DH18/26, L= 0.71, H= 0.37.

5: *Falunia* (*Hiltermanicythere*) *quadridentata* (BAIRD, 1850a) / SG 92, RV, 94x, 0.89, DH20/16, L= 1.00, H= 0.49.

6: *Falunia* (*Hiltermanicythere*) *retifastigata* (JONES, 1856) / SG 93, RV, 100x, 0.80, DH21/17, L= 0.88, H= 0.40.

7: *Falunia* (*Hiltermanicythere*) *rugosa* (COSTA, 1853) / SG 94, RV, 105x, 0.80, DH21/17, L= 0.88, H= 0.44.

8: *Falunia* (*Hiltermanicythere*) *turbida* (MUELLER, 1894) / SG 95, RV, 135x, 0.57, DH27/22, L= 0.63, H= 0.34.

9: *Incongruellina* (*Incongruellina*) *semispinescens* RUGGERI, 1958 / SG 96, LV, 105x, 0.80, PI6/18, L= 0.88, H= 0.60.

10: *Incongruellina* (*Lixouria*) *keiji* (SISSINGH, 1972) / SG 97, LV, 100x, 0.80, PI15/11, L= 0.90, H= 0.50.

11: *Incongruellina* (*Lixouria*) *marginata* (TERQUEM, 1878) / SG 98, LV, 100x, 0.80, PI13/13, L= 0.89, H= 0.59.

12: *Pterygocythereis ceratoptera* (BOSQUET, 1852) / SG 99, LV, 72x, 1.08, PI4/21, L= 1.22, H= 0.65.

13: *Echinocythereis keyseri* STAMBOLIDIS, 1982 / SG 100, RV, 200x, 0.40, PI4/30B, L= 0.43, H= 0.25.

14: *Echinocythereis scabra* (von MUNSTER, 1830) / SG 101, RV, 94x, 0.83, PI6/21, L= 0.94, H= 0.54.

15 - 17: *Henryhowella asperrima* (REUSS, 1849) /15: SG 102, RV, 96x, 0.80, AM15, L= 0.91, H= 0.53; 16: SG 103, LV, 100x, 0.80, AM15, L= 0.90, H= 0.58; 17: SG 104, RV, 92x, 0.85, ST4/10, L= 0.89, H= 0.53.

18: *Henryhowella irpex* (BRADY, 1880) / SG 105, LV, 80x, 1.00, DH16/2, L= 1.10, H= 0.70.
PLATE 7

1: *Buntonia (Buntonia) giesbrechti robusta* RUGGIERI, 1954 / SG 106, LV, 140x, 0.57, DH20/12, L= 0.60, H= 0.39.

2: *Buntonia (Buntonia) multicostata* RUGGIERI, 1952 / SG 107, RV, 145x, 0.57, ST5/6C, L= 0.60, H= 0.35.

3: *Buntonia (Buntonia) sublatissima dertonensis* RUGGIERI, 1954 / SG 108, LV, 150x, 0.53, DH24/21, L= 0.59, H= 0.39.

4: *Buntonia (Buntonia) sublatissima sublatissima* (NEVIANI, 1906) / SG 109, RV, 190x, 0.44, ST6/21B, L= 0.47, H= 0.31.

5: *Buntonia (Buntonia) textilis* BONADUCE, CIAMPO & MASOLI, 1975 / SG 110, LV, 155x, 0.42, PI6/17A, L= 0.45, H= 0.27.

6: *Buntonia (Quasibuntonia) seguenziana* (RUGGIERI, 1958) / SG III, LV, 230x, 0.36, PI5/IIA, L= 0.40.

7: *Ruggieria tetraptera* (SEGUENZA, 1880) / SG 112, RV, 120x, 0.67, DH18/4, L= 0.77, H= 0.45.

8: *Occultocythereis bituberculata* (REUSS, 1849) / SG 113, RV, 170x, 0.44, DH5/9, L= 0.47, H= 0.24.

9: *Occultocythereis dohri* PURI, 1963 / SG 114, RV, 160x, 0.50, DH5/26, H= 0.30.

10: *Acanthocythereis hystrix* REUSS, 1850 / SG 115, LV, 76x, 1.05, DH16/32, L= 1.16, H= 0.61.

11: *Bosquetina carinella* (REUSS, 1850)/SG 116, LV, 175x, 0.44, MA6/15, L= 0.47, H= 0.30.

12: *Bosquetina rhodiensis* SISSINGH, 1972 / SG 117, RV, 60x, 1.14, DH25/1, L= 1.26, H= 0.77.

13: *Aurila ablicans* (RUGGIERI, 1958) / SG 118, RV, 130x, 0.57, DH16/25, L= 0.66, H= 0.41.

14: *Aurila aspidoides* ULICZNY, 1969 / SG 119, LV, 180x, 0.44, ST9/13B, L= 0.50, H= 0.31.

15: *Aurila convexa convexa* BAIRD, 1850 / SG 120, RV, 100x, 0.80, DH15/5, L= 0.92, H= 0.60.

16: *Aurila convexa emathiae* ULICZNY, 1969 / SG 121, LV, 115x, 0.71, PI4/4C, L= 0.84, H= 0.59.

17: *Aurila cruciata cruciata* (RUGGIERI, 1950) / SG 122, LV, 90x, 0.89, DH15/6, L= 0.94, H= 0.68.

18: *Aurila cruciata minor* ULICZNY, 1969/S 123, LV, 200x, 0.40, DH17/11, L=.44, H= .29.

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PLATE 8

1: *Aurila fialodes* ULICZNY, 1969 / SG 124, LV, 88x, 0.89, DH16/19A, L= 0.97, H= 0.71.

2: *Aurila hesperiae* (RUGGIERI, 1975) / SG 125, C, 100x, 0.80, DH27/29, L= 0.86, H= 0.56.

3: *Aurila ithaca* ULICZNY, 1969 / SG 126, RV, 125x, 0.63, DH16/24, L= 0.69, H= 0.42.

4: *Aurila lanceaeformis* ULICZNY, 1969 / SG 127, RV, 120x, 0.67, DH20/17, L= 0.73, H= 0.45.

5: *Aurila loboides* ULICZNY, 1969 / SG 128, RV, 98x, 0.80, DH19/5, L= 0.88, H= 0.52.

6: *Aurila maculosa* ULICZNY, 1969 / SG 129, RV, 78x, 1.00, DH15/16A, L= 1.10, H= 0.68.

7: *Aurila pigadiana* SISSINGH, 1972 / SG 130, LV, 120x, 0.67, DH15/11, L= 0.71, H= 0.49.

8: *Aurila preacuta* ULICZNY, 1969 / SG 131, RV, 96x, 0.80, DH15/16, L= 0.89, H= 0.56.

9: *Aurila punctata punctata* (von MUNSTER, 1830) / SG 132, LV, 125x, 0.67, DH24/18B, L= 0.72, H= 0.51.

10: *Aurila punctata nilensis* BASSIOUNI, 1966 / SG 133, RV, 130x, 0.63, DH21/21, L= 0.70, H= 0.45.

11: *Aurila speyeri* (BRADY, 1868) / SG 134, RV, 92x, 0.89, DH19/8B, L= 0.98, H= 0.56.

12: *Aurila ulicznyi* SISSINGH, 1972 / SG 135, LV, 145x, 0.57, DH16/10, L= 0.61, H= 0.39.

13: *Aurila veniliae* (ULICZNY, 1969) / SG 136, LV, 125x, 0.63, PI4/3D, L= 0.72, H= 0.45.

14: *Aurila sp. 2* / SG 137, LV, 84x, 0.93, DH19/1, L= 1.05, H= 0.70.

15: *Mutilus cimbaeformis* (SEGUENZA, 1882) / SG 138, LV, 98x, 0.80, DH15/4, L= 0.88, H= 0.56.

16: *Mutilus dohrni* ULICZNY, 1969 / SG 139, RV, 100x, 0.80, DH25/26, L= 0.88, H= 0.54.

17: *Mutilus retiformis* (TERQUEM, 1878) / SG 140, LV, 100x, 0.80, DH16/29, L= 0.88, H= 0.58.

18: *Mutilus retiformis* (TERQUEM, 1878) / SG 141, RV, 92x, 0.89, DH15/2, L= 0.96, H= 0.64.
PLATE 9

1: *Mutilus venetiensis* (ULICZNY, 1969) / SG 142, LV, 98x, 0.82, DH16/9, L= 0.90, H= 0.61.

2: *Pokornyella deformis* (REUSS, 1850) / SG 143, LV, 170x, 0.50, AM4/28, L= 0.57, H= 0.41.

3: *Hermanites heidingeri* (REUSS, 1850) / SG 144, RV, 125x, 0.67, PI3/18, L= 0.72, H= 0.37.

4: *Hermanites sp.* / SG 145, LV, 120x, 0.67, PI3/17A, L= 0.75, H= 0.50.

5: *Poseidonamicus sp.* / SG 146, RV, 120x, 0.67, DH25/24, L= 0.72, H= 0.44.

6: *Quadracythere (Tenedocythere) prava* (BAIRD, 1850b) / SG 147, LV, 84x, 0.95, DH15/14, L= 1.05, H= 0.64.

7: *Quadracythere (Tenedocythere) prava* (BAIRD, 1850b) / SG 148, RV, 86x, 0.89, DH18/25, L= 0.98, H= 0.60.

8: *Urocythereis distinguenda* (NEVIANI, 1928) / SG 149, LV, 105x, 0.80, DH16/4, L= 0.86, H= 0.50.

9: *Urocythereis favosa* (ROEMER, 1838) / SG 150, RV, 74x, 1.08, DH15/18, L= 1.19, H= 0.70.

10: *Caudites calceolatus* (COSTA, 1853) / SG 151, LV, 150x, 0.53, AM13/2, L= 0.57, H= 0.33.

11: *Pachycaudites ungeri* (REUSS, 1849) / SG 152, LV, 82x, 1.00, DH19/26, L= 1.09, H= 0.70.

12: *Tyrrhenocythere filipesqui* HANGANU, 1962 / SG 153, LV, 125x, 0.67, AM2/5, L= 0.75, H= 0.50.

13: *Tyrrhenocythere pannonicum* OLTEANU, 1989 / SG 154, LV, 135x, 0.63, PO4/5, L= 0.66, H= 0.41.

14: *Tyrrhenocythere pignatii* RUGGIERI, 1955 / SG 155, RV, 120x, 0.67, AM3/10, L= 0.75, H= 0.44.

15: *Tyrrhenocythere cf. T. pannonicum* OLTEANU, 1989 / SG 156, RV, 230x, 0.36, DH5/16, L= 0.36, H= 0.23.

16: *Tyrrhenocythere sp. 2* / SG 157, RV, 185x, 0.44, DH5/14, L= 0.49, H= 0.29.

17: *Tyrrhenocythere sp. 3* / SG 158, RV, 190x, 0.42, AM10/3, L= 0.46, H= 0.29.

18: *Graptocythere hscripta* (CAPEDER, 1900) / SG 159, RV, 120x, 0.67, DH21/18, L= 0.73, H= 0.43.
1: *Flexus obtusa* RUGGIERI, 1962b / SG 160, LV, 98x, 0.82, PI6/11A, L= 0.92, H= 0.49.

2: *Loxocauda azeri* (AGALAROVA, 1961) / SG 161, RV, 220x, 0.34, PO5/21B, L= 0.37, H= 0.22.

3: *Loxocauda limata* SCHWEYER, 1949 / SG 162, RV, 195x, 0.42, PO2/14, L= 0.49, H= 0.25.

4: *Loxocauda stevanovici* KRSTIC, 1972 / SG 163, RV, 195x, 0.42, PO1/2, L= 0.49, H= 0.22.

5: *Loxoconcha affinis* (BRADY, 1866) / SG 164, RV, 220x, 0.34, ST3/23, L= 0.38, H= 0.26.

6: *Loxoconcha agilis* RUGGIERI, 1967 / SG 165, RV, 220x, 0.36, ST3/23, L= 0.38, H= 0.26.

7: *Loxoconcha alata* BRADY, 1868b / SG 166, LV, 150x, 0.51, DH21/15, L= 0.55, H= 0.32.

8: *Loxoconcha bairdi* MUELLER, 1912 / SG 167, LV, 100x, 0.80, PI6/24, L= 0.89, H= 0.63.

9: *Loxoconcha cumsacui* KRSTIC, 1972b / SG 168, RV, 260x, 0.31, PO1/26, L= 0.34, H= 0.20.

10: *Loxoconcha exagona* BONADUCE, CIAMPO & MASOLI, 1975 / SG 169, RV, 145x, 0.57, DH24/7, L= 0.61, H= 0.44.

11- 12: *Loxoconcha moncharmonti* CIAMPO, 1971a / 11: SG 170, RV, 260x, 0.31, ST3/4, L= 0.34, H= 0.20; 12: SG 171, LV, 240x, 0.33, ST3/26, L= 0.35, H= 0.21.

13: *Loxoconcha muelleri* (MEHES, 1908) / SG 172, C, 160x, 0.50, AM8/2, L= 0.58, H= 0.35.

14: *Loxoconcha napoliiana* PURI, 1963 / SG 173, RV, 130x, 0.67, ST6/20, L= 0.68, H= 0.40.

15: *Loxoconcha ovulata* (COSTA, 1835) / SG 174, RV, 270x, 0.29, ST3/19, L= 0.30, H= 0.19.

16: *Loxoconcha parallela* MUELLER, 1894 / SG 175, RV, 125x, 0.67, DH25/17, L= 0.73, H= 0.38.

17: *Loxoconcha petasus* LIVENTAL, 1929 / SG 176, LV, 200x, 0.40, PO1/11, L= 0.44, H= 0.23.

18: *Loxoconcha rhomboidea* (FISCHER, 1855) / SG 177, LV, 120x, 0.67, DH16/6, L= 0.72, H= 0.48.
PLATE 11

1: *Loxoconcha schweyeri* SUZIN, 1956 / SG 178, RV, 250x, 0.33, PO2/8, L= 0.34, H= 0.21.

2: *Loxoconcha spinosa* SOKAC, 1972 / SG 179, LV, 210x, 0.40, DH2/1, L= 0.42, H= 0.26.

3: *Loxoconcha stellifera* MUELLER, 1894 / SG 180, LV, 120x, 0.67, PI14/12, L= 0.71, H= 0.52.

4: *Loxoconcha turbida* MUELLER, 1912 / SG 181, LV, 280x, 0.29, MA2/27, L= 0.30, H= 0.21.

5: *Loxoconcha versicolor* MUELLER, 1894 / SG 182, RV, 220x, 0.36, ST3/8, L= 0.38, H= 0.20.

6: *Loxoconcha aff. L. agilis* RUGGIERI, 1967 / SG 183, LV, 135x, 0.57, PI12/9, L= 0.63, H= 0.40.

7: *Loxoconcha aff. L. bonaducei* CIAMPO, 1971 / SG 184, LV, 155x, 0.51, PI11/29, L= 0.58, H= 0.36.

8: *Loxoconcha cf. L. turbida* (MUELLER, 1912) / SG 185, RV, 160x, 0.50, PI4/32B, L= 0.55, H= 0.39.

9: *Loxoconcha sp. 1* / SG 186, RV, 200x, 0.40, AM4/5, L= 0.44, H= 0.30.

10: *Loxoconcha sp. 3* / SG 187, LV, 130x, 0.63, PI4/8, L= 0.70, H= 0.50.

11: *Loxoconcha sp. 7* / SG 188, LV, 150x, 0.51, PO5/12, L= 0.54, H= 0.38.

12: *Loxoconcha sp. 8* / SG 189, LV, 200x, 0.40, AM4/20, L= 0.45, H= 0.32.

13: *Loxoconcha sp. 9* / SG 190, RV, 200x, 0.40, AM4/4, L= 0.45, H= 0.28.

14: *Loxoconcha sp. 10* / SG 191, RV, 195x, 0.41, AM10/17, L= 0.43, H= 0.28.

15: *Loxoconcha sp. 11* / SG 192, LV, 210x, 0.40, AM10/22, L= 0.42, H= 0.29.

16: *Loxoconcha sp. 12* / SG 193, LV, 165x, 0.50, AM8/1, L= 0.55, H= 0.34.

17: *Loxoconcha sp. 13* / SG 194, RV, 220x, 0.36, DH13/9, L= 0.38, H= 0.23.

18: *Loxoconcha sp. 14* / SG 195, LV, 260x, 0.33, PO2/20, L= 0.38, H= 0.23.
PLATE 12

1: *Loxoconcha (Loxocaspia) cf. L. (L.) kalickyi* LUBIMova, 1981 / SG 196, RV, 160x, 0.50, AM2/16, L= 0.58, H= 0.34.

2, 3: *Loxoconcha (Loxocorniculina) djaffarovi* SCHNEIDER, 1956 / 2: SG 197, RV, 290x, 0.26, PO3, L= 0.29, H= 0.17; 3: SG 198, LV, 270x, 0.29, PO3, L= 0.31, H= 0.18.

4: *Hirschmania sp.* / SG 199, LV, 200x, 0.40, Pl4/28B, L= 0.43, H= 0.31.

5: *Phlyctocythere pellucida* MUELLER, 1894 / SG 200, RV, 200x, 0.40, PI9/6, L= 0.45, H= 0.25.

6: *Paracytheridea depressa* MUELLER, 1894 / SG 201, LV, 185x, 0.43, PO10, L= 0.48, H= 0.23.

7: *Paracytheridea inscita* DORK, 1980 / SG 202, LV, 220x, 0.37, DH14/29, L= 0.39, H= 0.19.

8: *Paracytheridea paralia* BARBEITO-GONZALEZ, 1971 / SG 203, RV, 150x, 0.53, PI3/26, L= 0.61, H= 0.32.

9: *Pedicythere mirabilis* SISSINGH, 1975 / SG 204, LV, 185x, 0.44, DH10/3, L= 0.46, H= 0.19.

10: *Pedicythere phryne* BONADUCE, CIAMPO & MASOLI, 1975 / SG 205, LV, 200x, 0.40, DH4/3, L= 0.40, H= 0.19.

11: *Pedicythere polia* COLALONGO & PASINI, 1988 / SG 206, LV, 180x, 0.44, DH10/20, L= 0.44, H= 0.26.

12: *Pedicythere sp.* / SG 207, RV, 200x, 0.40, PO11/30, L= 0.42, H= 0.27.

13: *Cytherura cf. C. cornuta* (BRADY, 1868) / SG 208, LV, 185x, 0.44, DH11/23, L= 0.43, H= 0.27.

14: *Eucytherura complexa* (BRADY, 1866) / SG 209, RV, 310x, 0.25, PI6/5, L= 0.27, H= 0.16.

15: *Eucytherura gibbera* MUELLER, 1894 / SG 210, RV, 270x, 0.29, ST3/2, L= 0.31, H= 0.17.

16: *Eucytherura ex.gr. E. mediopunctata* COLES & WHATLEY, 1989 / SG 211, RV, 310x, 0.26, ST1/7, L= 0.29, H= 0.17.

17: *Eucytherura ex.gr. E. mediopunctata* COLES & WHATLEY, 1989 / SG 212, LV, 340x, 0.24, ST1/7, L= 0.26.

18: *Eucytherura pseudoantipodum* COLES & WHATLEY, 1989 / SG 213, LV, 310x, 0.26, ST1/7, L= 0.28, H= 0.17.
PLATE 13

1: *Hemicytherura deflorei* RUGGERI, 1953c / SG 214, LV, 240x, 0.33, MA5/6B, L= 0.36, H= 0.21.

2: *Hemicytherura gracilicosta* RUGGERI, 1953c / SG 215, RV, 220x, 0.40, ST9/15A, L= 0.40, H= 0.22.

3, 6: *Hemicytherura hellenica* SISSINGH, 1972 /3: SG 216, RV, 500x, 0.16, PO10; 6: SG 216, RV, 260x, 0.29, PO10, L= 0.32, H= 0.20.

4, 5: *Hemicytherura videns* (MUeller, 1894) /4: SG 217, LV, 500x, 0.16, PO10; 5: SG 217, LV, 240x, 0.33, PO10, L= 0.38, H= 0.22.

7: *Semicytherura acuminata* (MUeller, 1894) / SG 218, LV, 160x, 0.50, DH25/29, L= 0.55, H= 0.29.

8: *Semicytherura acuticostata* (SARS, 1866) / SG 219, RV, 175x, 0.44, DH14/32, L= 0.46, H= 0.26.

9: *Semicytherura aenariensis* BONADUCE, CIAMPO & MASOLI, 1975 / SG 220, LV, 155x, 0.51, MA9/31B, L= 0.56, H= 0.27.

10: *Semicytherura alifera* RUGGERI, 1959 / SG 221, LV, 260x, 0.33, ST5/19A, L= 0.37, H= 0.17.

11: *Semicytherura dispar* (MUeller, 1894) / SG 222, LV, 240x, 0.33, ST3/6B, L= 0.36, H= 0.18.

12: *Semicytherura incongruens* (MUeller, 1894) / SG 223, RV, 270x, 0.29, PO3, L= 0.31, H= 0.17.

13: *Semicytherura inversa* (SEGUENSA, 1880) / SG 224, LV, 210x, 0.40, DH4/5A, L= 0.43, H= 0.24.

14: *Semicytherura paradoxa* (MUeller, 1894) / SG 225, RV, 150x, 0.51, DH11/32, L= 0.53, H= 0.28.

15: *Semicytherura punctata* (MUeller, 1894) / SG 226, RV, 190x, 0.42, DH11/31, L= 0.46, H= 0.22.

16: *Semicytherura quadridentata* (HARTMANN, 1953) / SG 227, RV, 170x, 0.50, PI15/5, L= 0.53, H= 0.29.

17: *Semicytherura rara* (MUeller, 1894) / SG 228, LV, 220x, 0.40, ST9/15C, L= 0.42, H= 0.19.

18: *Semicytherura spratti* SISSINGH, 1972 / SG 229, LV, 260x, 0.31, PI2/22B, L= 0.34, H= 0.17.
PLATE 14

1: Semicytherura tergestina MASOLI, 1968 / SG 230, RV, 250x, 0.33, ST10/6B, L= 0.35, H= 0.18.

2: Semicytherura cf. S. acuta MUELLER, 1912 / SG 231, RV, 190x, 0.41, PI11/7C, L= 0.44, H= 0.25.

3: Semicytherura cf. S. diafora BARBEITO-GONZALEZ, 1971 / SG 232, LV, 170x, 0.48, DH11/24, L= 0.50, H= 0.24.

4: Semicytherura cf. S. gibbera ARUTA, 1983 / SG 233, RV, 175x, 0.44, DH17/6, L= 0.51, H= 0.27.

5: Semicytherura sp. 1 / SG 234, RV, 300x, 0.26, AM14/15, L= 0.31, H= 0.15.

6: Semicytherura sp. 5 / SG 235, RV, 240x, 0.33, PI11/4B, L= 0.38, H= 0.20.

7: Semicytherura sp. 6 / SG 236, RV, 200x, 0.40, PI11/11A, L= 0.45, H= 0.23.

8: Semicytherura sp. 7 / SG 237, LV, 210x, 0.40, PI11/14B, L= 0.44, H= 0.23.

9: Semicytherura sp. 8 / SG 238, RV, 250x, 0.33, PI11/15A, L= 0.35, H= 0.18.

10: Semicytherura sp. 9 / SG 239, LV, 195x, 0.42, PI17/14, L= 0.47, H= 0.24.

11: Parahemingwayella downingae COLES & WHATLEY, 1989 / SG 240, LV, 280x, 0.29, ST2/6, L= 0.31, H= 0.16.

12: Cytheropteron aemulum CIAMPO, 1988 / SG 241, LV, 135x, 0.57, PI3/23, L= 0.64, H= 0.47.

13: Cytheropteron alatum SARS 1866 / SG 242, RV, 200x, 0.40, ST3/1, L= 0.42, H= 0.23.

14: Cytheropteron apostoliensis SISSINGH, 1972 / SG 243, RV, 190x, 0.43, ST9/14C, L= 0.44, H= 0.30.

15: Cytheropteron ascolii CARBONNEL, 1969 / SG 244, RV, 210x, 0.40, ST5/23, L= 0.40, H= 0.24.

16: Cytheropteron boldi CARBONNEL, 1969 / SG 245, RV, 380x, 0.21, AM14/19, L= 0.21, H= 0.15.

17: Cytheropteron cronini DINGLE, LORD & BOOMER, 1989 / SG 246, LV, 210x, 0.40, PO10/13B, L= 0.45, H= 0.30.

18: Cytheropteron hamatum SARS, 1869 / SG 247, RV, 200x, 0.40, PI6/7, L= 0.45, H= 0.30.
PLATE 15

1: Cytheropteron latum  MUELLER, 1894 / SG 248, RV, 240x, 0.33, ST9/14A, L= 0.35, H= 0.20.

2: Cytheropteron lineoporosa WHATLEY & COLES, 1987 / SG 249, LV, 145x, 0.57, DH10/21, L= 0.59, H= 0.36.

3: Cytheropteron monoceros BONADUCE, CIAMPO & MASOLI, 1975 / SG 250, LV, 180x, 0.44, PI5/4A, L= 0.50, H= 0.33.

4: Cytheropteron patagoniense BRADY, 1880 / SG 251, RV, 190x, 0.43, PI2/30, L= 0.48, H= 0.34.

5: Cytheropteron punctatum BRADY, 1868a / SG 252, RV, 220x, 0.36, PI5/5A, L= 0.41, H= 0.26.

6: Cytheropteron ruggieri PUCCI, 1955 / SG 253, LV, 200x, 0.40, PI5/12, L= 0.47, H= 0.31.

7: Cytheropteron trifosata WHATLEY & COLES, 1987 / SG 254, LV, 200x, 0.40, DH10/22, L= 0.40, H= 0.26.

8: Cytheropteron venustum BONADUCE, CIAMPO & MASOLI, 1975 / SG 255, LV, 180x, 0.44, DH13/7, L= 0.48, H= 0.29.

9: Cytheropteron cf. C. punctatum BRADY, 1868a / SG 256, LV, 260x, 0.33, DH23/26, L= 0.36, H= 0.22.

10, 11: Cytheropteron 29/4 DINGLE, LORD & BOOMER, 1990 / SG 257, LV, 430x, 0.13, PO10; 11: SG 257, LV, 220x, 0.33, PO10, L= 0.38, H= 0.21.

12: Aversovalva lancei CARBONNEL, 1969 / SG 258, LV, 250x, 0.31, ST3/14, L= 0.35, H= 0.23.

13: Aversovalva hydrodynamica WHATLEY & COLES, 1987 / SG 259, LV, 185x, 0.44, DH4/21, L= 0.46, H= 0.26.

14, 15: Cytheropteron sp. 3 / 14: SG 260, RV, 190x, 0.44, ST9/14D, L= 0.51, H= 0.29; 15: SG 261, RV, 850x, 0.10, ST9/14D.

16: Aversovalva cf. A. hydrodynamica WHATLEY & COLES, 1987 / SG 262, RV, 270x, 0.29, ST2/8, L= 0.29, H= 0.18.

17: Xestoleberis communis MUELLER, 1894 / SG 263, RV, 98x, 0.83, DH16/7, L= 0.92, H= 0.67.

18: Xestoleberis decipiens MUELLER, 1894 / SG 264, RV, 200x, 0.29, DH11/4, L= 0.29, H= 0.18.
1, 2: *Xestoleberis dispar* MUELLER, 1894 / SG 265, RV, 260x, 0.29, ST9/3B, L= 0.29, H= 0.15; 2: SG 266, LV, 155x, 0.50, ST6/27B, L= 0.51, H= 0.34.

3, 4: *Xestoleberis margaritea* (BRADY, 1866) /3: SG 267, LV, 210x, 0.40, ST5/30B, L= 0.40, H= 0.27; 4: SG 268, LV, 115x, 0.67, DH21/12, L= 0.72, H= 0.40.

5: *Xestoleberis ventricosa* MUELLER, 1894 / SG 269, LV, 200x, 0.29, ST10/8A, L= 0.29, H= 0.21.

6: *Xestoleberis (Pontoleberis) attilata* STANCHEVA, 1964 / SG 270, LV, 185x, 0.43, POS/13, L= 0.48, H= 0.36.

7: *Pseudocythere caudata* (SARS, 1866) / SG 271, LV, 140x, 0.57, DH22/17, L= 0.64, H= 0.31.

8-10: *Profundobythere splendida* COLES & WHATLEY, 1989 / 8: SG 272, RV, 190x, 0.42, DH5/20, L= 0.43, H= 0.26; 9: SG 272, RV, 360x, 0.22, DH5/20; 10: SG 272, RV, 825x, 0.09, DH5/20.

11: *Paradoxostoma normani* BRADY, 1868 / SG 273, LV, 115x, 0.67, ST5/15B, L= 0.73, H= 0.40.

12: *Paradoxostoma triste* MUELLER, 1894 / SG 274, RV, 155x, 0.50, ST5/15A, L= 0.54, H= 0.30.

13: *Paracytherois mediterranea* BONADUCE, CIAMPO & MASOLI, 1975 / SG 275, RV, 195x, 0.41, MA11/18, L= 0.45, H= 0.16.

14: *Paracytherois aff. P. mediterranea* BONADUCE, CIAMPO & MASOLI, 1975 / SG 276, RV, 200x, 0.40, ST1/1, L= 0.46, H= 0.17.

15: *Ilyocypris biplicata* (KOCH, 1838) / SG 277, LV, 115x, 0.69, DH25/10, L= 0.78, H= 0.43.

16: *Ilyocypris bradyi* SARS, 1890 / SG 278, LV, 105x, 0.80, ST10/23, L= 0.86, H= 0.50.

17: *Argilloecia acuminata* (MUELLER, 1894) / SG 279, RV, 185x, 0.43, PO11, L= 0.48, H= 0.20.

18: *Argilloecia cylindrica* MUELLER, 1894 / SG 280, RV, 170x, 0.50, ST9/4B, L= 0.51, H= 0.24.
PLATE 17

1: *Argilloecia kissamovensis* SISSINGH, 1972 / SG 281, LV, 175x, 0.44, PO10, L= 0.50, H= 0.26.

2: *Pontocypris acuminata* (MUELLER, 1894) / SG 282, RV, 115x, 0.67, AM15/38, L= 0.76, H= 0.38.

3: *Pontocypris sp.* / SG 283, RV, 160x, 0.50, PI17/1, L= 0.55, H= 0.36.

4: *Propontocypris intermedia* (MUELLER, 1894) / SG 284, LV, 120x, 0.67, AM15/39, L= 0.75, H= 0.39.

5: *Propontocypris sp.* / SG 285, RV, 200x, 0.40, MA2/10, H= 0.25.

6: *Australoecia posterocutata* COLES & WHATLEY, 1989 / SG 286, RV, 200x, 0.40, PI5/6C, L= 0.43, H= 0.17.

7: *Pontocyprella sp.* / SG 287, RV, 135x, 0.57, AM15/25, L= 0.62, H= 0.33.

8: *Paracypris sp.* / SG 288, RV, 110x, 0.74, PO9/13A, L= 0.78, H= 0.43.

9: *Paracypris sp.* / SG 289, LV, 105x, 0.74, PO9/13B, H= 0.48.

10: *Candona (Candona) cf. C. altoides* PETKOVSKI, 1961 / SG 290, RV, 145x, 0.57, DH10/26, L= 0.57, H= 0.29.

11: *Candona (Camptocypria) sp.* / SG 291, RV, 155x, 0.69, PO2/30, L= 0.74, H= 0.34.

12: *Candona (Camptocypria) balcanica* ZALANYI, 1929 / SG 292, RV, 240x, 0.33, PO3/27, L= 0.35, H= 0.19.

13: *Candona (Camptocypria) flectimarginata* SOKAC, 1967 / SG 293, RV, 200x, 0.40, PO2/29, L= 0.43, H= 0.23.

14: *Candona (Pontoniella) acuminata acuminata* ZALANYI, 1929 / SG 294, RV, 175x, 0.44, PI17/3, L= 0.49, H= 0.26.

15: *Candona (Pontoniella) paracuminata* KRSTIC, 1968 / SG 295, RV, 135x, 0.57, PO1/25, L= 0.66, H= 0.33.

16: *Candona (Pontoniella) sitovoensis* STANCHEVA, 1981 / SG 296, LV, 100x, 0.80, PO4/1A, L= 0.92, H= 0.46.

17: *Candona (Pontoniella) truncata* SOKAC, 1972 / SG 297, RV, 130x, 0.67, PO2/25, L= 0.73, H= 0.33.

18: *Candona (Pontoniella) cf. C. (P.) sitovoensis* STANCHEVA, 1981 / SG 298, LV, 230x, 0.36, PO3/23B, L= 0.40, H= 0.20.
PLATE 18

1:  *Candona (Pontoniella) sp.* 3 / SG 299, LV, 200x, 0.40, PO2/12, L= 0.48, H= 0.25.

2:  *Candona (Pontoniella) sp.* 4 / SG 300, LV, 135x, 0.57, PO5/20, L= 0.66, H= 0.36.

3:  *Candona (Pontoniella) sp.* 5 / SG 301, LV, 110x, 0.69, PO5/26, L= 0.78, H= 0.36.

4:  *Candona (Pontoniella) sp.* 6 / SG 302, LV, 200x, 0.40, PO2/10, L= 0.39, H= 0.20.

5:  *Candona (Typhlocyrella) annae* KRSTIC, 1972 / SG 303, LV, 100x, 0.80, PO4/B, L= 0.94, H= 0.46.

6:  *Cavernocandona roaixensis* CARBONNEL, 1969 / SG 304, LV, 150x, 0.53, DH10/17, L= 0.51, H= 0.33.

7:  *Cyprinotus salinus* (BRADY, 1868) / SG 305, RV, 115x, 0.69, PO4/2, L= 0.72, H= 0.50.

8:  *Stanchevia sp.* / SG 306, LV, 210x, 0.40, PO2/11, L= 0.44, H= 0.22.

9:  *Potamocypris fulva* (BRADY, 1868) / SG 307, LV, 180x, 0.44, DH14/6, L= 0.48, H= 0.29.

10: Genus et sp. indet. 3 / SG 308, LV, 250x, 0.33, DH8/7, L= 0.34, H= 0.20.

11: Genus et sp. indet. 9 / SG 309, RV, 110x, 0.69, DH18/20, L= 0.76, H= 0.43.

12: Genus et sp. indet. 10 / SG 310, LV, 160x, 0.50, PI5/21A, L= 0.55, H= 0.29.

13: Genus et sp. indet. 13 / SG 311, RV, 80x, 1.00, DH19/25, L= 1.10, H= 0.55.

14: *Urocythereis sp.* / SG 312, LV, 86x, 0.89, DH19/24, L= 0.96, H= 0.51.

15: *Eucytherura sp.* / SG 313, RV, 270x, 0.29, AM14/13, L= 0.31, H= 0.17.

16: *Pseudocytherura calcarata* (SEGUENZA, 1880) / SG 314, RV, 100x, 0.80, PO9/15, L= 0.84, H= 0.52.
PLATE 19

1: Krithe aequabilis CIAMPO, 1986 / SG 315, RV, 100x, ST6/17A, L= 0.64, H= 0.29.

2: Krithe aquilonia COLES, WHATLEY & MOGUILEVSKY, 1994 / SG 316, LV, 100x, DH8/29, L= 0.59, H= 0.34.

3: Krithe cf. K. padovanii COLALONGO & PASINI, 1988 / SG 317, LV, 100x, MA2/9D, L= 0.49, H= 0.29.

4: Krithe martinsoni COLALONGO & PASINI, 1988 / SG 318, RV, 100x, DH22/18A, L= 0.64, H= 0.27.

5: Krithe monosteracensis SEGUENZA, 1880 / SG 319, RV, 100x, DH5/11, L= 0.39, H= 0.17.

6: Krithe morkhoveni ayressi COLES, WHATLEY & MOGUILEVSKY, 1994 / SG 320, LV, 100x, ST8/20, L= 0.51, H= 0.31.

7: Krithe padovanii COLALONGO & PASINI, 1988 / SG 321, LV, 100x, PO9/27, L= 0.54, H= 0.32.

8: Krithe pernoides pernoides CIAMPO, 1986 / SG 322, LV, 125x, ST7/16, L= 0.59, H= 0.33.

9: Krithe pernoides simiosa CIAMPO, 1986 / SG 323, RV, 100x, DH22/22, L= 0.64, H= 0.29.

10: Krithe praetexta (SARS, 1866) / SG 324, LV, 100x, MA1/1, L= 0.61, H= 0.32.

11: Krithe producta BRADY, 1880 / SG 325, RV, 100x, ST3/18, L= 0.54, H= 0.29.

12: Krithe sp. 1 / SG 326, LV, 125x, PO9/2, L= 0.64, H= 0.32.

13: Krithe sp. 3 / SG 327, RV, 125x, MA2/9B, L= 0.69, H= 0.32.

14: Krithe sp. 4 / SG 328, LV, 100x, MA4/2D, L= 0.60, H= 0.29.
1: *Krithe sp. 5* / SG 329, RV, 100x, MA4/2C, L= 0.59, H= 0.32.

2: *Parakrithe dactylomorpha* RUGGIERI, 1962 / SG 330, LV, 100x, ST10/27, L= 0.54, H= 0.26.

3: *Parakrithe dimorpha* BONADUCE, CIAMPO & MASOLI, 1975 / SG 331, LV, 160x, DH23/20, L= 0.44, H= 0.20.

4: *Parakrithe sp. 1* / SG 332, LV, 100x, DH23/24, L= 0.51, H= 0.25.

5: *Parakrithe sp. 2* / SG 333, LV, 100x, ST10/22B, L= 0.56, H= 0.27.

6: *Pontocypris mytiloides* (NORMAN, 1862) / SG 334, RV, 160x, P11/17, L= 0.51, H= 0.29.

7: *Propontocypris sp. 1* / SG 335, LV, 100x, DH21/8, L= 0.74, H= 0.44.

8: *Candona (Fabaeformiscandona) sp.* / SG 336, LV, 100x, AM16/14, L= 0.81, H= 0.61.

9: Genus *et sp. indet. 2* / SG 337, LV, 100x, AM3/8, L= 0.61, H= 0.37.

10: *Pseudopsammocythere similis* (MUELLER, 1894) / SG 338, LV, 125x, MA4/15, L= 0.54, H= 0.25.

11: *Cypris sp.* / SG 339, LV, 100x, P15/7B, L= 0.39, H= 0.25.

12: *Cyprideis torosa* (JONES, 1850) / SG 340, RV, 125x, P15/10A, L= 0.44, H= 0.22.