Ostracods of the Upper Pliocene - Pleistocene Punta Mazza succession (NE Sicily) with special focus on the Family Trachyleberididae SYLVESTER-BRADLEY, 1948, and description of a new species

Francesco SCIUTO [1]

Abstract: The ostracod associations of the Upper Pliocene-Pleistocene sedimentary succession outcropping at Punta Mazza (Milazzo, Sicily NE) have been investigated. The ostracod fauna is often well-preserved and well-diversified: there 42 species belonging to 24 genera have been found. The association consists almost exclusively of bathyal taxa such as *Bythocypris obtusata* (SARS), *B. bosquetiana* (BRADY), *Henryhowella* ex *H. profunda* BONADUCE *et al.* group, *Quasibuntonia radiatopora* (SEGUENZA), *Retibythere* (*Bathybythere*) *scaberrima* BRADY, *Pseudocythere caudata* SARS and *Bythocythere mylaensis* SCIUTO. Also, the *Krithe* group is well-represented with *Krithe compressa* (SEGUENZA) and *K. pernoides* (BORNEMANN). Further taxa such as *Cytheropteron testudo* SARS are rare. Almost all species, especially those belonging to Trachyleberididae SYLVESTER-BRADLEY are described, illustrated and commented on, including a new species, *Acanthocythereis reticulata* n.sp., found in the lower part of the section in Upper Pliocene sediment, is proposed as new. Finally, a specimen belonging to the genus *Quasibuntonia* RUGGIERI is currently given in open nomenclature.

Key Words: Marine Ostracods; Trachyleberididae; bathyal; new species; Plio-Pleistocene; Sicily.

Citation : SCIUTO F. (2014).- Ostracods of the Upper Pliocene - Pleistocene Punta Mazza succession (NE Sicily) with special focus on the Family Trachyleberididae SYLVESTER-BRADLEY, 1948, and description of a new species.- *Carnets de Géologie* [*Notebooks on Geology*], Brest, vol. 14, n° 1, p. 1-13.

Riassunto : ***Ostracodi della successione del Pliocene Superiore - Pleistocene di Punta Mazza (Sicilia NE) con particolare riferimento alla Famiglia Trachileberididae SYLVESTER-BRADLEY, 1948, e descrizione di una nuova specie.-*** Sono-state studiate le associazioni ostracodi della successione sedimentaria del Pliocene Superiore-Pleistocene affiorante a Punta Mazza (Milazzo, Sicilia NE). La fauna è spesso ben conservata e piuttosto diversificata: sono state trovate 42 specie appartenenti a 24 generi L'Associazione consiste quasi esclusivamente di taxa batiali come: *Bythocypris obtusata* (SARS), *B. bosquetiana* (BRADY), *Henryhowella* ex *H. profunda* BONADUCE *et al.* group, *Quasibuntonia radiatopora* (SEGUENZA), *Retibythere* (*Bathybythere*) *scaberrima* BRADY, *Pseudocythere caudata* SARS e *Bythocythere mylaensis* SCIUTO. Anche il gruppo dei *Krithe* è ben rappresentato con *Krithe compressa* (SEGUENZA) e *K. pernoides* (BORNEMANN). Altri taxa come *Cytheropteron testudo* SARS sono rari. Nel presente lavoro, inoltre, sono state descritte, illustrate e commentate più in dettaglio le specie appartenenti alla famiglia Trachyleberididae SYLVESTER-BRADLEY. Tra di esse, una viene proposta come nuova: *Acanthocythereis reticulata* n.sp., rinvenuta nei livelli più bassi della sezione riferiti al Pliocene Superiore. Un'ulteriore specie, infine, appartenente al genere *Quasibuntonia* RUGGIERI è al momento descritta in nomenclatura aperta.

Parole chiave : Ostracodi marini; Trachileberididae; batiale; specie nuova; Plio-Pleistocene; Sicilia.

Résumé : ***Les ostracodes de la succession Pliocène supérieur - Pleistocène de Punta Mazza (NE Sicile) avec, plus particulièrement, les représentants de la Famille des Trachyleberididae SYLVESTER-BRADLEY, 1948, et la description d'une nouvelle espèce.-*** Nous avons étudié les associations d'ostracodes de la série sédimentaire du Pliocène supérieur-Pléistocène qui affleure à Punta Mazza (Milazzo, NE Sicile). La faune d'ostracodes est souvent bien préservée et diversifiée : on y a été récolté 42 espèces appartenant à 24 genres. L'association se compose presqu'exclusivement de taxons bathyaux parmi lesquels *Bythocypris obtusata* (SARS), *B. bosquetiana* (BRADY), *Henryhowella* ex *H. profunda* BONADUCE *et al.* group, *Quasibuntonia radiatopora* (SEGUENZA), *Retibythere (Bathybythere*) *scaberrima* BRADY, *Pseudocythere caudata* SARS et *Bythocythere mylaensis* SCIUTO, entre les autres. Le groupe *Krithe* y est bien représenté également, avec *Krithe compressa* (SEGUENZA) et *K. pernoides* (BORNEMANN). D'autres taxons comme *Cytheropteron testudo* SARS sont rares. Presque toutes les

[1] *Department of Biological, Geological and Environmental Science, Palaeoecological Research Group, University of Catania, I-95124 Catania (Italy)*
fsciuto@unict.it
Manuscript online since January 25, 2014
[Editor: Bruno GRANIER; technical editor: Christian C. EMIG; language editor: Stephen EAGAR]

espèces, plus particulièrement celles appartenant aux Trachyleberididae SYLVESTER-BRADLEY, 1948, sont décrites, figurées et commentées. Parmi ces espèces, nous en introduisons une nouvelle : *Acanthocythereis reticulata* n.sp., rencontrée dans la partie basse de la coupe dans des sédiments d'âge Pliocène supérieur. Enfin, un spécimen rapporté au genre *Quasibuntonia* RUGGIERI est, quant à lui, laissé en nomenclature ouverte.

Mots-Clefs : Ostracodes marins ; Trachyleberididae ; bathyal ; nouvelle espèce ; Plio-Pléistocène ; Sicile.

1. Introduction

The family Trachyleberididae SYLVESTER-BRADLEY, 1948, is one of the most diverse families in the Class Ostracoda that includes more than 120 genera of living and fossil marine ostracods belonging to all marine environments from littoral to bathyal. It has a present-day and fossil world-wide distribution and it is known from Mesozoic to the Recent.

Neogene records of Trachyleberididae in the Mediterranean area include at least 58 different species (GUERNET, 2005), with 25 species belonging to 16 genera, reported as living in the Mediterranean Sea (HORNE *et al.,* 2001). The present contribution focuses on the Trachyleberididae found in the Gelasian – Calabrian sedimentary sequence out-cropping at Punta Mazza (Figs. 1 - 2 - 3) in the eastern side of the Capo Milazzo Peninsula (Messina, NE Sicily).

A

B

Figure 1: A) Geographical location of the Capo Milazzo Peninsula and Punta Mazza; **B)** Detail.

2. Geological background

The Cape Milazzo Peninsula (Messina, Sicily NE: Fig. 1) is geologically characterized by a metamorphic basement (Aspromonte Unit of the Calabride complex), overlain unconformably by a complicated series of Miocene and Plio-Pleistocene sediments with extremely variable thicknesses, frequent facies transitions, stratigraphic gaps and unconformities (FOIS, 1990a, 1990b; SCIUTO, 2003, 2005, 2009). At Punta Mazza (Figs. 2 - 3), the stratigraphic sequence starts with calcareous breccias prevalently composed of *Porites* boundstones assigned to the Messinian (FOIS, 1990a, 1990b); followed unconformably by the Upper Pliocene–Calabrian sedimentary sequence consisting of: yellow sands and silts with *Dendrophyllia* sp. and *Keratoisis* sp. (samples 13-11); gray sands and silts with *Keratoisis* sp., *Gryphus* sp., echinoids, bivalves and bryozoans (samples 10-6); gray silts with corals (samples 5-1: Figs. 2 - 3). The total thickness of the analyzed sedimentary succession is 15 metres. These sediments were deposited during the Late Pliocene–Calabrian (FOIS, 1990a, 1990b; VIOLANTI, 1991; SCIUTO, 2003, 2005), in epibathyal environments as testified by brachiopod (GAETANI & SACCÀ, 1984), bryozoan (*e.g.*, ROSSO, 2002), foraminifer (VIOLANTI, 1991) and ostracod associations (SCIUTO, 2003, 2005). This predominantly sandy succession is unconformably overlain by a thick conglomerate layer containing a rich molluscan fauna assigned to the Tyrrhenian Stage (RUGGIERI & GRECO, 1965). The sedimentary sequence is capped by Holocene aeolian volcanic ashes (Fig. 3).

15 samples were taken from 15 m of the Upper Pliocene-Gelasian-Calabrian sedimentary succession (Fig. 3) and the ostracod assemblages have been studied. The sampled section of Punta Mazza corresponds to that studied by VIOLANTI (1991) for foraminifer fauna to which we refer for the relative dating that has been updated to incorporate the modern stratigraphic subdivisions of the Quaternary (*sensu* GIBBARD & COHEN, 2008).

3. Results

The ostracod fauna is often well preserved and diverse: 42 species belonging to 24 genera have been found (Table). The lower part of the section (upper part of the *G. bononiensis* Zone, samples 13-10) is characterized by few species such as *Costa tricostata pliocenica* RUGGIERI, *Bairdoppilata profunda* AIELLO *et al.*, *Agrenocythere pliocenica* (SEGUENZA). The remainning part of the section (*Globigerina cariacoensis* and *Globorotalia truncatulinoides* zones) is characterized by many more specimens and species. The associations consist again almost exclusively of bathyal taxa such as among others *Bythocypris obtusata* (SARS), *B. bosquetiana* (BRADY), *Henryhowella* ex *H. profunda* BONADUCE *et al.* group, *Quasibuntonia radiatopora* (SEGUENZA), *Retibythere (Bathybythere) scaberrima* BRADY, *Pseudocythere caudata* SARS and *Bythocythere mylaensis* SCIUTO. Also the *Krithe* group is well represented with *Krithe compressa* (SEGUENZA) and *K. pernoides* (BORNEMANN). Further taxa such as *Cytheropteron testudo* SARS are rare.

Among all species found along the sedimentary succession, those belonging to Trachyleberididae have been described and illustrated here; furthermore a fossil species *Acanthocythereis reticulata* n.sp., found in sample 13 from Upper Pliocene sediment, showed characters that cannot be referred to any known species and, therefore, is here proposed as new. Finally, a specimen belonging to the genus *Quasibuntonia* RUGGIERI is currently left in open nomenclature.

Figure 2: General view of the investigated sedimentary succession exposed at Punta Mazza.

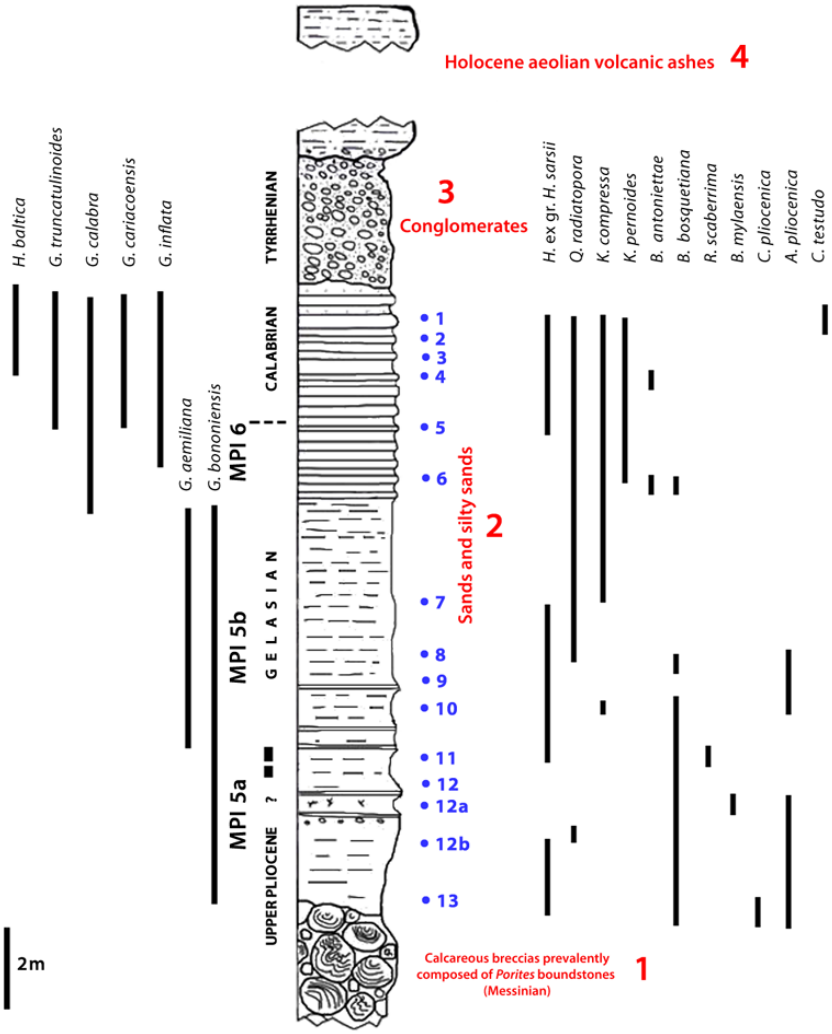


Figure 3: Stratigraphic log of Punta Mazza.

Ostracod species \ Samples	13	12b	12a	12	11	10	9	8	7	6	5	4	3	2	1
Bythocypris obtusata	x	x	x	x	x	x		x	x	x	x	x	x	x	x
Cytherella vulgatella	x	x	x		x	x		x	x	x	x	x	x	x	x
Henryhowella ex gr. *H. hirta*	x	x			x	x	x		x		x	x	x	x	x
Xestoleberis communis		x												x	x
Quasibuntonia radiatopora sculpta		x						x	x	x	x	x	x	x	x
Eopaijenborchella cymbula													x	x	x
Cytheropteron testudo														x	x
Cytheropteron bifidum								x	x			x	x	x	x
Krithe compressa									x	x	x	x	x	x	x
Krithe pernoides										x	x	x	x	x	x
Cytheropteron pinarense								x		x		x		x	
Buntonia dertonensis				x										x	
Cytheropteron sulcifer			x					x		x	x	x		x	
Henryhowella ex gr. *H. profunda*			x					x						x	
Saida limbata											x		x		
Cytheropteron omega	x												x		
Bythocypris antoniettae										x		x			
Bairdoppilata conformis	x	x	x	x	x	x		x	x	x	x	x			
Sclerochilus contortus	x					x				x	x	x			
Anchistrocheles interrupta					x					x	x	x			
Argilloecia acuminata						x					x				
Eucythere curta							x				x				
Bythocypris bosquetiana	x	x	x	x	x	x		x		x					
Cytheropteron pseudoalatum										x					
Cytheropteron sp. 1									x						
Agrenicythere pliocenica	x	x	x			x	x	x							
Aurila spp. juv.						x									
Retibythere (*Bathybythere*) *scaberrima*					x										
Macrocypris sp.					x										
Cytheropteron eleonorae		x	x	x											
Cytheropteron rossanae		x	x	x											
Pseudocythere caudata		x	x	x											
Bairdoppilata profunda	x	x	x	x											
Quasibuntonia sp. 1				x											
Cytheropteron italoi			x												
Bythocythere sp. juv.			x												
Monoceratina oblita			x												
Bythocythere mylaensis			x												
Propontocypris sp.			x												
Xestoleberis ventricosa		x													
Costa tricostata pliocenica	x														
Acanthocythereis reticulata n.sp.	x														

Table: List of the ostracod species found at Punta Mazza (in order of appearance).

4. Systematics

Class Ostracoda Latreille, 1806

Order Podocopida Sars, 1866

Suborder Cytherocopina Grundel, 1967

Superfamily Cytheroidea Baird, 1850

Family Trachyleberididae Sylvester-Bradley, 1948

Subfamily Buntoninae Apostolescu, 1961

Genus *Buntonia* Howe, 1935

Buntonia dertonensis Ruggieri, 1954

(Pl. 1, fig. B)

1954 *Buntonia sublatissima dertonensis* Ruggieri, p. 565, 568, Figs. 25, 25a, 26, 32-33;
1965 *Buntonia sublatissima dertonensis* Ruggieri: Dieci & Russo, p. 75, Pl. 12, fig. 12;
1972 *Buntonia* (*Buntonia*) *sublatissima dertonensis* Ruggieri: Sissingh, p. 95, Pl. 6, fig. 6;
1981 *Buntonia* (*Buntonia*) *sublatissima dertonensis* Ruggieri: Uffenorde, p. 149, Pl. 10, fig. 12;
1980 *Buntonia dertonensis* Ruggieri: Ciampo, p. 10, Pl. 1, figs. 5-6;
1985 *Buntonia* aff. *B. dertonensis* Ruggieri: Bonaduce & Sprovieri, Pl. 2, fig. 3;
2000 *Buntonia dertonensis* Ruggieri: Aiello *et al.*, p. 98, Pl. 4, figs. 1-3, 5.

Remarks – The specimens of Punta Mazza (Pl. 1, fig. B) show some minor differences in the distribution of foveolae in the anterior marginal area compared to figured specimens of Ruggieri (1954) and are very similar to that figured from Monte S. Nicola by Aiello *et al.* (2000).

This species is known from the Tortonian (Dieci & Russo, 1965 *inter alias*) in the Biozone M Pl 5 (Aiello *et al.,* 2000). In the present study, it was found also in the Calabrian; other occurrences may confirm this datum. Very few specimens were found in samples 12 (Gelasian) and 2 (Calabrian).

Genus *Quasibuntonia* Ruggieri, 1958

Quasibuntonia radiatopora sculpta (Seguenza, 1880)

(Pl. 1, figs. C-D)

1880 Cythere radiatopora sculpta Seguenza, p. 193;
1954 *Buntonia radiatopora sculpta* Seguenza: Ruggieri, p. 562, Fig. 17, 17a;
1958 *Quasibuntonia radiatopora sculpta* (Seguenza): Ruggieri, Fig. 22, 22a;
1965 *Buntonia* (*Quasibuntonia*) *radiatopora sculpta* (Seguenza): Colalongo, p. 100, Pl. 12, fig. 3;
1973 *Quasibuntonia radiatopora* (Seguenza): Benson p. 67, Fig. 3 (4);
1988 *Quasibuntonia sculpta* (Seguenza): Colalongo & Pasini, p. 64, Pl. 27, figs. 3-5;
2008 *Quasibuntonia radiatopora* (Seguenza): Sciuto & Rosso, p. 35, tab. 1, Pl. 1, fig. 10.

Remarks - Guernet (2005) considered this subspecies a simple morphological variant of *Q. radiatopora radiatopora* (Seguenza), because the morphological differences between the two subspecies are minimal and, moreover, they are often found associated. Here, following Ruggieri (1954, 1958), the distinction between the two subspecies is maintained because the presence or absence of the ornamentation in the anterior of the carapace, cannot be considered minimal. The genus *Quasibuntonia* (Seguenza) is known as bathyal (Ruggieri, 1958), and *Q. radiatopora* is reported among psychrospheric ostracod by Benson (1972a, 1972b, 1973). The species was previously known from the Lower Pliocene (Ruggieri, 1954, 1958) to the Lower Pleistocene (Colalongo & Pasini, 1988). It is common within the entire section, predominantly from samples 8 to 1.

Quasibuntonia sp. 1

(Pl. 1, fig. E)

Remarks - The figured specimen is quite similar to *Quasibuntonia seguenziana* Ruggieri, 1958, primarily for the general shape of the carapace, but it is distinguishable because of the different arrangement of the foveolae in the posterior area of the carapace, the larger size and the different shape. Very rare, found only in sample 12.

Subfamily Trachyleberidinae Sylvester-Bradley, 1948

Genus *Agrenocythere* Benson, 1972

Agrenocythere pliocenica (Seguenza, 1880)

(Pl. 1, fig. A)

1880 *Cythereis pliocenica* Seguenza, p. 192;
1953 *Cythereis dictyon pliocenica* Seguenza: Ruggieri, p. 78, Pl. 2, figs. 10-11;
1965 *Bradleya pliocenica* (Seguenza): Colalongo, p. 91, Pl. 11, fig. 1;
1971 *Bradleya* ? *pliocenica* (Seguenza): Benson & Sylvester-Bradley, Pl. 1, figs. 4, 6;
1972a *Agrenocythere pliocenica* (Seguenza): Benson, p. 77-88, Figs. 44-50; Pl. 3, figs. 3-4; Pl. 5, figs. 3-4;
1973 *Agrenocythere pliocenica* (Seguenza): Benson, Fig. 2.A;
1980 *Agrenocythere pliocenica* (Seguenza): Colalongo & Pasini, p. 51-52, Pl. 1, fig. 1;
1985 *Agrenocythere pliocenica* (Seguenza): Bonaduce & Sprovieri, Pl. 1, figs. 2, 4;
1985 *Agrenocythere pliocenica* (Seguenza): Peters *et al.*, Fig. 5;
1991 *Agrenocythere pliocenica* (Seguenza): Ruggieri, p. 56;
2000 *Agrenocythere pliocenica* (Seguenza): Aiello *et al.*, p. 101-102, Pl. 5, fig. 4;
2003 *Agrenocythere pliocenica* (Seguenza): Sciuto, p. 181, Fig. 2e.

Remarks - *Agrenocythere pliocenica* (Seguenza) is particularly significant because, according to Benson (1972a, 1972b, 1973, 1984), it indicates psychrospheric oceanic conditions. The species in the Mediterranean Basin is known from the Early Pliocene to the Early Plei-

stocene (RUGGIERI, 1953, *inter alias*). This species is reported from all the Pliocene sediments of deep environment of central and southern Italy (AIELLO *et al.*, 2000), and the Pliocene sequences found in the ODP wells in the Tyrrhenian Sea, all of which relate to bathyal environments (BENSON, 1972a, 1972b; COLALONGO & PASINI, 1988; COLALONGO *et al.*, 1990). Abundant only in the lower part of the section (Gelasian layers, samples 8-13).

Genus *Costa* NEVIANI, 1928

Subgenus *Cuneocosta* RUGGIERI, 1992

Costa (*Cuneocosta*) *tricostata pliocenica* RUGGIERI, 1992

(Pl. 1, figs. F-G)

1992 *Costa* (*Cuneocosta*) *tricostata pliocenica* RUGGIERI, p. 177-178, Fig. 6;
2000 *Costa* (*Cuneocosta*) *tricostata pliocenica* RUGGIERI: AIELLO *et al.*, p. 102, Pl. 5, fig. 2;
2003 *Costa tricostata pliocenica* RUGGIERI: SCIUTO, p. 181, tab. 1, Fig. 2f.

Remarks – According to RUGGIERI (1992), *Costa* (*Cuneocosta*) *tricostata pliocenica* is referred to bathyal environments. The species is known from Early Pliocene (RUGGIERI, 1992) to Early Pleistocene (AIELLO *et al.*, 2000). Present at Punta Mazza only in the lower part of the section (sample 13, Upper Pliocene layers).

Genus *Henryhowella* PURI, 1957

The species belonging to *Henryhowella* PURI are exclusively marine, ubiquitous and known from the Badenian to the Recent (GUERNET, 2005). The oldest species to be described is *H. asperrima* (REUSS, 1850) from the Badenian of Vienna Basin, is known exclusively in the Miocene (BONADUCE *et al*. 1999; GUERNET, 2005; MOSTAFAWI & MATZKE-KARASZ, 2006) and shows characteristics that make it easly distinguishable from all others.

Other species belonging to this genus are: *H. ruggerii* OERTLI, 1961, from the Langhian, *H. rudis* CIAMPO, 1981, from the Miocene, *H. hirta* (COSTA, 1853) from the Pliocene, *H. sarsii* (MÜLLER, 1894) from the Recent of the Gulf of Naples with the subspecies *H. sarsii* (MÜLLER, 1894) *profunda* BONADUCE *et al.*, 1999, from the Pliocene and finally, *H. parthenopea* BONADUCE *et al.*, 1999, from the Recent of the Gulf of Naples.

Considering only the Plio-Pleistocene and Recent species, according to MALZ & JELLINEK (1984) and MOSTAFAWI & MATZKE-KARASZ (2006), *Henryhowella sarsii* (MÜLLER, 1894) would seem to be a junior synonym of *H. hirta* (COSTA, 1853). Furthemore, the minor morphological variations of the genus *Henryhowella* (as well as the different development of spines and tubercles) are not sufficient to justify the institution of *H. parthenopea* proposed by BONADUCE *et al.* (1999). Therefore, it is probable that this species is again synonym of *H. hirta* (COSTA, 1853). Nevertheless, examining the SEM photos of many specimens it is noted that there are certainly some morphological difference in the carapaces that allow one to distinguish *H. sarsii* (MÜLLER, 1894) *profunda* BONADUCE *et al.,* 1999, from the other species.

Here I propose the subdivision into two groups of the Pliocene-Pleistocene species belonging to the genus *Henryhowella* PURI, 1957: the *Henryhowella hirta* (COSTA, 1853) group, and the *Henryhowella profunda* BONADUCE *et al.*, 1999 group.

Henryhowella ex *H. hirta* (COSTA, 1853) group

(Pl. 1, fig. H)

1853 *Cypridina hirta* COSTA, p. 174, Pl. XV, figs. 2a, 2c;
1894 *Cythereis sarsii* MÜLLER, p. 370, Pl. 8, fig. 8;
1950 *Cythereis hirta* (COSTA): RUGGIERI, p. 25;
1980 *Henryhowella asperrima* (REUSS): YASSINI, p. 102, Pl. 6, figs. 6, 8, 10;
1999 *Henryhowella sarsii sarsii* (MÜLLER, 1894): BONADUCE *et al.*, p. 64, Pl. 2, figs. 1-10; Pl. 3, fig. 12; Pl. 4, figs. 9-10; Pl. 5, figs. 1-2, 6, 8, 11;
1999 *Henryhowella parthenopea* BONADUCE *et al.*, p. 61, Pl. 3, figs. 1-11, 13-14; Pl. 4, figs. 11-12; Pl. 5, figs. 3-5, 9-10, 12;
2003 *Henryhowella hirta* (COSTA): GUERNET *et al.*, p. 84;
2008 *Henryhowella parthenopea* BONADUCE *et al.*: FARANDA & GLIOZZI, Pl. 6, figs, 2, 5, 8, 11.

▶ Plate 1:

A - *Agrenocythere pliocenica* (SEGUENZA, 1880), right valve, external lateral view (scale bar: 200µm).

B - *Buntonia dertonensis* (RUGGIERI, 1954), right valve, external lateral view (scale bar: 200µm).

C - *Quasibuntonia radiatopora sculpta* (SEGUENZA, 1880), right valve, external lateral view (scale bar: 200µm).

D - *Quasibuntonia radiatopora sculpta* (SEGUENZA, 1880), left valve, external lateral view (scale bar: 200µm).

E - *Quasibuntonia* sp. 1, right valve, external lateral view (scale bar: 200µm).

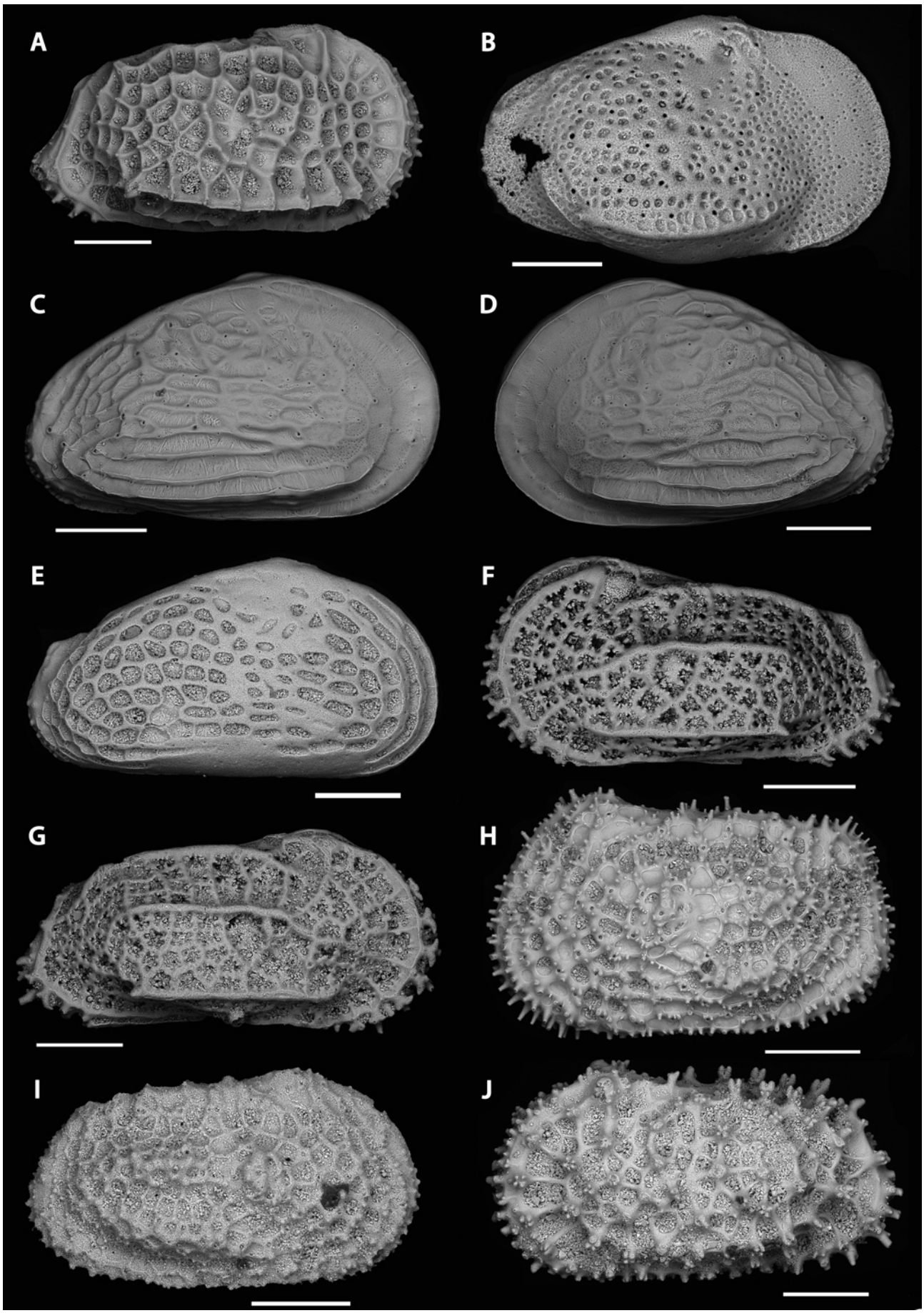
F - *Costa* (*Cuneocosta*) *tricostata pliocenica* RUGGIERI, 1992, left valve, external lateral view (scale bar: 200µm).

G - *Costa* (*Cuneocosta*) *tricostata pliocenica* RUGGIERI, 1992, right valve, external lateral view (scale bar: 200µm).

H - *Henryhowella* ex *H. hirta* (COSTA, 1853) group, left valve, external lateral view (scale bar: 200µm).

I - *Henryhowella* ex *H. profunda* BONADUCE *et al.* 1999 group, right valve, external lateral view (scale bar: 200µm).

J - *Acanthocythereis reticulata* n.sp., left valve (male), Paratype PMC. O 41 P 03/9/2013, external lateral view (scale bar: 200µm).


A
B
C
D
E
F
G
H
I
J

Remarks – The specimen of *Henryhowella* figured here is very similar to the specimen figured by BONADUCE *et al.* (1999: Pl. 2, fig. 3) and indicated as *H. sarsii sarsii* (MÜLLER, 1894). According to MALZ & JELLINEK (1984) and MOSTAFAWI & MATZKE-KARASZ (2006), as noted previously, our specimen is referred to *Henryhowella hirta* (COSTA, 1853) and is common within the entire section.

Henryhowella ex *H. profunda* BONADUCE *et al.* 1999 group

(Pl. 1, fig. I)

1999 *Henryhowella sarsii profunda* BONADUCE *et al.*: p. 68, (Pl. 1), figs. 5-12; Pl. 4, figs. 1-4; Pl. 3, fig. 12; Pl. 4, figs. 9-10; Pl. 5, figs. 1-2, 6-8, 11;

2005 *Henryhowella sarsii profunda* BONADUCE *et al.*: SCIUTO, p. 222, Fig. 2A;

2006 *Henryhowella hirta* (COSTA): MOSTAFAWI & MATZKE-KARASZ, p. 20, Pl. 2, fig. 9;

2008 *Henryhowella sarsii profunda* BONADUCE *et al.*: FARANDA & GLIOZZI, Pl. 6, figs. 14-18.

Remarks – The specimen figured here is similar to *H. sarsii profunda* BONADUCE *et al.* (1999: Pl. 1, fig. 8). The specimen figured by MOSTAFAWI & MATZKE-KARASZ (2006: Pl. 2, fig. 9) and indicated as *Henryhowella hirta* (COSTA) can hardly be distinguished from the specimen indicated as *H. sarsii profunda* BONADUCE *et al.* figured by the authors in Pl. 4, fig. 67. In particular, the two specimens have a similar external outline and the distribution of tubercles and/or spines is practically the same. Therefore, both are referred here to the same group. Found in the entire section.

Genus *Acanthocythereis* HOWE, 1963

Type species *Acanthocythereis araneosa* HOWE, 1963

Acanthocythereis reticulata n.sp.

(Pl. 1, fig. J; Pl. 2)

Derivatio nominis: from the Latin word *reticulum*: "mesh".

Material: 4 right valves, 3 left valves and 3 carapaces.

Holotype*:* The left male valve figured in Pl. 2, fig. B. PMC. O 10 H 03/9/2013 (L= 890 mm, H= 510 mm)

Paratypes*:* Two RV figured in Pl. 2, fig. A (female), 5 (male); the RV figured in Pl. 2, fig. D (male), the carapace figured in Pl. 2, fig. C (male) (PMC. O 37-40 P 03/9/2013) and other two carapaces (female) not figured.

Type locality: Punta Mazza along the eastern side of the Capo Milazzo Peninsula (Tav. Milazzo, F.253 IV SO, 38°16'20"N, 15°14'20"E) in the yellow sandy silts (sample 13) of Upper Pliocene out-cropping unconformably on Messinian *Porites* limestone.

Stratigraphic range: Upper Pliocene (Upper part of M Pl 5 Zone).

Diagnosis: *Acanthocythereis reticulata* n.sp. is characterized by subrectangular elongate valves with the exterior surface entirely ornamented by a strong and wide reticulation consisting of straight and thick muri bounding wide quadrangular *fossae* with margins mostly straight. Conjunctive, composite spines are present on the valve surface and around the outer margin.

Description:

Carapace elongated medium-sized subrectangular in lateral external view (Pl. 2, figs. A-E). Outer margin fully marked by numerous composite spines. Anterior margin regularly arched. Dorsal margin long and straight. The dorsal margin passing into the posterior margin, through an obtuse angle in the subdorsal region. Ventral margin straight.

Outer surface ornamented by a strong, large and regular polygonal reticulation with numerous conjunctive composites spines (Pl. 2, figs. A-B). Fossae mostly pentagonal in central area. Six composite spines in anterior marginal rim. Few conjunctive simple normal pore-canals (Pl. 2, figs. A-B)

Eye tubercles well marked.

Inner lamella: anteriorly and postero-ventrally wide, vestibula present (Pl. 2, figs. D-E).

Hinge amphidont (Pl. 2, figs. D-E, G-K).

Muscle scars typical of the Trachyleberidinae (Pl. 2, fig. F).

Sexual dimorphism marked: male (Pl. 2, fig. B) shows greater length and less height than the female (Pl. 2, fig. A).

Remarks – The here described species has been assigned to the genus *Acanthocythereis* HOWE, 1963, using morphological features such as the general shape of the carapace, the type of hinge and the muscle scars. *A. reticulata* n.sp. is easily distinguishable from all other co-generic species because of the strong, large polygonal reticulation with fossae and muri well-marked. In particular *A. reticulata* n.sp. shows a much lower angle between the dorsal and ventral line and a different distribution of fossae and muri than *A. hystrix* (REUSS). The new species described here has been found in the Upper Pliocene sequence, associated with an ostracod fauna strongly dominated by a few species and particularly by *Agrenocythere pliocenica* (SEGUENZA), *Costa tricostata pliocenica* RUGGIERI, *Cytherella vulgatella* AIELLO *et al.*, followed in order of abundance by: *Bairdoppilata profunda* AIELLO *et al.*, *Bythocypris obtusata* (SARS), *B. bosquetiana* (BRADY), *Henryhowella* ex gr*. H. hirta* (COSTA), *Bairdoppilata conformis* (TERQUEM), *Sclerochilus contortus* (NORMAN).

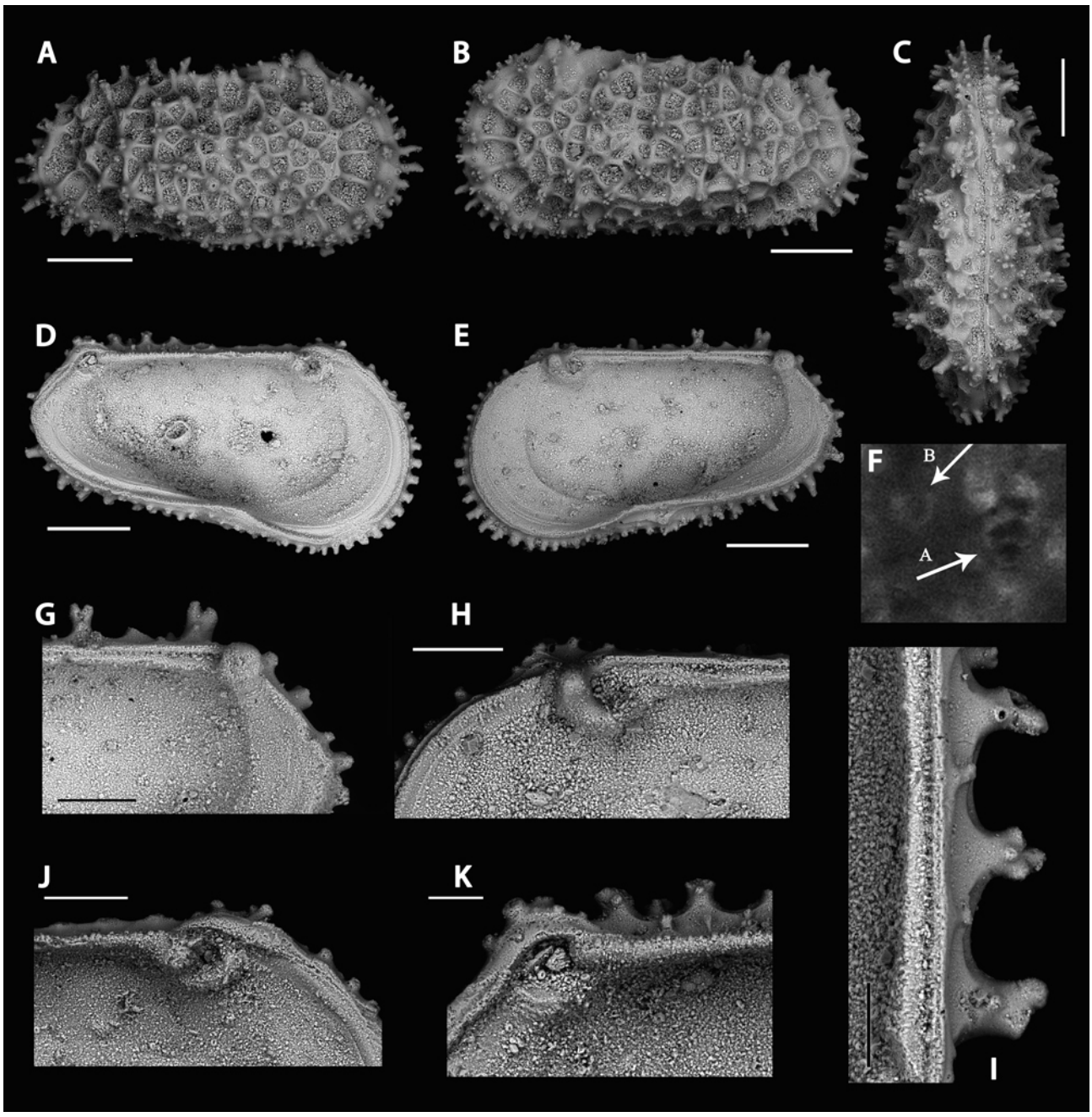


Plate 2: *Acanthocythereis reticulata* n.sp.

A - Right valve (female), Paratype PMC. O 37 P 03/9/2013, external lateral view (scale bar: 200µm).

B - Left valve (male), Holotype PMC. O 10 H 03/9/2013, external lateral view (scale bar: 200µm).

C - Carapace in dorsal view (male), Paratype PMC. O 38 P 03/9/2013 (scale bar: 200µm).

D - Left valve (male), Paratype PMC. O 39 P 03/9/2013, internal lateral view (scale bar: 200µm).

E - Right valve (male), Paratype PMC. O 40 P 03/9/2013, external lateral view (scale bar: 200µm).

F - Muscle scars.

G - Right valve, internal view, detail of posterior part of hinge (scale bar: 100µm).

H - Right valve, internal view, detail of anterior part of hinge (scale bar: 100µm).

I - Internal view, detail of central part of hinge (scale bar: 100µm).

J - Left valve, internal view, detail of anterior part of hinge (scale bar: 100µm)

K - Left valve internal view, detail of anterior part of hinge (scale bar: 50µm).

Distribution: *A. reticulata* n.sp. was found only in the lower part of the section (sample 13, Upper Pliocene, upper part of M Pl 5a Zone).

5. Discussion

The ostracod fauna of Punta Mazza is of low diversity through the entire section comprising an average of 10 species per sample, a value strictly comparable with those reported by BENSON (1975) for the South Atlantic bathyal associations or with those reported by DINGLE & LORD (1990) for deep water of SE Atlantic. The associations, moreover, are characterized by a small number of highly dominant species and by a cortege of species represented by few specimens. This type of occurrence corresponds very well with the diagrammatic projections plotted by BENSON (1984) for associations of the Bathyal Zone (650 m water deep).

From the analysis of the species association, there also emerges the distributions that are typically bathyal, or referred to adjacent bathyal environments with some species that currently show a very wide depth range. The species with bathyal affinity which are particularly abundant are: *Costa tricostata pliocenica* RUGGIERI, *Bairdoppilata profunda* AIELLO *et al.*, *Agrenocythere pliocenica* (SEGUENZA), *Bythocypris obtusata* (SARS), *B. bosquetiana* (BRADY), *Henryhowella* ex *H. profunda* BONADUCE *et al.* group followed by, less abundant: *Quasibuntonia radiatopora* (SEGUENZA), *Retibythere* (*Bathybythere*) *scaberrima* BRADY, *Pseudocythere caudata* SARS, *Bythocythere mylaensis* SCIUTO, *Bythocypris antoniettae* SCIUTO, *Cytheropteron eleonorae* SCIUTO and *C. testudo* SARS.

It is noteworthy that, the fossil association contains some taxa, whose distribution seems to be strongly influenced by temperature. These species are *Agrenocythere pliocenica* (SEGUENZA), *Quasibuntonia radiatopora*, *Cytheropteron testudo*, and probably also *Bythocypris obtusata, B. antoniettae* and *B. mylaensis* (SCIUTO, 2009, 2012a, 2012b). The first two species are indicated as psychrospheric by BENSON (1972a). Regarding *Cytheropteron testudo* SARS, 1869, the data acquired until now on geographic, stratigraphic and bathymetric distribution of this species (MONTCHARMONT-ZEI *et al.*, 1985; DINGLE & LORD, 1990; SWANSON & AYRESS, 1999; STEPANOVA *et al.*, 2003; JELLINEK *et al.*, 2006; FARANDA & GLIOZZI, 2011 *inter alias*) leads to the conclusion that *C. testudo* could be considered as a stenothermic species restricted to very cold waters independently of depth. Similarly, *Bythocypris obtusata* has been reported from the Norwegian and British coasts between 145 and 165 m water depth by SARS (1928) and in the Recent Mediterranean Sea at depths between 150 and 2905 m by PURI *et al.* (1969). Finally, *Bythocythere mylaensis* originnates from sediments sampled at 745 m depth in the Northern Ionian Sea dating from the post Würmian acme (ROSSO *et al.*, 2010) and *Bythocypris antoniettae* SCIUTO, that was found by BREMAN (1975) in an interval of the core 353 in the bathyal sediments of Adriatic Sea, corresponding, according to van STRAATEN (1966), to a very cold period of Early Pleistocene.

Therefore, with the data available, the sediments studied indicate a sedimentary paleobasin located in the Bathyal Zone, with paleoenvironmental conditions typically oceanic and characterized by very low temperatures. These conditions were maintained unchanged throughout the stratigraphic interval of the section studied from Upper Pliocene to the Calabrian Stage. Consequently *Acanthocythereis reticulata* n.sp. can be considered as a bathyal taxon; further findings will to confirm this datum.

Acknowledgements

The author is grateful to Antonietta ROSSO (University of Catania) and the two reviewers, Stephen EAGAR and David HORNE, for corrections and detailed suggestions and comments to the manuscript. Thanks are also due to the editors, Bruno GRANIER and Christian C. EMIG. The SEM photos were taken by Alfio VIOLA (University of Catania). This paper is Catania Palaeoecological Research Group contribution n° 382.

Bibliographic references

AIELLO G., BARRA D. & BONADUCE G. (2000).- Systematics and biostratigraphy of the Ostracoda of the Plio-Pleistocene Monte S. Nicola section (Gela, Sicily).- *Bollettino della Società Paleontologica Italiana*, Modena, vol. 39, n° 1, p. 83-112.

BENSON R.H. (1972a).- Ostracodes as indicators of threshold depth in the Mediterranean during the Pliocene. *In*: STANLEY D.J. (ed.), The Mediterranean Sea: a natural sedimentation laboratory.- Hutshinson and Ross, Stroudsbourg, Pennsylvania, p. 63-73.

BENSON R.H. (1972b).- The *Bradleya* problem, with descriptions of two new psychrospheric ostracode genera, *Agrenocythere* and *Poseidonamicus* (Ostracoda: Crustacea).- *Smithsonian Contribution to Paleobiology*, Washington, vol. 12, 138 p.

BENSON R.H. (1973).- Psychrospheric and continental Ostracoda from ancient sediments in the floor of Mediterranean.- *Initial Report of the Deep-Sea Drilling Project*, College Station, vol. 8, p. 1002-1009.

BENSON R.H. (1975).- The origin of the psychrosphere as recorded in changes of deep-sea ostracodes assemblages.- *Lethaia*, Oslo, vol. 8, p. 69-83.

BENSON R.H. (1984).- Estimating greater paleodepths with ostracodes, especially in past thermospheric oceans.- *Palæogeography, Palæoclimatology, Palæoecology*, Amsterdam, vol. 48, p. 107-141.

BENSON R.H. & SYLVESTER-BRADLEY P.C. (1971).- Deep–sea ostracodes and the transformation of ocean to sea in the Tethys. *In*: OERTLI H.J.

(ed.), Colloque sur la paléoécologie des ostracodes. Colloquium on the paleoecology of Ostracodes (Pau, 20-27 VII 1970).- *Bulletin du Centre de Recherches Pau-SNPA*, vol. 5, Supplément, p. 63-91.

BONADUCE G., BARRA D. & AIELLO G. (1999).- The genus *Henryhowella* PURI, 1957 (Crustacea, Ostracoda) in the Atlantic and Mediterranean from Miocene to Recent.- *Bollettino della Società Paleontologica Italiana*, Modena, vol. 38, n° 1, p. 59-72.

BONADUCE G. & SPROVIERI R. (1985).- The appearance of Cytheropteron testudo SARS (Crustacea, Ostracoda) is a Pliocene event. Evidence from a Sicilian sequence (Italy).- *Bollettino della Società Paleontologica Italiana*, Modena, vol. 23, n° 1, p. 131-136.

BREMAN E. (1975).- Ostracodes in a bottom core from the deep southeastern basin of the Adriatic Sea. I, II.- *Koninklijke Nederlandse Akademie van Wetenschappen, Proceedings,* Amsterdam, (Ser. B), vol. 78, p. 198-218.

CIAMPO G. (1980).- Ostracodi miocenici (Tortoniano-Messiniano) della regione di Ragusa (Sicilia).- *Bollettino della Società Paleontologica Italiana*, Modena, vol. 19, n° 1, p. 5-20.

COLALONGO M.L. (1965).- Gli ostracodi della serie di Le Castella (Calabria).- *Giornale di Geologia*, Bologna, vol. 33, p. 83-123.

COLALONGO M.L. & PASINI G. (1980).- La ostracofauna plio-pleistocenica della sezione della Vrica in Calabria (con considerazioni sul limite Neogene-Quaternario).- *Bollettino della Società Paleontologica Italiana*, Modena, vol. 19, n° 1, p. 44-126.

COLALONGO M.L. & PASINI G. (1988).- Ostracofauna plio-pleistocenica batiale rinvenuta nel Pozzo 654A dell'ODP Leg 107 (Mar Tirreno occidentale).- *Bollettino della Società Paleontologica Italiana*, Modena, vol. 27, n° 3, p. 277-289.

COLALONGO M.L., PASINI G., POLUZZI A. & SPROVIERI R. (1990).- Relationship between the benthic foraminifers and the ostracodes in the Pliocene-Pleistocene Tyrrhenian deep-sea record (ODP LEG 107, site 654).- *Proceedings of the Ocean Drilling Program Scientific Results*, College Station, vol. 107, p. 479-493.

COSTA O.G. (1853).- Paleontologia del regno di Napoli. Parte III.- Giorgio Franz, Monaco, 196 p. (XVI Pls.).

DIECI G. & RUSSO A. (1965).- Ostracodi tortoniani dell'Appennino Settentrionale (Tortona, Montegibbio, Castelvetro).- *Bollettino della Società Paleontologica Italiana*, Modena, vol. 3, n° 1, p. 38-88.

DINGLE R.V. & LORD A.R. (1990).- Benthic ostracods and deep water-masses in the Atlantic Ocean.- *Palæogeography, Palæoclimatology, Palæoecology*, Amsterdam, vol. 80, n^{os} 3-4, p. 213-235.

FARANDA C. & GLIOZZI E. (2008).- The ostracod fauna of the Plio-Pleistocene Monte Mario succession (Roma Italy).- *Bollettino della Società Paleontologica Italiana*, Modena, vol. 47, n° 3, p. 215-267.

FARANDA C. & GLIOZZI E. (2011).- A revision of the "Northern Guest" Ostracoda (Crustacea) occurrence in the Quaternary of the Mediterranean area.- *Il Quaternario*, Roma, vol. 24, p. 75-92.

FOIS E. (1990a).- La successione neogenica di Capo Milazzo (Sicilia nord-orientale).- *Rivista Italiana di Paleontologia e Stratigrafia*, Milano, vol. 95, n° 4, p. 397-440.

FOIS E. (1990b).- Stratigraphy and palaeogeography of the Capo Milazzo area (NE Sicily, Italy): clues to the evolution of the southern margin of the Tyrrhenian Basin during the Neogene.- *Palæogeography, Palæoclimatology, Palæoecology*, Amsterdam, vol. 78, n^{os} 1-2, p. 87-108.

GAETANI M. & SACCÀ D. (1984).- Brachiopodi batiali del Pliocene e del Pleistocene di Sicilia e Calabria.- *Rivista Italiana di Paleontologia e Stratigrafia*, Milano, vol. 90, n° 3, p. 407-458.

GIBBARD P. & COHEN K.M. (2008).- Global chronostratigraphical correlation table for the last 2.7 million years.- *Episodes*, Beijing, vol. 31, n° 2, p. 243-247.

GUERNET C. (2005).- Ostracodes et stratigraphie du Néogène et du Quaternaire méditerranéens.- *Revue de Micropaléontologie*, Paris, vol. 48, p. 83-121.

HORNE D.J., BRUCE A. & WHITTAKER J.E. (2001).- Ostracoda. *In*: COSTELLO M.J., EMBLOW C. & WHITE R.J. (eds.), European register of marine species: a check-list of the marine species in Europe and a bibliography of guides to their identification.- *Patrimoines Naturels*, vol. 50, Muséum National d'Histoire Naturelle, Paris, p. 244-251.

JELLINEK T., SWANSON K. & MAZZINI I. (2006).- Is the cosmopolitan model still valid for deep sea podocopid ostracods? (With the description of two new species of *Pseudobosquetina* GUERNET & MOULLADE 1994 and *Cytheropteron testudo* SARS 1869 as case studies).- *Senckenbergiana maritima*, vol. 36, n° 1, p. 29-50.

MALZ H. & JELLINEK T. (1984).- Marine Plio/ Pleistozän - Ostracoden von SE-Lakonien (Peloponnes, Griechenland).- *Senckenbergiana biologica*, Frankfurt, vol. 65, n^{os} 1-2, p. 113-167.

MONCHARMONT-ZEI M., RUSSO B., SGARRELLA F., BONADUCE G. & MASCELLARO P. (1985).- Paleoclimatic record from 4 cores (Gulf of Taranto, Ionian Sea). Evidence from Foraminifera and Ostracoda.- *Bollettino della Società Paleontologica Italiana*, Modena , vol. 23, n° 1, p. 21-51.

MOSTAFAWI N. & MATZKE-KARASZ R. (2006).- Pliocene Ostracoda of Cephalonia, Greece. The unrevised species of ULICZNY (1969).- *Revista Española de Micropaleontologia*, Madrid, vol. 38, n° 1, p. 11-48.

MÜLLER G.W. (1894).- Die ostracoden des Golfes

von Neapel und der angrenzenden meeresabschnitte.- *Herausgegeben von der zoologischen Station zu Neapel*, *Monographie*, Berlin, n° 21, 404 p. (40 Pls.). Online at: https://archive.org/stream/dieostracodendes21ml#page/n0/mode/2up

PETERS J.M., TROELSTRA S.R. & VAN HARTEN D. (1985).– Late Neogene and Quaternary vertical movements in Eastern Crete and their regional significance.- *Journal of Geological Society of London*, vol. 142, n° 3, p. 501-513.

PURI H.S., BONADUCE G. & GERVASIO A.M. (1969).- Distribution of Ostracoda in the Mediterranean. *In*: NEALE J.W. (ed.), The taxonomy, morphology and ecology of Recent Ostracoda.- Oliver and Boyd, Edinburgh, p. 358-411.

ROSSO A. (2002).- *Terataulopocella borealis* gen. et sp. nov., a deep-water Pliocene Lekythoporid (Bryozoa) from the Mediterranean Area.- *Memorie di Scienze Geologiche*, Padova, vol. 54, p. 65-72.

ROSSO A., VERTINO A., DI GERONIMO I., SANFILIPPO R., SCIUTO F., DI GERONIMO R., VIOLANTI D., CORSELLI C., TAVIANI M., MASTROTOTARO F.& TURSI A. (2010).- Hard and soft-bottoms thanatofacies from the Santa Maria di Leuca deep-water coral province, Mediterranean.- *Deep-Sea Research Part II: Topical Studies in Oceanography*, Amsterdam, vol. 57, n^{os} 5-6, p. 360-379.

RUGGIERI G. (1950).- Gli ostracodi delle sabbie grigie quaternarie (Milazziano) di Imola.- *Giornale di Geologia*, Bologna, (Serie 2), vol. 22, p. 59-115.

RUGGIERI G. (1953).- Età e faune di un terrazo marino sulla costa ionica della Calabria.- *Giornale di Geologia*, Bologna, (Serie 2), vol. 23, p. 55-170.

RUGGIERI G. (1954).- Iconografia degli Ostracodi marini del Pliocene e del Pleistocene italiani.- *Atti della Società Italiana di Scienze Naturali*, Milano, vol. 93, n^{os} 3-4, p. 561-575.

RUGGIERI G. (1958).- Alcuni Ostracodi del Neogene Italiano.- *Atti della Società Italiana di Scienze Naturali,* Milano, vol. 97, n° 2, p. 127-149.

RUGGIERI G. (1991).- Gli ostracodi nell'opera di Giuseppe SEGUENZA.- *Atti dell'Accademia Peloritana dei Pericolanti*, Messina, vol. 67 (suppl. n° 1), p. 41-77.

RUGGIERI G. (1992).- Considerazioni tassonomiche su ostracodi neogenici e pleistocenici risultate dalla revisione di vecchi lavori dello scrivente.- *Bollettino della Società Paleontologica Italiana*, Modena, vol. 31, n° 2, p. 175-188.

RUGGIERI G. & GRECO A. (1965).- Studi geologici e paleontologici su Capo Milazzo con particolare riguardo al Milazziano.- *Geologica Romana*, Roma, vol. IV, p. 41-88.

SARS G.O. (1928).- An account of the Crustacea of Norway. Vol. IX: Ostracoda.- Bergen Museum, Oslo, 277 p.

SCIUTO F. (2003).- Dati preliminari sulla ostracofauna pliocenica di Capo Milazzo (Sicilia NE).- *Bollettino della Società Paleontologica Italiana*, Modena, vol. 42, n^{os} 1-2, p. 179-184.

SCIUTO F. (2005).- Ostracodi batiali pleistocenici di Capo Milazzo (Sicilia NE) ed implicazioni paleoambientali.- *Rendiconti della Società Paleontolologica Italiana*, Modena, vol. 2, p. 219-227.

SCIUTO F. (2009).- *Bythocythere mylaensis* n.sp. (Crustacea, Ostracoda) from Early Pleistocene of Capo Milazzo (NE Sicily).- *Bollettino della Società Paleontologica Italiana*, Modena, vol. 48, n° 3, p. 183-188.

SCIUTO F. (2012a).- New ostracod species from Lower Pleistocene bathyal sediments of Capo Milazzo (NE, Sicily).- *Bollettino della Società Paleontologica Italiana*, Modena, vol. 51, n° 2, p. 117-125.

SCIUTO F. (2012b).- *Bythocythere solisdeus* n.sp. and *Cytheropteron eleonorae* n.sp. (Crustacea, Ostracoda) from the Early Pleistocene bathyal sediments of Cape Milazzo (NE, Sicily).- *Geosciences*, Basel, vol. 2, p. 147-156.

SCIUTO F. & ROSSO A. (2008).- Distribution pattern of deep-water ostracod assemblages in the Lower Pleistocene sediments from Furnari (Sicily).- *Bollettino della Società Paleontologica Italiana*, Modena, vol. 47, n° 1, p. 33-43.

SEGUENZA G. (1880).- Le formazioni terziarie nella provincia di Reggio Calabria.- *Memorie della Classe di scienze fisiche, matematiche e naturali*, *Regia Accademia dei Lincei*, Roma, (Serie 3), vol. VI, 416 p. Online at: https://archive.org/stream/leformazioniterz00segu#page/n9/mode/2up

SISSINGH W. (1972).- Late Cenozoic Ostracoda in the South Aegean Island Arc.- *Utrecht Micropaleontology Bulletins*, n° 6, 187 p.

STEPANOVA A., TALDENKOVA E. & BAUCH H.A. (2003).- Recent Ostracoda from the Laptev Sea (Arctic Siberia): species assemblages and some environmental relationships.- *Marine Micropaleontolology*, Amsterdam, vol. 48, n^{os} 1-2, p. 23–48.

STRAATEN L.M.J.U. van (1966).- Micro-malacological investigation of cores from the Southeastern Adriatic Sea.- *Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschappen*, Amsterdam, (series B), vol. 69, p. 429-445.

SWANSON K.M. & AYRESS M.A. (1999).- *Cytheropteron testudo* and related species from the SW Pacific with analyses of their soft anatomies, relationships and distribution.- *Senckenbergiana biologica,* Frankfurt, vol. 79, n° 2, p. 151-193.

UFFENORDE H. (1981).– Ostracoden aus dem Oberoligozan und Miozan des unteren Elbe-Gebietes (Niedersachsen und Hamburg, NW – Deutsches Tertiarbecken).- *Paleontographica, Abt. A*, Stuttgart, Bd. 172, p. 103-

198.

VAN HARTEN D. (1990).- 24. Modern abyssal ostracod faunas of the eastern Mid-Atlantic Ridge area in the North Atlantic and a comparison with the Mediterranean. *In*: WHATLEY R. & MAYBURY C. (eds.), Ostracoda and global events.- British Micropalaeontological Society Publication Series, Chapman and Hall, London, p. 321-328.

VIOLANTI D. (1991).- Pliocene-Pleistocene foraminiferal assemblages of north-eastern Sicily: analysis of recent data. *In*: BONFIGLIO L. (ed.), Celebrazioni del I centenario in memoria di Giuseppe SEGUENZA naturalista e paleontologo.- *Atti Accademia Peloritana dei Pericolanti*, Messina, vol. 47, suppl. 1, parte 2, p. 365-393.

YASSINI I. (1980).- Répartition des ostracodes dans une série marine régressive d'âge pliocène dans la région d'Alger (Algérie).- *Revue de Micropaléontologie*, Paris, vol. 22, n° 2, p. 89-124.