

Description of two new species of ostracods from the Strait of Messina (central Mediterranean)

Francesco SCIUTO

University of Catania, Department of Biological, Geological and Environmental Sciences, Earth Sciences Section (Palaeoecological Research Group), Corso Italia 55, I-95029 Catania (Italy)
fsciuto@unict.it

Nevio PUGLIESE

University of Trieste, Department of Matematic and Geosciences, Via E.Weiss 4, I-34128 Trieste (Italy)

Sciuto F. & Pugliese N. 2013. — Description of two new species of ostracods from the Strait of Messina (central Mediterranean). *Zoosystema* 35 (1): 35-44. <http://dx.doi.org/10.5252/z2013n1a4>

ABSTRACT

More than 100 years after the studies of G. Seguenza, sediment samples from the Strait of Messina (central Mediterranean) were examined in order to study their ostracod faunas. Two new species, *Anchistrocheles seguenzai* n. sp. and *Phlyctocythere sicula* n. sp., were found, both in thanatocoenoses from the Bathyal zone, at a depth of 545 m. *Anchistrocheles seguenzai* n. sp. is distinguishable from *A. tenera* (Breman, 1975), the only living species of the genus in Recent Mediterranean, and from the other species of the genus because of the more reniform-subquadrangular outline of its carapace and the different height/length ratio values. In the same way, *Phlyctocythere sicula* n. sp. can be distinguished from *P. pellucida* (Müller, 1894) the only living species of the genus in Recent Mediterranean, because of its more rounded outline, less marked caudal process which is more obtuse and more shifted to the median side of the posterior end, the inflated postero-ventral area, the more acute anterior margin and the narrower marginal zone and vestibula. The stratigraphic and geographic distribution of some species of both genera is indicated.

KEY WORDS

Marine ostracods,
Mediterranean,
Strait of Messina,
Bathyal,
Recent,
new species.

RÉSUMÉ

Description de deux nouvelles espèces d'ostracode du détroit de Messine (Méditerranée centrale).

Plus de 100 ans après les études de G. Seguenza nous avons collecté des échantillons de sédiments provenant du Déroit de Messine (Méditerranée centrale) pour étudier la faune d'ostracodes. Deux nouvelles espèces *Anchistrocheles seguenzai*

MOTS CLÉS
Ostracodes marine,
Méditerranée,
Déroit de Messine,
Bathyal,
actuel,
espèces nouvelles.

n. sp. et *Phlyctocythere sicula* n. sp., ont été trouvées, toutes deux dans des thanatocoenoses de la zone bathyale à une profondeur de 545 m. *Anchistrocheles seguenzai* n. sp. se distingue de *A. tenera* (Breman, 1975), la seule espèce vivante du genre dans le Méditerranéen Récent ainsi que des autres espèces du genre, par le contour externe de la carapace plus subrectangulaire et par la différence du rapport hauteur/longueur. *Phlyctocythere sicula* n. sp. se distingue de *P. pellucida* (Müller, 1894) la seule espèce actuelle du genre dans le Méditerranéen Récent, par son contour externe plus arrondi ; le processus caudal moins marqué, plus obtus et plus déplacé vers la partie médiane du bord postérieur; le bord postéro-ventral enflé; le bord antérieur plus aiguë; une zone marginale et un vestibule plus étroits. La distribution géographique et stratigraphique de plusieurs espèces des deux genres est donnée.

INTRODUCTION

The Strait of Messina, in central Mediterranean, separates Sicily from Calabria. Its physiography is strongly linked to the complex geological-structural context in which it is placed (Fig. 1), characterised by strong tectonic activity and high sedimentation rate (Montenat *et al.* 1987). The Strait culminates with a threshold between Scilla and Capo Peloro at a depth ranging from 76 to 130 m, separating the Tyrrhenian Basin to the North from the Ionian Basin to the South.

South of the threshold, the Strait could be morphologically considered as a deep funnel shaped canyon, with very steep slopes, which in a few kilometres deepens down to 1400 m (Fig. 1). In the area, the shelf is extremely reduced or completely absent, and the slope is steep and deeply furrowed by minor transverse canyons along which sediments transported up the coast by torrents flow. Similarly, the morphology of the subaerial sectors is characterised by steep and rugged landscapes.

Hydrodynamics is locally forced and enhanced by the physiography, and dominated by strong and complex tidal currents, producing eddies. This hydrodynamic motion, and the tectonic instability of the area cause at time turbidity flows which strongly influence the bottom widely displacing sediments and faunas (Montenat *et al.* 1987).

Unlike for other Mediterranean sectors, the ostracod fauna of this particular area is poorly known. Only Giuseppe Seguenza was interested in it. In the years 1883-1885 he published two papers on the ostracods living in the Messina harbour between 50 and 75 m.

The first paper (Seguenza 1883) is a list of 37 species (two of which indicated as new) living in the Strait of Messina and also present as fossils in the area.

The second paper (Seguenza 1883-1885), published in several issues, describes 60 species, 18 out of which reported as new.

All this material and types of Seguenza's new species were lost because of the Messina earthquake in 1908.

Müller (1912) refers about Seguenza's species but considers many taxa as "*genera dubia et species dubiae*".

Finally, Ruggieri (1989), critically examined Seguenza's studies and concluded that some of his species, which are not figured, cannot be identified only on the basis of the original descriptions. In contrast, the figured taxa could be considered as valid only by providing topotypical material.

After more than one hundred years from the studies of Seguenza, in 2005-2007, bottom samples were collected in the Strait of Messina. They delivered few living ostracods and several dead specimens. Although the description of the ostracod fauna is beyond the aim of this paper, two species appeared

of particular interest as they were not previously known. This paper aims to describe these new species, and to summarise knowledge on the distribution of the genera to which they belong to.

MATERIAL AND METHODS

Samples were collected in 2005-2007 mostly through a Van Veen grab, during some oceanographic cruises (MERC) on board of the R/V *Universitatis*. Their study was directed to the construction of the geological and sedimentological map of the Strait of Messina.

The sampling area in the Strait of Messina, between Sicily to the West and Calabria to the East, is included between 37°58'N and 38°11'N.

A total of 300 samples were collected from Circalittoral to Bathyal zones (50 m to 1350 m water depth). Sediments are mainly terrigenous and consist of gravel, sand and mud. Until now, 60 samples of 300 cm³ in volume, were used for the analysis of the ostracod fauna. 25 out of them did not contain ostracods.

In the remaining 35 samples the specimens are rare. Nearly always, only a few isolated valves, and even single valves, have been found in each sample. However a total of 113 species of ostracoda were picked up from the > 63 microns fraction. Living specimens, belonging to a total of 16 species, were found in only 14 samples. In contrast, 97 ostracod species were found in thanatocoenoses and thaphocoenoses.

Two of them cannot be assigned to any of the already described ostracod species and are here described as new. Valves were present in thanatocoenoses at 545 m water depth (sample MERC 10) and 327 m water depth (MERC 148).

Ostracod valves were examined and measured under a LMU Tescan Vega II SEM in low vacuum conditions.

The type material is housed in the Muséum national d'Histoire naturelle (MNHN) in Paris.

ABBREVIATIONS

H	height;
L	length;
LV	left valve;
MERC	Messina-Reggio Calabria cruise;
RV	right valve.



FIG. 1. — Geographical location of sampling stations in the Strait of Messina.

SYSTEMATICS

Class OSTRACODA Latreille, 1806
Order PODOCOPIIDA Sars, 1866
Family BAIRDIIDAE Sars, 1887

Genus *Anchistrocheles* Brady & Norman, 1889

TYPE SPECIES. — *Anchistrocheles fumata* Brady, 1890.

Anchistrocheles sequenzai n. sp.
(Fig. 2)

TYPE MATERIAL. — **Holotype**: Strait of Messina, central Mediterranean, R/V *Universitatis*, cruise MERC, sampling station MERC 10 (38°07'14"N, 15°32'55"E; 545 m depth), terrigenous mud, 12.XII.2005, right valve (L 0.530 mm, H 0.280 mm), MNHN PMC.O7H.1.10.2012 (Fig. 2A).

Paratypes: same data as holotype, the left valve MNHN PMC.O25P.1.10.2012 (Fig. 2C), station MERC 148, 327 m depth, terrigenous mud, 18.VI.2006, and two valves not figured MNHN PMC.O26P.1.10.2012; MNHN PMC.O27P.1.10.2012.

OTHER MATERIAL EXAMINED. — One fossil complete carapace found in the Pleistocene (Calabrian) sedimentary succession cropping out at Scoppo (ME) (Fig. 1) along the sicilian side of the Strait of Messina (Fig. 2B).

STRATIGRAPHIC RANGE. — Early Pleistocene (Calabrian) to Recent.

ETYMOLOGY. — This species is dedicated to Giuseppe Seguenza (Messina, 1833-1889) one of the most important Sicilian naturalists and palaeontologists of the 19th century.

DIAGNOSIS. — *Anchistrocheles seguenzai* n. sp. is characterised by valves reniform-subquadrangular laterally compressed with anterior and postero-ventral marginal area narrow and flattened.

DESCRIPTION

Carapace medium-sized, reniform-subquadrangular in lateral view, elongate and compressed in dorsal view with the posterior end more acute than the anterior one (Fig. 2A-C).

Valves almost symmetric with RV slight overlapping LV in dorsal area. Anterior margin regularly rounded with a wide bending radius, dorsal margin convex and sub-polygonal in RV, somewhat flatter in LV, posterior margin straight passing to the postero-ventral margin through an obtuse angle. Ventral margin concave and sinuous with a marked oral curvature. Anterior and postero-ventral marginal area narrow and flattened: larger anteriorly and narrower postero-ventrally (Fig. 2C).

Outer surface smooth. Normal pore-canals little, simple, numerous and evenly distributed on the external surface (Fig. 2A, B).

Inner lamella anteriorly and postero-ventrally wide. Anterior and postero-ventral vestibula narrow (Fig. 2D, H). Marginal pore-canals (Fig. 2D, H) straight and simple; a few ones close set.

Eye tubercles absent.

Hinge adont (Fig. 2C, F). A thin dorsal groove in the left valve that corresponds with a complementary thin dorsal edge in the right valve.

Four large and clear adductors muscle scars, one frontal scar and two mandibular scars (Fig. 2G).

REMARKS

The generic attribution of *Anchistrocheles seguenzai* n. sp. is difficult as its carapace is characterised by morphological features that are shared by *Bythocypris*

Brady, 1880. Until now the differences between the two genera can be defined only in the presence of soft parts (Van Morkoven 1963; Maddocks 1969). Nevertheless, the present species has been confidently assigned to *Anchistrocheles* following Aiello *et al.* (1996) using the characters listed below: the anterior margin more obliquely subtruncated, the more subrectangular outline of the valves, the almost symmetrical right and left valves and the sharp-pointed dorsal margin exhibited by *Anchistrocheles* in comparison to that of *Bythocypris*.

Anchistrocheles has a Recent and fossil worldwide distribution. The genus is known from the Early Pliocene and Pleistocene of Italy (Colalongo 1965; Greco *et al.* 1974; Colalongo & Pasini 1980, 1988; Barra *et al.* 1998; Aiello & Barra 2001; Sciuto 2005; Sciuto & Rosso 2008), the Pleistocene of Rhodes (Mostafawi 1989), the Pleistocene of the Atsumi Peninsula, central Japan (Yajima 1987) and the Neogene of the Hawaii Island (Brady 1890). The genus seems to have been found also in the Late Tortonian-Messinian of Morocco (Aiello *et al.* 1996).

Recent species (13 species) are known from the North Sea, the Irish Sea and the English Channel (Brady & Norman 1889), from Madagascar (Brady 1890; Maddocks 1969; Scott 1905), from Bermuda (Maddocks 1976) and from Mozambique (Maddocks 1969), from bathyal thanatocoenoses off Santa Maria di Leuca (Ionian Sea) (Rosso *et al.* 2010) and from the Gulf of Aqaba (Bonaduce *et al.* 1980).

To date the genus *Anchistrocheles* is known from the Recent Mediterranean only with *A. tenera* (Bremner, 1975), a species reported from the western Mediterranean (Bonaduce *et al.* 1983), including the Gulf of Naples (Aiello *et al.* 1996), and from the Adriatic Sea (Bremner 1975) and documented also from bathyal environments of the Atlantic Ocean.

Anchistrocheles seguenzai n. sp. is distinguishable from all other species of the genus because of the more reniform-subquadrangular outline of its carapace and the different H/L values.

Anchistrocheles seguenzai n. sp. resembles: 1) *Anchistrocheles* sp. described by Bonaduce *et al.* (1980) from Recent shallow-water (30 m deep) sediments from the Gulf of Aqaba; 2) *A. barnharti* Maddocks, 1976, from Recent lagoonal sands on

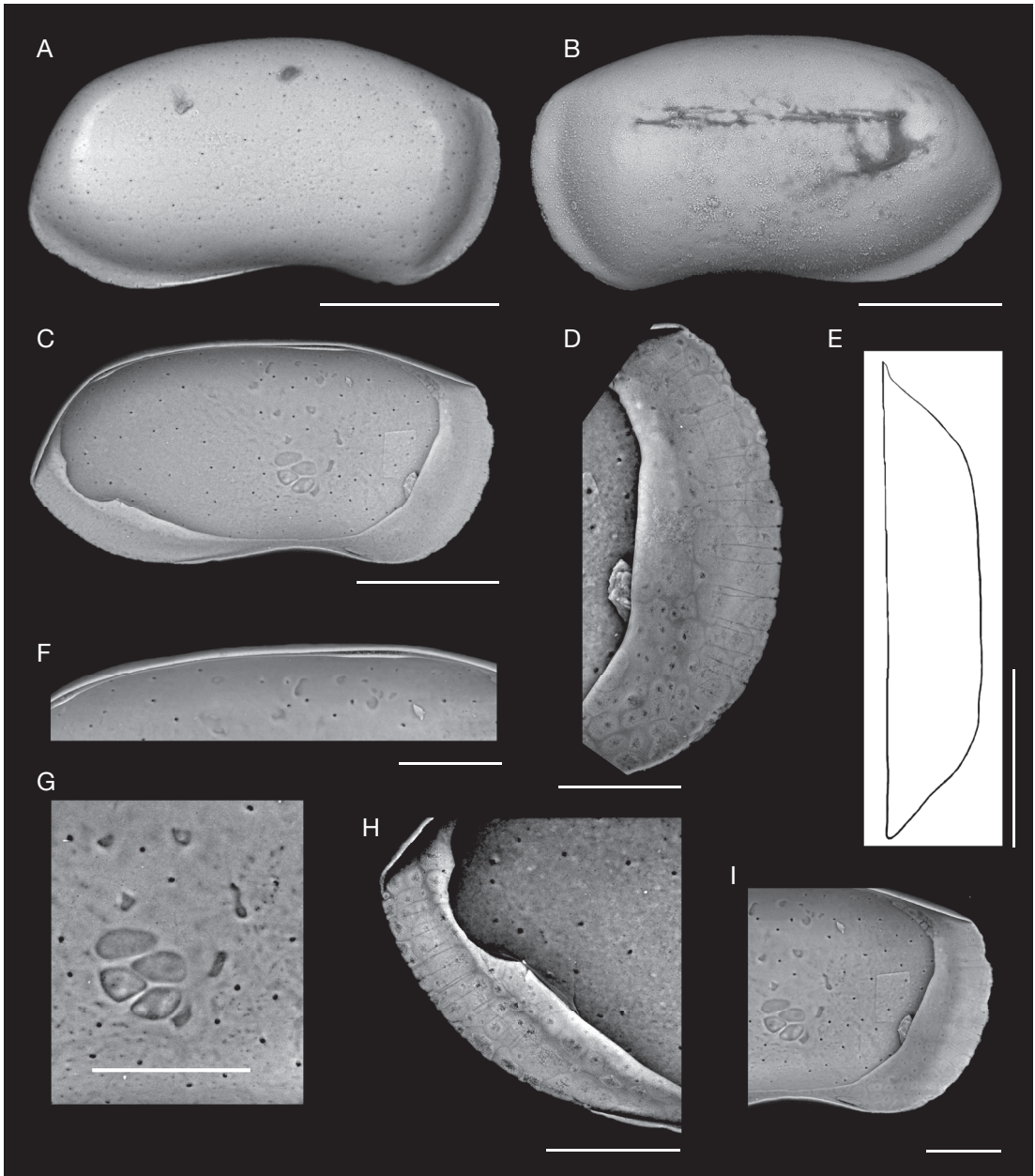


FIG. 2. — *Anchistrocheles seguenzai* n. sp.: **A**, holotype (MNHN PMC.O7H.1.10.2012); **B**, specimen from Scoppo; **C, D, F-I**, paratype (MNHN PMC.O25P.1.10.2012); **A**, right valve, external lateral view; **B**, left valve, external lateral view; **C**, left valve, internal lateral view; **D**, left valve, internal lateral view, detailed of the anterior marginal area with marginal pore-canals; **E**, right valve, dorsal view, drawing of outline; **F**, left valve, detail of the hinge; **G**, left valve, internal lateral view, muscle scars; **H**, left valve, internal lateral view, detail of the posteroventral marginal area with marginal pore-canals; **I**, left valve, internal lateral view, detail of the anterior marginal area. Scale bars: A-C, E, 200 µm; D, I, 50 µm; F-H, 100 µm.

the Bermuda platform; and 3) *A. acerosa* (Brady, 1868), reported by Brady & Norman (1889) from the North Sea, the Irish Sea and the English Channel. Nevertheless, specimens of these species show lateral outlines of their carapace less subquadrangular and more rounded than *A. seguenzai* n. sp.

Family LOXOCONCHIDAE Sars, 1925

Genus *Phlyctocythere* Keij, 1958

TYPE SPECIES. — *Phlyctocythere eocaenica* Keij, 1958.

Phlyctocythere sicula n. sp. (Fig. 3)

TYPE MATERIAL. — Holotype: Strait of Messina, central Mediterranean, R/V *Universitatis*, cruise MERC, Sampling station MERC 10 (38°07'14"N, 15°32'55"E; 545 m depth), terrigenous mud, 10.XII.2005, right valve (L 0.670 mm, H 0.365 mm), MNHN PMC.O8H.1.10.2012 (Fig. 3A).

Paratypes: same data as holotype, 2 left valves, MNHN PMC.O28P.1.10.2012 (Fig. 3B), O29P.1.10.2012 (Fig. 3C).

OTHER MATERIAL EXAMINED. — One left valve found in the Pleistocene (Calabrian) sedimentary succession cropping out at Scoppo (ME) (Fig. 1) along the sicilian side of the Strait of Messina.

STRATIGRAPHIC RANGE. — Early Pleistocene (Calabrian) to Recent.

ETIMOLOGY. — Named from the Sicily Island.

DIAGNOSIS. — *Phlyctocythere sicula* n. sp. is characterised by a suboval, inflated carapace with swollen postero-ventral area and a short caudal process in postero-central area.

DESCRIPTION

Carapace medium to large sized, suboval in lateral view. Anterior margin rounded and slightly pointed, dorsal margin regularly arched and convex, gently passing to the caudal process of the posterior area (Fig. 3A, B). Caudal process short and obtuse. Ventral margin slightly sinuous, regularly and

steeply bending to the posterior margin towards the caudal process.

Carapace inflated and oval in dorsal view.

Outer surface lightly ornamented by a very weak reticulum particularly evident in the ventrolateral area (Fig. 3I). Few normal pore-canal, simple and evenly distributed, widely spaced, on the surface of the valve (Fig. 3C, G, H).

Inner lamella anteriorly wide, narrower posteriorly, reduced to the minimum ventrally (Fig. 3C). Vestibula large anteriorly, narrow in postero-ventral area (Fig. 3C).

Marginal pore-canal not observable.

Eye tubercles absent.

Hinge merodont: in the LV a curved smooth bar (Fig. 3C, F) with two little elongated lateral grooves at the anterior and posterior ends (Fig. 3G, H). RV with complementary elements.

Four adductor scars and a single dorsal muscle scar (Fig. 3 C, D).

REMARKS

Phlyctocythere sicula n. sp. shows general features, and particularly the outline, similar to those of *Loxococoncha* Sars, 1866 and, especially, to *Loxococonchella* Triebel, 1954, but differs from both of them mainly because of the weak ornamentation of the carapace.

Relatively to the hinge, the genus *Phlyctocythere* seems to show a wide variability; despite, Keij (1958) described the hinge of the type species as adont in its original description. Several species assigned to *Phlyctocythere* actually have a more or less developed hinge. *P. pellucida* (Müller, 1894) possesses a hinge as do some specimens, recorded by Van Morkoven (1963) and left in open nomenclature, which show traces of hinge terminal elements. Similarly, *P. curva* Van den Bold, 1988 shows a hinge "Weak, in the left valve consisting of a long, curved, very slightly crenulate bar with terminal, elongate, slightly, crenulate sockets" (Van den Bold 1988: 52). Consequently, the presence of a merodont hinge in the observed species does not prevent its inclusion within the genus *Phlyctocythere*. Furthermore, the present species has been assigned to *Anchistrocheles* using some features belonging to the type species such as the four muscle scars in

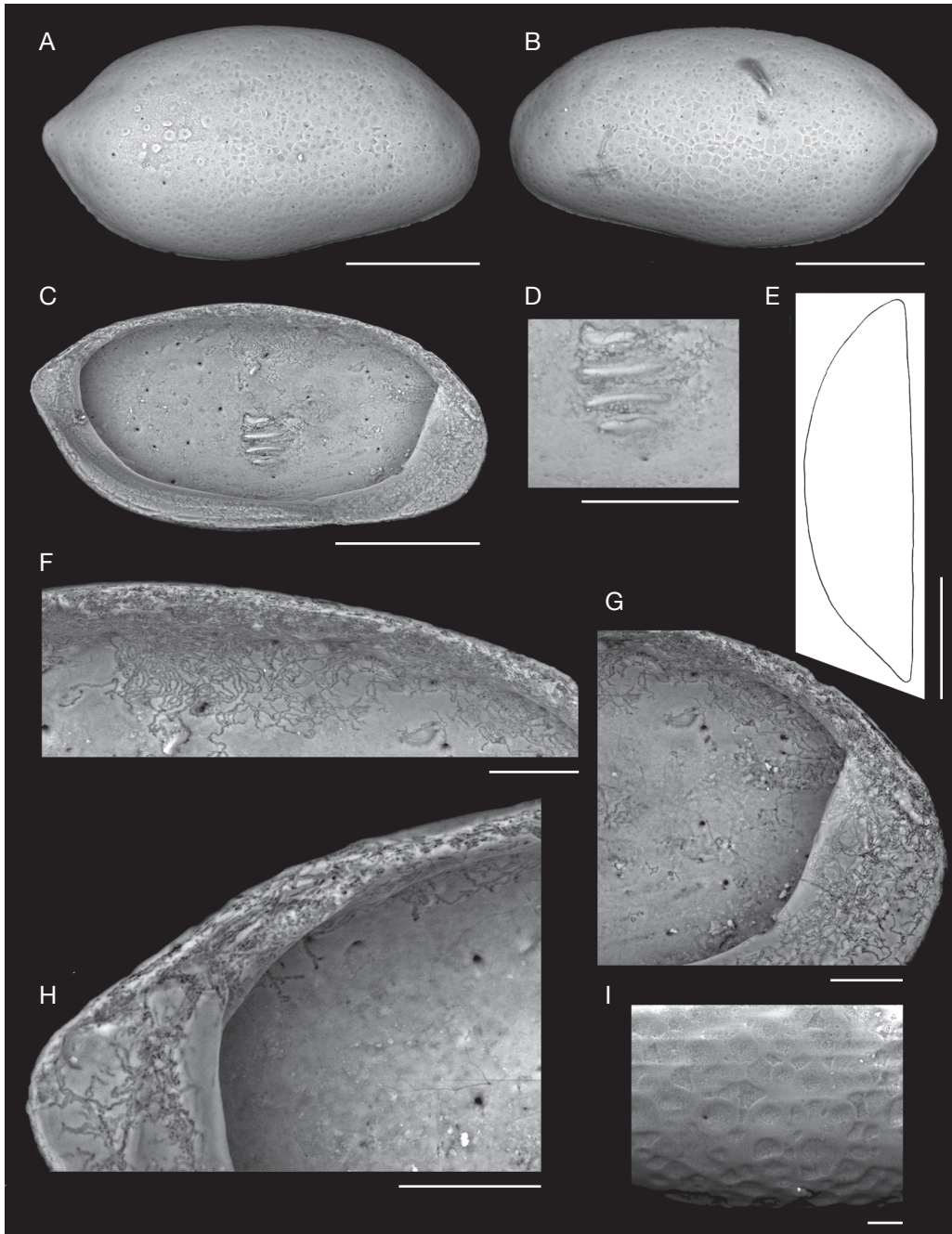


FIG. 3. — *Phlyctocythere sicula* n. sp.: **A**, holotype (MNHN PMC.O8H.1.10.2012) right valve, external lateral view; **B**, **I**, paratype (MNHN PMC.O28P.1.10.2012); **C**, **D**, **F-H** paratype (MNHN PMC.O29P.1.10.2012); **B**, left valve, external lateral view; **C**, left valve, internal view; **D**, left valve, internal view, muscle scars; **E**, left valve, dorsal view, drawing of outline; **F**, left valve, internal view, detail of the central part of the hinge; **G**, left valve, internal view, detail of the anterior part of the hinge; **H**, left valve, internal view, detail of the posterior part of the hinge; **I**, left valve, detail of ornamentation in ventral area. Scale bars: A-C, E, 200 µm; D, 100 µm; F-H, 50 µm; I, 20 µm.

row, the different vestibula, the normal pore canals widely spaced and the light ornamentation of the outer surface of the carapace.

Phlyctocythere includes 12 living species and some fossil ones; some of them are reported in open nomenclature. It has a present-day and fossil worldwide distribution. The oldest species have been doubtfully reported from the Barremian of SE France (Donze 1971), and further taxa are known from the Eocene of the Paris Basin (Keij 1958), the Tortonian-Messinian of SE Sicily (Ciampo 1980) and the Pleistocene of Italy (Ciampo 1976; Moncharmont-Zei *et al.* 1985).

Living species have been reported from the Mediterranean (Müller 1894; Ciampo 2003), the south Pacific (Correge 1993), the NE Atlantic (Freiwald & Mostafawi 1998), northwestern Europe (Sars 1866; 1922-1928), North Carolina (Atlantic Ocean) (Hazel 1975), tropical West Africa (Hartmann & Hartmann Schroeder 1975).

In the Recent Mediterranean the genus *Phlyctocythere* was formerly known only with *P. pellucida* (Müller, 1894). *Phlyctocythere pellucida* was reported from: 1) the Gulf of Naples associated with calcareous algae down to a depth of 100 m (Puri *et al.* 1964); 2) Malta, where it was collected from 9 and 128 m (Bonaduce & Masoli 1970); 3) the east Mediterranean (Liban), collected from 75 and 245 m (Bonaduce *et al.* 1970); 4) Adriatic Sea down to 150 m (Uffenorde 1972; Bonaduce *et al.* 1975).

Phlyctocythere sicula n. sp. is distinguishable from *P. pellucida* because of the more rounded outline, the caudal process less marked, more obtuse and more shifted to the median side of the posterior end; the postero-ventral area inflated, the more acute anterior margin, the narrower marginal zone and vestibula.

Acknowledgements

Many thanks are due to Prof. A. Rosso (University of Catania) for discussion and suggestions on the manuscript, A. Ohler and to the two anonymous referees. Thanks are due also to the crew of the research vessel *Universitatis* and to Mr Alfio Viola (University of Catania) for SEM photos.

REFERENCES

- AIELLO G. & BARRA D. 2001. — Pliocene ostracod assemblages at the MPI 3-MPI 4 boundary in the Capo Rossello borehole (Agrigento, Sicily). *Bollettino della Società Paleontologica Italiana* 40 (1): 97-103.
- AIELLO G., BARRA D. & BONADUCE G. 1996. — *Anchistrocheles interrupta*, a new deep-water marine ostracod species (Pussellinae, Ostracoda) from the Plio-Pleistocene of the Mediterranean Basin. *Bollettino della Società Paleontologica Italiana* 34 (3): 271-274.
- BARRA D., BONADUCE G. & SGARRELLA F. 1998. — Paleoenvironmental bottom water conditions in the Early Zanclean of the Capo Rossello area (Agrigento, Sicily). *Bollettino della Società Paleontologica Italiana* 37 (1): 61-98.
- BONADUCE G. & MASOLI M. 1970. — Benthic marine Ostracoda from Malta. *Pubblicazioni della Stazione Zoologica di Napoli* 38: 47-56.
- BONADUCE G., BRAMBATI A. & MASOLI M. 1970. — Ostracoda and Recent sediments of the St. George Bay (Jun El Khudr, Lebanon). *Pubblicazioni della Stazione Zoologica di Napoli* 38: 57-70.
- BONADUCE G., CIAMPO G. & MASOLI M. 1975. — Distribution of Ostracoda in the Adriatic Sea. *Pubblicazioni della Stazione Zoologica di Napoli* 40 (suppl.): 1-304.
- BONADUCE G., MASOLI M., MINICHELLI G. & PUGLIESE N. 1980. — Some new benthic ostracod species from the Gulf of Aqaba (Red Sea). *Bollettino della Società Paleontologica Italiana* 19 (1): 143-178.
- BONADUCE G., CILIBERTO B., MASOLI M., MINICHELLI G. & PUGLIESE N. 1983. — The deep-water benthic ostracodes of the Mediterranean, in MADDOCKS R. F. (ed.), Application of Ostracoda: Proceedings of the Eighth International Symposium on Ostracoda July 26-29, 1982, *Department of Geosciences University of Houston, Texas*: 459-471.
- BRADY G. S. 1890. — On Ostracoda collected by H. B. Brady in the South Sea islands. *Transactions of the Royal Society of Edinburgh* 35 (2): 489-525.
- BRADY G. S. & NORMAN A. M. 1889. — A monograph of the marine and freshwater Ostracoda of the north Atlantic and of the northwestern Europe. Section I Podocopa. *Scientific Transactions of the Royal Dublin Society*, ser. 2, 4: 63-270.
- BREMAN E. 1975. — Ostracodes in a bottom core from the deep southeastern basin of the Adriatic Sea. I, II. *Koninklijke Nederlandse Akademie van Wetenschappen, Proceeding*, ser. B, 78: 198-218.
- CIAMPO G. 1976. — Ostracodi pleistocenici di Cala Bianca (Marina di Camerota, Salerno). *Bollettino della Società Paleontologica Italiana* 15 (1): 3-23.
- CIAMPO G. 1980. — Ostracodi miocenici (Tortoniano-Messiniano) della regione di Ragusa (Sicilia). *Bollettino*

- della Società Paleontologica Italiana 19 (1): 5-20.
- CIAMPO G. 2003. — Reconstruction of Late Pleistocene-Holocene palaeobathymetries from Ostracoda on the Tyrrhenian continental shelf. *Geobios* 36: 1-11.
- COLALONGO M. L. 1965. — Gli Ostracodi della serie di Le Castella (Calabria). *Giornale di Geologia* 33: 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* 19 (1): 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* 27 (3): 277-289.
- CORREGE T. 1993. — The relationship between water masses and benthic ostracod assemblages in the western Coral Sea, southwest Pacific. *Palaeogeography, Palaeoclimatology, Palaeoecology* 105: 245-266.
- DONZE P. 1971. — Rapport entre les faciès et la répartition générique des ostracodes dans quatre gisements types, deux à deux synchroniques, du Berrasiens et du Barrémien du sud-est de la France. *Bulletin du Centre de Recherche de Pau* 5 (suppl.): 651-661.
- FREIHALD A. & MOSTAFAWI N. 1998. — Ostracods in a cold-temperate coastal environment, western Troms, northern Norway: sedimentary aspect and assemblages. *Facies* 38: 255-274.
- GRECO A., RUGGIERI G. & SPROVIERI R. 1974. — La sezione calabriana di Monasterace (Calabria). *Bollettino della Società Paleontologica Italiana* 93: 151-179.
- HARTMANN G. & HARTMANN SCHROEDER G. 1975. — Zoogeography and biology of littoral Ostracoda from South Africa, Angola and Mozambique, in SWAIN F. M. (ed.), Biology and paleobiology of Ostracoda. *Bulletins of American Paleontology* 65 (282): 353-368.
- HAZEL J. E. 1975. — Ostracode biofacies in the cape Hatteras, North Carolina area, in SWAIN F. M. (ed.), Biology and paleobiology of Ostracoda. *Bulletins of American Paleontology* 65 (282): 463-488.
- KEIJ A. J. 1958. — Note on the Lutetian Ostracoda of Damery (Marne), France. *Koninklijke Nederlandse Akademie van Wetenschappen, Proceeding*, ser. B, 61 (1): 63-73.
- MADDOCKS R. F. 1969. — Revision of Recent Bairdiidae (Ostracoda). *United States Natural Museum Bulletin* 295: 1-126.
- MADDOCKS R. F. 1976. — Pussellinae are interstitial Bairdiidae (Ostracoda). *Micropaleontology* 22 (2): 194-214.
- 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* 23 (1): 21-51.
- MONTENAT C., BARRIER P. & DI GERONIMO I. 1987. — The Strait of Messina, past and present: a review. *Documents et travaux IGAL, Paris* 11: 7-13.
- MOSTAFAWI N. 1989. — Limnische und marine ostracoden aus dem Neogen der Insel Rhodos (Griechenland). *Courier Forschungsinstitut Senckenberg* 113: 117-157.
- MÜLLER G. W. 1894. — *Die Ostracoden des Golfes von Neapel und der angrenzenden Meeres-Abschnitte*. Fauna und flora des Golfes von Neapel 21. R. Friedlander, Berlin, 404 p.
- MÜLLER G. W. 1912. — Ostracoda, in *Das Tierreich* 31. Lieferung, Berlin, 434 p.
- PURI H. S., BONADUCE G. & MALLOY J. 1964. — Ecology of the Gulf of Naples. *Pubblicazioni della Stazione Zoologica di Napoli* 3 (suppl.): 87-199.
- ROSSO A., VERTINO A., DI GERONIMO I., SANFILIPPO R., SCIUTO F., DI GERONIMO R., VIOLANTI D., CORSELLI C., TAVIANI M., MASTROTOTARO F., TURSÌ A. 2010. — Hard and soft bottom thanatofacies from the Santa Maria di Leuca deep-water coral province, Mediterranean. *Deep-Sea Research II* 57: 360-379.
- RUGGIERI G. 1989. — Gli ostracodi nell'opera di Giuseppe Seguenza. *Atti della Accademia Peloritana dei Pericolanti* 68 (suppl. n° 1): 41-77.
- SARS G. O. 1866. — Oversigt af Norges marine Ostracoder. *Forhandlinger i Videnskabs - Selskabet i Christiania* 7: 1-130.
- SARS G. O. 1922-1928. — *An Account of the Crustacea of Norway*. Vol. 9 (Ostracoda). Bergen Museum, Bergen, 277 p.
- SCIUTO F. 2005. — Ostracodi batiali pleistocenici di Capo Milazzo (Sicilia NE) ed implicazioni paleoambientali. *Rendiconti della Società Paleontologica Italiana* 2: 219-227.
- 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* 47 (1): 33-43.
- SCOTT A. 1905. — Report on the Ostracoda collected by professor Herdman at Ceylon in 1902. *Royal Society of London* 3: 365-384.
- SEGUENZA G. 1883. — Gli ostracodi dei periodi terziarii e quaternarii viventi nel mare di Messina. *Bollettino della Società Geologica Italiana* 2: 57-63.
- SEGUENZA G. 1883-1885. — Gli Ostracodi del porto di Messina. *Naturalista Siciliano* 1883, anno II (12): 284-288; 1883, anno III (2): 39-42; 1883, anno III (3): 75-77; 1883, anno III (4): 124-128; 1884, anno III (5): 149-152; 1884, anno III (6): 186-189; 1884, anno III (9): 253-257; 1884, anno III (11): 319-322; 1884, anno IV (1-2): 44-48, 1 tav.; 1885, anno IV (4): 76-79; 1885, anno IV (5): 110-112; 1885 anno V (3): 57-61.
- UFFENORDE H. 1972. — Ökologie und jahreszeitliche Verteilung rezenter benthonischer Ostracoden des

- Limski Kanal bei Rovinj (nordliche Adria). *Gottinger Arbeit zur Geologie und Palaontologie* 13: 1-121.
- VAN DEN BOLD W. A. 1988. — Neogene Paleontology in the northern Dominican Republic 7. The subclass Ostracoda (Arthropoda: Crustacea). *Bulletins of American Paleontology* 94 (329): 1-105.
- VAN MORKOVEN F. P. C. M. 1963. — *Post Palaeozoic Ostracoda*. Vol. II. Elsevier, Amsterdam, 478 p.
- YAJIMA M. 1987. — Pleistocene Ostracoda from the Atsumi Peninsula, central Japan. *Transactions and Proceeding of the Palaeontology Society of Japan* new series 146: 49-76.

*Submitted on 20 May 2011;
accepted on 14 September 2012;
published on 29 March 2013.*