https://doi.org/10.30836/igs.1025-6814.2022.1.250209
UDC 565.33:551.79(262.13)

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QUATERNARY-RECENT OSTRACODS (PODOCOPIDA, PLATYCOPIDA) OF THE TYRRHENIAN SEA (ITALY)

The article provides the systematic description of eight species of ostracods described by Dykan (2018, 2020), belonging to the genera Bythocypris, Pontocypris, Pterygocythereis, Bosquetina, Acantocythereis and Cytherella, as well as eleven species in open nomenclature (sp., cf., ex gr.) of the genera Argilloecia, Loxoconcha, Sarsicytheridea, Pontocytheroma, Echinocythereis, Paleoblitacythereis, Pseudobosquetina and Bythoceratina. The ostracods derive from Upper Quaternary, Holocene and modern deposits of the southwestern part of the Tyrrhenian Sea. Sampling stations cover shelf, continental slope and deep water basin in 65-3500 m water depth. The systematic section provides synonymy, detailed descriptions, ecology, geographical and stratigraphical distribution of species. SEM-images of external and internal structures of the carapace like hinge, normal pore canals, macro- and mesosculpture are provided. The documented species belong to North Atlantic, West Atlantic, South Antarctic and Mediterranean zoogeographic groups according to the zoogeographical classification developed for the ostracods of the Tyrrhenian Sea.

Keywords: *Ostracoda; systematic; Tyrrhenian Sea; Upper Pleistocene; Holocene; Recent.*

Introduction

Ostracods are the widespread and well-studied group of the marine microorganisms in the Mediterranean. Fossil and Recent ostracods of the Tyrrhenian Sea have been studied in the outcrops of the coastal and mainland Central Italy: Mazzini et al., 1999 (Central Italy, Tuscany, Upper Pleistocene); Gliozzi, 1999 (Central Italy, Abruzzi, Upper Messinian); Ciampo, 1985 (Southern Italy, Tortonian-Messinian), Aiello et al., 2020 (Southern Italy, coastal area of Tyrrhenian Sea, Port of Salerno; Upper Quaternary); in the outcrops of the island of Sicily: Luigi, 1985 (Palermo, Lower Pleistocene); Ciampo, 1985 (Tortonian-Messinian); in the outcrops of the island of Sardinia: Sciuto, 2009, 2012, 2014 (Upper Pliocene-Pleistocene); Bonaduce, Russo, 1984 (Lower-Middle Miocene); Bossio et al., 2006 (Miocene); Bossio, Gliozzi, 2004 (Upper Miocene); in the outcrops of the island of Procida: Aiello et al., 2012 (Bay of Naples, Pleistocene). Water area of the Tyrrhenian Sea remains less studied: Aiello et al., 2021 (the northern part

Citation: Dykan N.I. 2022. Quaternary-recent Ostracods (Podocopida, Platycopida) of the Tyrrhenian Sea (Italy). *Geologičnij žurnaj,* 1 (378): 62-81. https://doi.org/10.30836/igs.1025-6814.2022.1.250209
Цитування: Дикань Н.І. Четвертинні-рецентні остракоди (Podocopida, Platycopida) північно-західної частини Тірренського моря (Італія). *Геологічний журнал.* 2022. № 1 (378). С. 62—81. https://doi.org/10.30836/igs.1025-6814.2022.1.250209

of the sea, Gulf of Pozzuoli; Recent), Dykan, 2018, 2020 (in the southwestern part of the sea, Upper Pleistocene, Holocene, Recent). The author (Dykan, 2018, 2020) described 69 species of the fossil (Upper Pleistocene-Holocene) and recent ostracods from the bottom sediments in the southwestern part of the Tyrrhenian Sea. Eight species are new to science (genera Bythocypris, Pontocypris, Pterygocythereis, Bosquetina, Acantocythereis and Cytherella), eleven species (genera Argilloecia, Loxoconcha, Sarsicytheridea, Pontocytheroma, Echinocythereis, Paleoblitacythereis, Pseudobosquetina and Bythoceratina) were described in the open nomenclature (sp., cf., ex gr.) (Dykan, 2018, 2020).

The evolutionist and zoologist Ernst Mayr (1968) wrote: «…The emergence of a new species is the most important elementary event in evolution. It means the irreversible violation of continuity and the formation of a unit with new potential possibilities…" Therefore, the author of the article considers it necessary to publish standardized descriptions for the newly time described species (Dykan, 2018, 2020) for the English-speaking scientific community of the osracodologists.

Materials and methods

Geological (lithological and paleontological) studies of the southwestern part of the Tyrrhenian Sea were conducted by the Institute of Geological Sciences of the National Academy of Sciences of Ukraine during a research voyage by the hydrographic ship "Donuzlav" of the National Academy of Sciences of Ukraine (1987). The study area comprises the southwestern part of the Tyrrhenian Sea within the Tyrrhenian Basin and the African-Sicilian threshold, the areas of the Tunis and Kitira Straits. The samples of the marine deposits were taken by a corer with the 127 mm diameter at 2.1 m water depth, as well as by a dredge at 0.4 m water depth. 148 samples from 28 geological stations were taken for microfaunistic analysis from shallow to deep water zone: geological profile A-A, shelf-continental slope, 65-1290 m water depth; geological profile B-B, continental slope-deep-water depression, 246-2670 m water depth; the northern part of the study region, deep-water depression, 2295-3250 m water depth; the Kitira Strait, 1000-2500 m water depth (Fig. 1, Table). Fossil (Upper Pleistocene, Holocene) and recent ostracods (carapaces, valves) were found in 35 samples at eleven geological stations (profiles A-A, B-B). The samples were taken every 10 cm along the vertical section of the column and were washed by flotation. The washed sample was divided into the fractions of 0.1-0.25 mm, 0.25-0.50 mm, 0.50-1.0 mm, 1.0-2.0 mm. The fractions were examined under a MBS-10 binocular microscope and the fossil remains of the ostracods were collected by the No. 1 column brush into the Franke chamber. The morphology of the external and internal structure of a shell was studied using a stereoscope SEM JEOL JSM-6490 LV (Laboratory of Physical Research Methods, Institute of Geological Sciences of the NAS of Ukraine, Kyiv, Ukraine). Zoogeographic analysis of ostracods (reconstruction of the modern and ancient areals) is based on the analysis of the geographical distribution and the stratigraphic position (Paleogene-Recent) of the fossil and recent ostracods of the Mediterranean region and the Ocean. The type

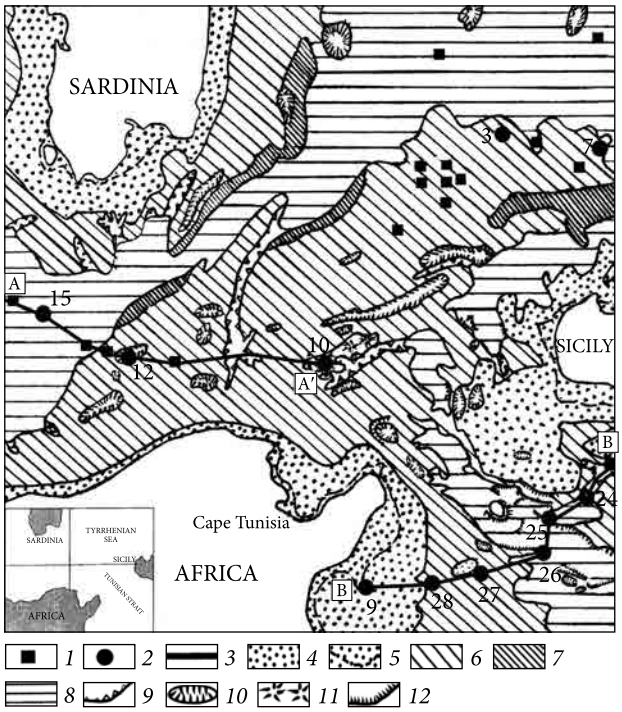

Fig. 1. Research area and the location of the geological stations: *1* — geological station; *2* — geological station with sampling for ostracods; *3* — geological profile; *4* — sloping plains of the shelf; *5* — coastal zone boundary; *6* — sloping plains of the continental slope; *7* — steep slopes of the foot of the continental slope; *8* — deep-water depression; *9* — canyon; *10* — ridge and isolated mountain; *11* — areas of ridge relief; *12* — canyon bench (Dykan, 2020)

series (collection 2589) is housed in the Department of Quaternary Geology, the Institute of Geological Sciences of the NAS of Ukraine, Kyiv, Ukraine. Taxonomic classification is given according to World Ostracoda Database (World Ostracoda Database — Cytheracopina, 2021; World Ostracoda Database, 2021).

Abbreviations

H, height; **L,** length; **L/H**, degree of elongation; **C**, carapace; **V**, valve; **RV**, right valve; **LV**, left valve; **A**, adult; **J/VII**, juvenile/stage of development; **2589–0,** collection number.

Systematic paleontology

Phylum Arthropoda von Siebold, 1848
Subphylum Crusracea Brünnich, 1772
Class Ostracoda Latreille, 1802
Subclass Podocopa G.O. Sars, 1866
Order Podocopida G.O. Sars, 1866
Suborder Bairdiocopina Gründel, 1967
Superfamily Bairdioidea G.O. Sars, 1865
Family Bythocyprididae Maddocks, 1969
Genus ***Bythocypris*** **Brady, 1880**
Bythocypris floridensis **Dykan, 2020**
Fig. 2, photo 1, 2, 3, 3 *a*, 3 *b*

Bythocypris cf. *B. reniformis*: Cronin, 1983, Pl. II, F, H.
Bythocypris floridensis sp. nov.: Dykan, 2020, S. 26-27, tab. 4, figs. 1, 2, 3a, b, c.

Etymology. After the geographical name of the Florida Peninsula.

Type series. 2589-313 (holotype), Fig. 3, photo 1, female, LV, southwestern continental slope of the Tyrrhenian Sea, sample D87-12, lat. 37°49' N, long. 9°02' E, 246 m water depth, int. 0-30 cm, sand, Recent; 2589-312 (paratype), female, RV; 2589-314 (paratype), female, RV.

The coordinates of the sampling stations

No. station	Latitude	Longitude	Bottom water depth [m]
D87-9	36°12' N	10°48' E	65
D87-28	36°16' N	11°27' E	181
D87-26	36°26' N	12°20' E	186
D87-12	37°49' N	9°02' E	246
D87-27	36°23' N	11°57' E	340
D87-24	36°52' N	12°42' E	418
D87-10	37°45' N	10°47' E	455
D87-25	36°35' N	12°31' E	1290
D87-3	38°59' N	11°31' E	2295
D87-15	37°53' N	8°11' E	2670
D87-7	39°00' N	12°57' E	3250

Diagnosis. Anterior end slightly sloping anterodorsally. Surface fuzzy pitted.

Description. Carapace irregular suboval, equivalve (overlap along ventral margin). Large (L = = 1.16-1.18 mm), moderately elongate (RV, L/H = = 1.88-1.94; LV, L/H = 1.88). Maximum convexity in median part. Maximum height partially offset to anterior end. Dorsal margin evenly convex. Ventral margin narrow strongly concave in RV and almost straight in LV. Anterior end slightly sloping anterodorsally, rounded. Posterior end straightly sloping posterodorsally, narrowly rounded below the longitudinal axis. Surface fuzzy pitted. Surface pore canals fuzzy and small. Duplicature wide (1/7 length of the valve). Hinge rectodont, left-bared, with notched groove and hinge ears in RV. Adductor muscle scars distinct in internal view, the type of their location is two-row. Three irregular oval scars are located in the front row, one oval scar located behind and near the middle and lower scars. Adductor muscle scars are poorly dissected.

Dimensions. 2589-313 (holotype), female, LV, L = 1.16 mm, H = 0.61 mm, L/H = 1.88; 2589-312 (paratype), female RV, L = 1.16 mm, H = 0.61 mm, L/H = 1.88; 2589-314 (paratype), female RV, L = = 1.18 мм, H = 0.61 mm, L/H = 1.94.

Variability. Manifested in degree of elongation (female, L/H = 1.88-1.94, author's collection, Tyrrhenian Sea, Recent; L/H = 1.94-2.03, Cronin, 1983, Sargasso Sea, Holocene, Atlantic strata).

Comparisons. *Bythocypris floridensis* Dykan, 2020 differs from *Bythocypris reniformis* Brady, 1880 in evenly rounded anterior end, narrow strongly concave ventral margin in RV, pitted surface.

Locality. Recent: southwestern part of the Tyrrhenian Sea, 246 m water depth, sample D87-12, int. 0-30 cm (here and on – depth of sampling)

Stratigraphical range. Recent: southwestern part of the Tyrrhenian Sea; Holocene (Atlantic): Sargasso Sea (Peninsula Florida) (Cronin, 1983).

Geographical distribution. Central-western part of the AtlanticOcean (Sargasso Sea), Mediterranean basin (Tyrrhenian Sea).

Habitat conditions. Marine species, psammophilic. Tyrrhenian Sea, sloping plain of continental slope,

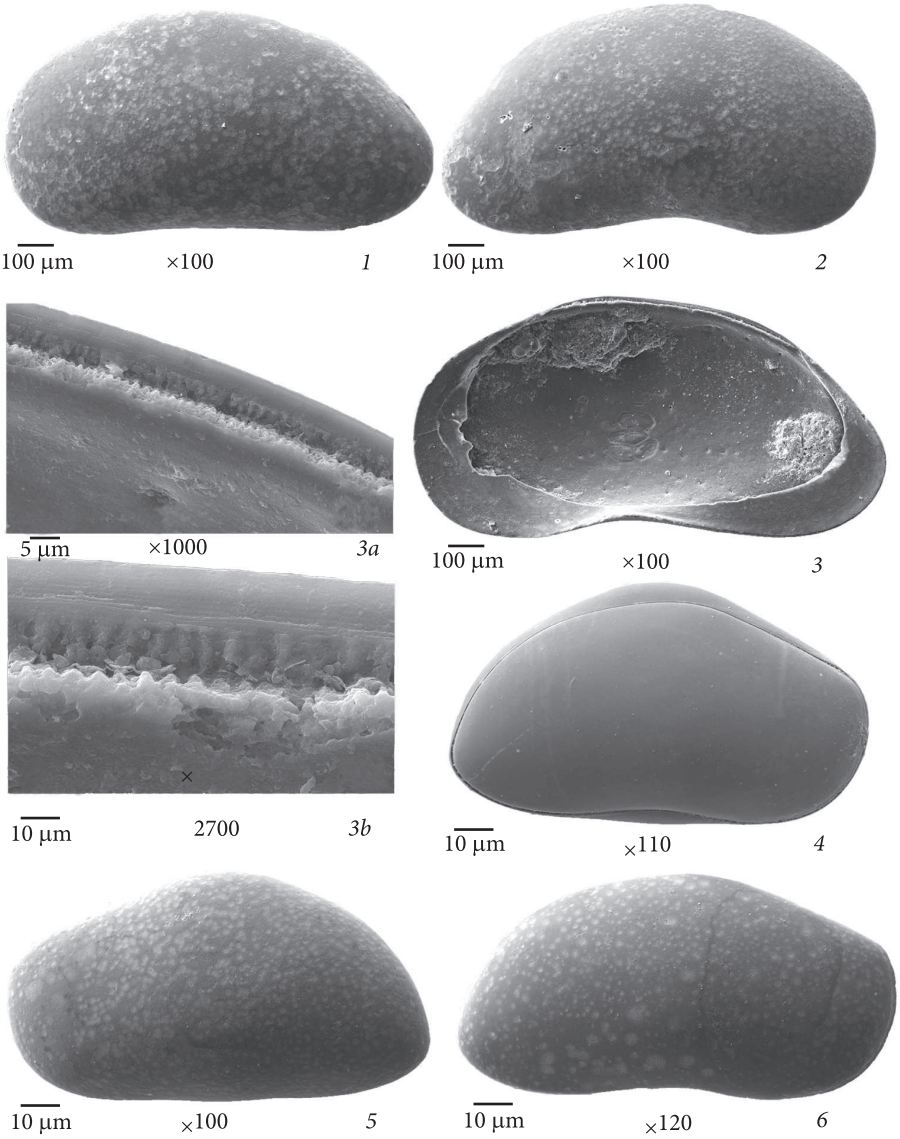

Fig. 2. SEM photographs of the shell of ostracods: Bythocypris floridensis Dykan, 2020: *1* — 2589-313 (holotype), adult, female, LV, external, ×100, sample D87-12, int. 0-30 cm, Recent; *2* — 2589-312 (paratype), adult, female, RV, external, ×100, sample D87-12, int. 0-30 cm, Recent; *3* — 2589-314 (paratype), adult, female, RV, internal, ×100, sample D87-12, int. 0-30 cm, Recent; *3a* — hinge, RV, ×1000; *3b* — details of hinge, ×2700. **Bythocypris cronini Dykan, 2020:** *4* — 2589-286 (holotype), adult, female, carapace, RV, external, ×110; sample D87-15, int. 28-30 cm, Recent; *5* — 2589-289 (paratype), adult, female, LV, external, ×100, sample D87-3, int. 47-49 cm, Holocene; *6* — 2589-295 (paratype), adult, female, RV, external, ×120, sample D87-15, int. 76-80 cm, Holocene

246 m water depth, sandy. Western part of the Sargasso Sea, shelf and continental slope, 220-1070 m water depth; Florida Straits (Cronin, 1983).

Zoogeography. West Atlantic species. Recent area: western part of the Sargasso Sea (Cronin, 1983); southwestern part of the Tyrrhenian Sea (Dykan, 2018, 2020).

Bythocypris cronini Dykan, 2020

Fig. 2, photo 4, 5, 6; Fig. 3, photo 1, 2, 3, 4, 5, 6, 7, 8

Bythocypris cronini sp. nov.: Dykan, 2020, S. 27-28, tab. 5, figs. 1-8; tab. 6, figs. 1-3.
Bythocypris cf. *B. affinis*: Cronin, 1983, Pl. II, E, G.

Etymology. Named after Dr. Thomas Cronin, in recognition of his contribution to the study of marine ostracods.

Type series. 2589-286 (holotype), Fig. 3, photo 4, female, C, RV, southwestern deep-water depression of the Tyrrhenian Sea, sample D87-15, lat. 37°53' N, long. 8°11' E, 2670 m water depth, int. 28-30 cm, silt, Recent; 2589-289 (paratype), female, LV; 2589-295 (paratype), female, RV; 2589-251 (paratype), female, LV; 2589-296 (paratype), female, RV; 2589-287 (paratype), C, J/VII, RV; 2589-297 (paratype), J/V-VI, LV; 2589-255 (paratype), J/V-VI, RV; 2589-298(paratype), J/IV, LV; 2589-253 (paratype), J/III, LV; 2589-267 (paratype), J/III LV.

Diagnosis. Anterior end high, strongly sloping antero-dorsally. Surface smooth.

Description. Carapace asymmetric (RV irregular suboval, LV close to subtriangular), LV much larger than RV. Overlap around entire margin of

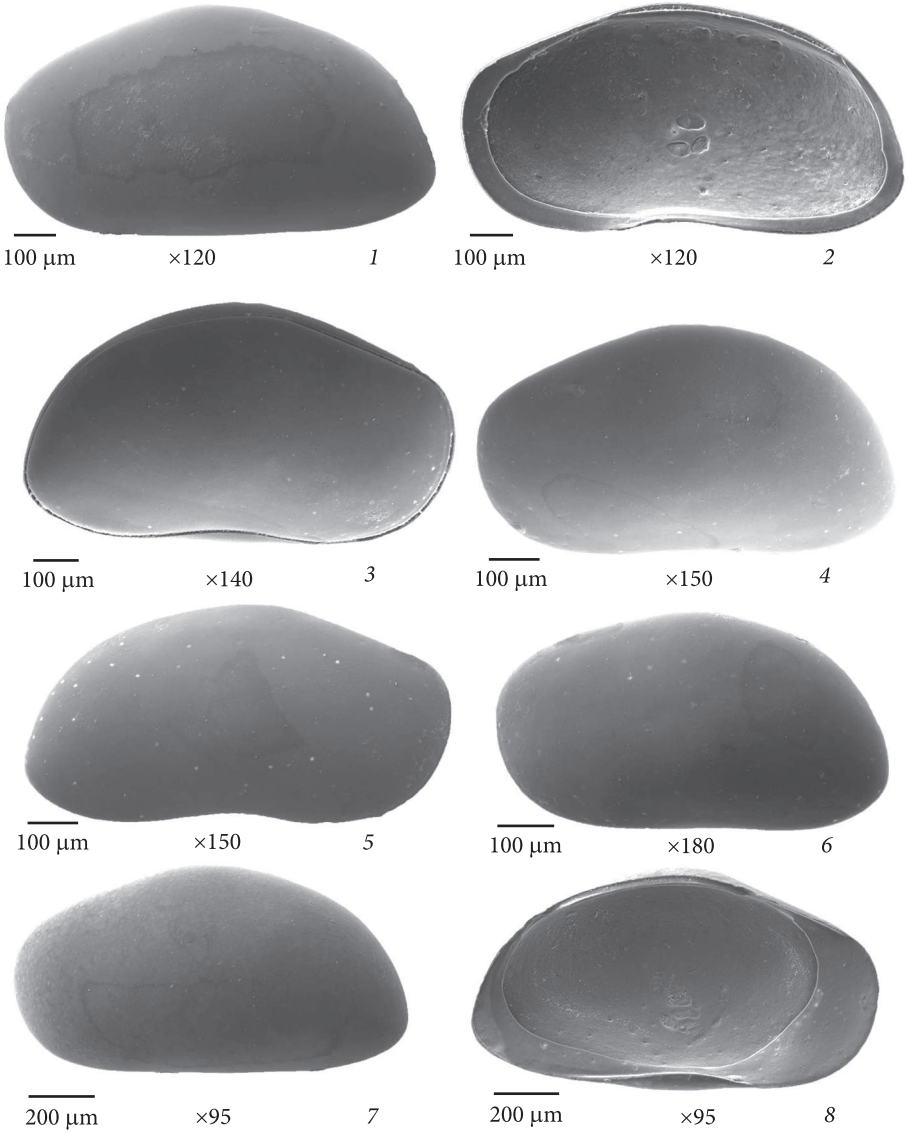

Fig. 3. SEM photographs of the shell of ostracods: Bythocypris cronini Dykan, 2020: *1* — 2589-251 (paratype), adult, female, LV, external, ×120, sample D87-25, int. 70-74 cm, Holocene; *2* — 2589-296 (paratype), adult, female, RV, internal, ×120, sample D87-15, int. 76-80 cm, Holocene; *3* — 2589-287 (paratype), carapace, J/VII stage, RV, external, ×140, sample D87-15, int. 28-30 cm, Recent; *4* —2589-297 (paratype), J/V-VI stage, LV, external, ×150, sample D87-15, int. 76-80 cm, Holocene; *5* — 2589-255 (paratype), J/V-VI stage, RV, external, ×150, sample D87-25, int. 60-64 cm, Holocene; *6* — 2589-298 (paratype), J/IV, LV, external, ×180, sample D87-15, int. 76-80 cm, Holocene; *7* — 2589–253 (paratype), J/III, LV, external, ×95, sample D87-25, int. 60-64 cm, Holocene; 8 — 2589-267 (paratype), J/III, LV, internal, ×95, sample D87-3, int. 19-22 cm, Recent

the valve, maximum overlap on dorsal and ventral parts. Large (L = 1.0-1.19 mm), moderately elongated (LV, L/H = 1.71-1.85; RV, L/H = 1.92-1.98). Maximum convexity partly offset to anterior end in RV. Maximum height in middle of the valve. Dorsal margin slightly convex in RV, has shape of significantly convex obtuse angle in LV. Ventral margin straight in LV, slightly convex in RV. Anterior end high, straight anterodorsally, widely rounded above longitudinal axis. Posterior end low, narrowly rounded below the longitudinal axis. Surface smooth. Duplicature narrow (1/20 length of the valve). Muscle scars clear in internal view. Duplicature wide in anterior end (1/6 length of the valve) in juvenile of III stage.

Dimensions. 2589-286 (holotype), female, RV: L = 1.06 mm, H = 0.54 mm, L/H = 1.96, LV: L = = 1.08 mm, H = 0.63 mm, L/H = 1.71; 2589-289 (paratype), female, LV, L = 1.12 mm, H = 0.65 mm, L/H = 1.73; 2589-295 (paratype), female, RV, L = = 1.0 mm, H = 0.52 mm, L/H = 1.92; 2589-251 (paratype), female, LV, L = 1.0 mm, H = 0.54 mm, L/H = 1.85; 2589-296 (paratype), female, RV, L = 1.01 mm, H = 0.52 mm, L/H = 1.94; 2589-266 (paratype), female, LV, L = 1.19 mm, H = 0.68 mm, L/H = 1.75; 2589-287 (paratype), C, juvenile/VII stage, RV: L = 0.85 mm, H = 0.43 mm, L/H = 1.98; LV: L = 0.88 mm, H = 0.49 mm, L/H = 1.8; 2589-297 (paratype), juvenile/V-VI, LV, L = 0.81 mm, H = 0.45 mm, L/H = 1.8; 2589-255 (paratype), juvenile/V-VI, RV, L = 0.80 mm, H = 0.41 mm, L/H = 1.95; 2589-290 (paratype), juvenile/V-VI, LV, L = 0.80 mm, H = 0.43 mm, L/H = 1.86; 2589-298 (paratype), juvenile/IV, LV, L = 0.63 mm, H =

= 0.36 mm, L/H = 1.75; 2589-288 (paratype), juvenile/IV, LV, L = 0.63 mm, H = 0.36 mm, L/H = = 1.75; 2589-288 (paratype), juvenile/IV, LV, L = = 0.63 mm, H = 0.36 mm, L/H = 1.75; 2589-253 (paratype), juvenile/III, LV, L = 0.61 mm, H = 0.32 mm, L/H = 1.91; 2589-267 (paratype), J/III, LV, L = 0.61 mm, H = 0.34 mm, L/H = 1.79

Variability. Manifested in shape of anterior end (slightly concave, straight anterodorsally), degree of convexity of dorsal end (from strongly to slightly convex) in LV.

Comparison. *Bythocypris cronini* Dyk. differs from *Bythocypris affinis* (Brady, 1886) (Yasuhara et al., 2009, p. 884, Pl. 2, figs. 1-4, Recent, Sargasso Sea) in subtriangular shape in LV.

Locality. Upper Pleistocene: southwestern part of the Tyrrhenian Sea, 1290 m water depth, sample D87-25, int. 130-134 cm, int. 140-144 cm; 2670 m water depth, sample D87-15, int. 96-100 cm. Holocene: southwestern part of the Tyrrhenian Sea, 1290 m water depth, sample D87-25, int. 60-0.64 cm, int. 70-74 cm; depth 2295 m, sample Д87-3, int. 47-49 cm; depth 2670 м, sample Д87-15, int. 76-80 cm. Recent: southwestern part of the Tyrrhenian Sea, depth 1290 m, sample Д87-25, int. 10-14 cm, int. 20-24 cm; depth 2295 m, sample Д87-3, int. 19-22 cm; depth 2670 m, sample Д87-15, int. 28-30 cm.

Stratigraphical position. Upper Pleistocene, Holocene, Recent: southwestern part of the Tyrrhenian Sea, Sargasso Sea (Peninsula Florida) (Cronin, 1983).

Biostratigraphy. *Bythocypris cronini* Dykan belongs to Pleistocene species group. Its lower stratigraphic boundary (appearance) is Upper Pleistocene in the Mediterranean Sea.

Geographical distribution. Central-western part of the Atlantic Ocean (Sargasso Sea), Mediterranean basin (Tyrrhenian Sea).

Habitat conditions. Marine deep-sea species, pelophilic. Tyrrhenian Sea, continental slope, 1290 m water depth; deep-water depression, 2295-2670 m water depth, silt. Western part of the Sargasso Sea, mainland slope, 347-1034 m water depth; Florida Straits (Cronin, 1983). Close species of *Bythocypris affinis* (Brady, 1886) has been described from the northwestern part of the Atlantic Ocean, Carolina Slope in 1798 m water depth (Upper Pleistocene, Holocene) (Cronin, 1983).

Zoogeography. Mediterranean species. Late Pleistocene-Holocene, Recent area: southwestern part of the Tyrrhenian Sea; mosaic area in the western part of the Sargasso Sea (shelf and continental slope, Florida Straits) (Cronin, 1983).

Bythocypris tireniensis Dykan, 2020

Fig. 4, photo 1, 2, 3, 4, 5, 6

Bythocypris tireniensis sp.nov.: Dykan, 2020, S. 29-30, tab. 6, figs. 4-8.

Etymology. After geographical name of the Tyrrhenian Sea.

Type series. 2589-347 (holotype), Fig. 5, photo 1, female, LV, southwestern deep-water depression of the Tyrrhenian Sea, sample D87-7, lat. 37°00' N, long. 12°57' E, 3250 m water depth, int. 129-133 cm, silt, Upper Pleistocene; 2589-351 (paratype), male, LV; 2589-348 (paratype), male, RV; 2589-349 (paratype), male, RV; 2589-346 (paratype), J/last stages, C; 2589-350 (paratype), J/last stages, C.

Diagnosis. Maximum height in anterior third. Dorsal and ventral margins almost parallel. Surface smooth with rare normal pores.

Description. Carapace suboval (female), irregular suboval (male), equivalve. Large (L = 1.05-1.13 mm), from moderately elongate to elongate (L/H = 1.83-2.09). Slightly convex, maximum convexity in median part. Maximum height in anterior third. Dorsal and ventral margins almost parallel. Dorsal margin straight, short, slightly inclined to posterior end; anteriodorsal angle obtuse rounded (male). Dorsal margin slightly convex, widely concave anterodorsally (female). Anterior end high, widely rounded. Posterior end evenly rounded in lower half of the valve. Ventral margin slightly concave. Surface smooth with rare normal pores. Osculum of normal pores rounded, deepened, without rim. Duplicature wide (1/5-1/10 length of the valve). Hinge rectodont, left-bared, with groove and internal high bar in RV. Muscle scars clear in internal view. Carapace of last stages juvenile inequivalve, RV much larger than LV, overlap around dorsal, anterior, ventral margins, maximum overlap on dorsal margin.

Dimensions. 2589-347 (holotype), female, LV: L = = 1.24 mm, H = 0.75 mm, L/H = 1.65; 2589-351 (paratype), male, LV: L = 1.11 mm, H = 0.59 mm, L/H = 1.88; 2589-348 (paratype), male, RV: L = = 1.13 mm, H = 0.60 mm, L/H = 1.83; 2589-349 (paratype), male, RV, L = 1.11 mm, H = 0.53 mm, L/H = 1.09; 2589-346 (paratype), J/last stages: RV, L = 0.87 mm, H = 0.48 mm, L/H = 1.80; LV, L = = 0.89 mm, H = 0.54 mm, L/H = 1.65; 2589-350

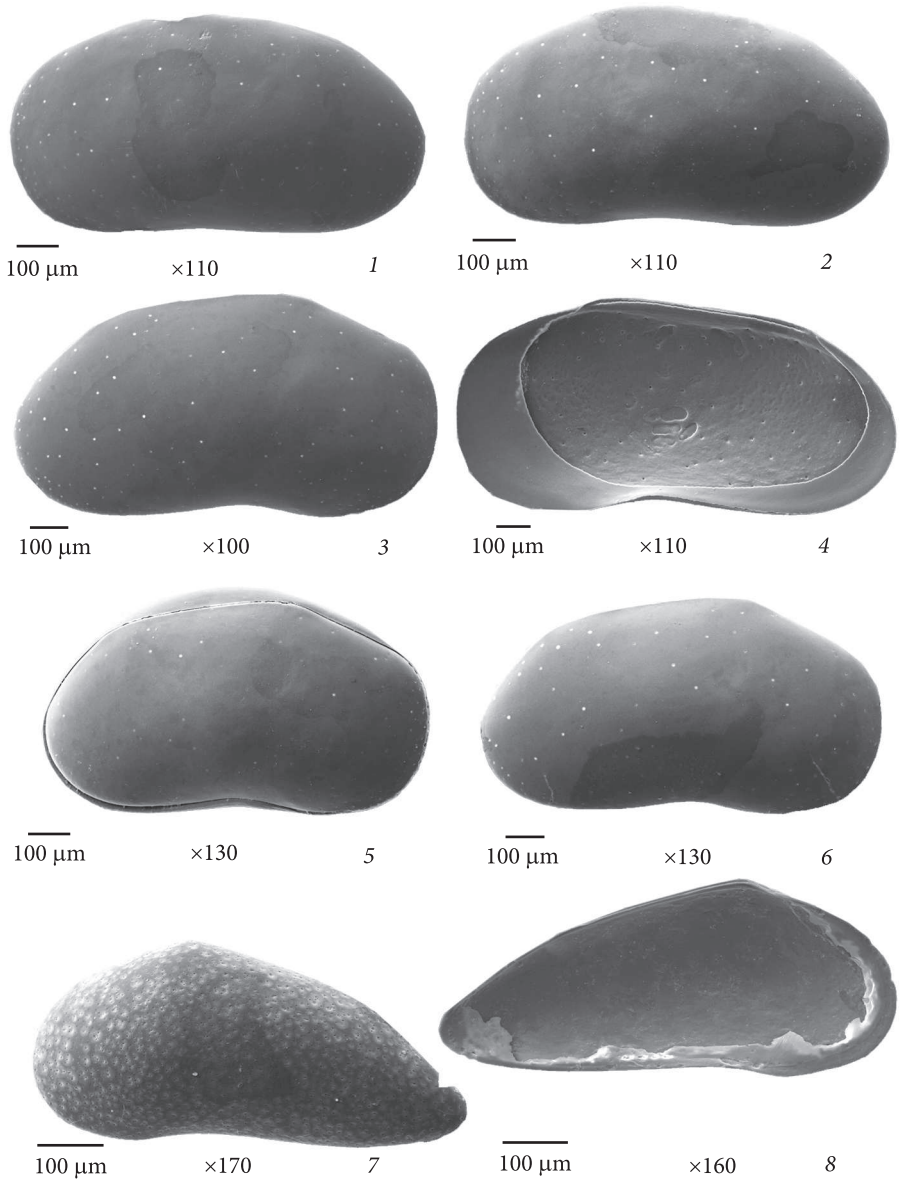

Fig. 4. SEM photographs of the shell of ostracods: Bythocypris tireniensis Dykan, 2020: *1* — 2589-347 (holotype), adult, female, LV, external, ×110, sample D87-7, int. 129-133 cm, Upper Pleistocene; *2* — 2589-351 (paratype), adult, male, LV, external, ×110, sample D87-7, int. 155-163 cm, Upper Pleistocene; *3* — 2589-348 (paratype), adult, male, RV, external, ×100, sample D87-7, int. 155-165 cm, Upper Pleistocene; *4* — 2589-349 (paratype), adult, male, RV, internal, ×110, sample D87-7, int. 155-165 cm, Upper Pleistocene; *5* — 2589-346 (paratype), J/last stages, C, ×130, sample D87-7, int. 155-165 cm, Upper Pleistocene; *6* — 2589-350 (paratype), J/last stages, RV, ×130, sample D87-7, int. 155-165 cm, Upper Pleistocene. **Pontocypris maddockae Dykan, 2020:** *7* — 2589-244 (holotype), adult, LV, external, ×170, sample D87-24, int. 0-40 cm, Recent; *8* — 2589-282 (paratype), adult, LV, internal, ×160, sample D87-28, int. 0-30 cm, Recent

(paratype), J/last stages, RV, L = 0.88 mm, H = = 0.47 mm, L/H = 1.87.

Sexual dimorphism. Manifested in shape of carapace (suboval in female, irregular suboval in male), absolute size of carapace (females, L = 1.05 mm, smaller than males, L = 1.11-1.13 mm), degree of elongation (in female, L/H = 1.84, less than male, L/H = 1.83-2.09), shape of dorsal margin (short straight in male, slightly convex in female).

Comparison. *Bythocypris tireniensis* Dykan, 2020 differs from *Bythocypris affinis* (Brady, 1886) (Yasuhara et al., 2009, p. 884, Pl. 2, figs. 1-4; Upper Pleistocene, Holocene; North Atlantic) in higher posterior end, rounded anterior end anterioventrally.

Locality. Upper Pleistocene: southwestern part of the Tyrrhenian Sea, 3250 m water depth, sample D87-7, int. 129-133 cm, 155-165 cm.

Stratigraphical position. Upper Pleistocene: southwestern part of the Tyrrhenian Sea.

Biostratigraphy. *Bythocypris tireniensis* Dykan belongs to the Pleistocene species group. Its lower stratigraphic boundary (appearance) is the Upper Pleistocene in the Mediterranean Sea.

Geographical distribution. Mediterranean basin (Tyrrhenian Sea).

Palaeoecology. Marine species, pelophilic. It existed in biotopes of the deep-water depression of the Tyrrhenian Sea, at 3250 m water depth, on silt in the Late Pleistocene.

Zoogeography. Mediterranean species. Late Pleistocene, primary area: southwestern part of the Tyrrhenian Sea).

Suborder Cypridocopina Baird, 1850
Superfamily Pontocypridoidea G.W. Müller, 1894
Family Pontocyprididae G.W. Müller,1894

Genus *Pontocypris* Sars, 1866

***Pontocypris maddockae* Dykan, 2020**

Fig. 4, photo 7, 8

Pontocypris maddockae sp. nov.: Dykan, 2020, S. 30-31, tab. 10, figs. 1-2;
Pontocypris sp. 5: Maddocks, 1969, Fig. 32, D.

Etymology. Named after the ostracod researcher Rosalie F. Maddocks.

Type series. 2589-244 (holotype), Fig. 5, photo 7, LV, southwestern continental slope of the Tyrrhenian Sea, sample D87-24, lat. 36°52' N, long. 12°42' E, 418 m water depth, int. 0-40 cm, silt, Recent; 2589-282 (paratype), LV; 2589-301 (paratype), LV; 2589-278 (paratype), LV.

Diagnosis. Dorsal margin high, with obtuse clear angle at the top, straight anterodorsally and posterodorsally. Posterior end narrowly low rounded, widely concave postero-dorsally. Surface small-pitted.

Description. Carapace irregular subtriangular, medium-size (L = 0.68-0.72 mm), elongate (L/H = = 2.12-2.32), slightly convex. Maximum height in anterior third. Maximum convexity in median part. Dorsal margin high, with obtuse clear angle at the top, straight anterodorsally and posterodorsally. Ventral margin widely concave in anterior third. Anterior end higher than posterior, wide and smoothly rounded. Posterior end low and narrowly rounded, widely convex posterodorsally. Surface small-pitted with abundant normal pores canals. Normal pores clear, numerous, small; long sensory setae fragmentary. Hinge rectodont, left-bared with hinge ears. Muscle scars are poorly visible.

Dimensions. 2589-244 (holotype), LV: L = 0.69 mm, H = 0.32 mm, L/H = 2.16; 2589-282 (paratype), LV: L = 0.72 mm, H = 0.31 mm, L/H = 2.32; 2589-301 (paratype), LV: L = 0.68 mm, H = 0.31 mm, L/H = 2.12; 2589-278 (paratype), LV: L = 0.68 mm, H = 0.31 mm, L/H = 2.19.

Comparison. *Pontocypris maddockae* Dykan, 2020 differs from *Pontocypris* aff. *frequens* (G.W. Müller, 1894) (Barbeito-Gonzàlez, 1971, S. 268, Taf. VI, Abb. 1-3 c; L = 1.16 mm, H = 0.49 mm, L/H = 2.36; Recent, Aegean Sea) in smaller size, wide concavity in postero-dorsal part, numerous surface pore canals, shape and narrower duplicature. *Pontocypris maddockae* differs from *Propontocypris intermedia* (Brady, 1868) (Shornikov, 1969, p. 172, table IV, 2, L = 0.67 mm, Recent, Black Sea, Mediterranean Sea; Mostafawi, 2003, p. 71, fig. 49, L = 0.61 mm, L/H = 2.1, Recent, Arabian Sea, South China Sea) in shape of dorsal margin, the location of maximum height, greater concavity of ventral margin.

Locality. Upper Pleistocene: southwestern part of the Tyrrhenian Sea, 418 m water depth, sample D87-24, int. 90-94 cm, 100-104 cm. Recent: southwestern part of the Tyrrhenian Sea, 181 m water depth, sample D87-28, int. 00-30 cm; 418 m water depth, sample D87-24, int. 00-40 m.

Stratigraphical position. Upper Pleistocene: southwestern part of the Tyrrhenian Sea. Recent**:** Indian Ocean (Maddocks, 1969), southwestern part of the Tyrrhenian Sea.

Biostratigraphy. *Pontocypris maddockae* Dykan belongs to the Pleistocene species group. Its lower stratigraphic boundary (appearance) is Upper Pleistocene in the Mediterranean Sea.

Geographical distribution. Mediterranean basin (Tyrrhenian Sea), Indian Ocean.

Habitat conditions. Marine species, pelophilic. Tyrrhenian Sea, shelf, 181 m water depth, silt; continental slope, 418 m water depth, mud.

Zoogeography. Mediterranean species. Recent mosaic area: the Indian Ocean (Maddocks, 1969), southwestern part of the Tyrrhenian Sea.

Genus *Argilloecia* G.O. Sars, 1866

***Argilloecia* sp. 1**

Fig. 5, photo 1

Argilloecia sp. 1: Dykan, 2020, S. 31-32, tab. 2, fig. 7.

Comparison. *Argilloecia* sp. 1 differs from *Argilloecia* sp. figures by Cronin (1983: Pl. 7, G, I, RV, Upper Pleistocene, Atlantic Ocean, Peninsula Florida) in smaller height and shape (narrower, more elongate, without inflection posterodorsally) of posterior end. *Argilloecia* sp. 1 differs from *Argilloecia* sp. Documented by Mostafawi (2003: p. 71, fig. 50, LV, L = 0.47 mm, L/H = 2.61, Recent, Persian Gulf, Arabian Sea) in shape of dorsal end (low, slightly convex, more elongate, sloping posteroventrally), larger size and elongation degree of the valve. *Argilloecia* sp. 1 differs from *Argillo-*

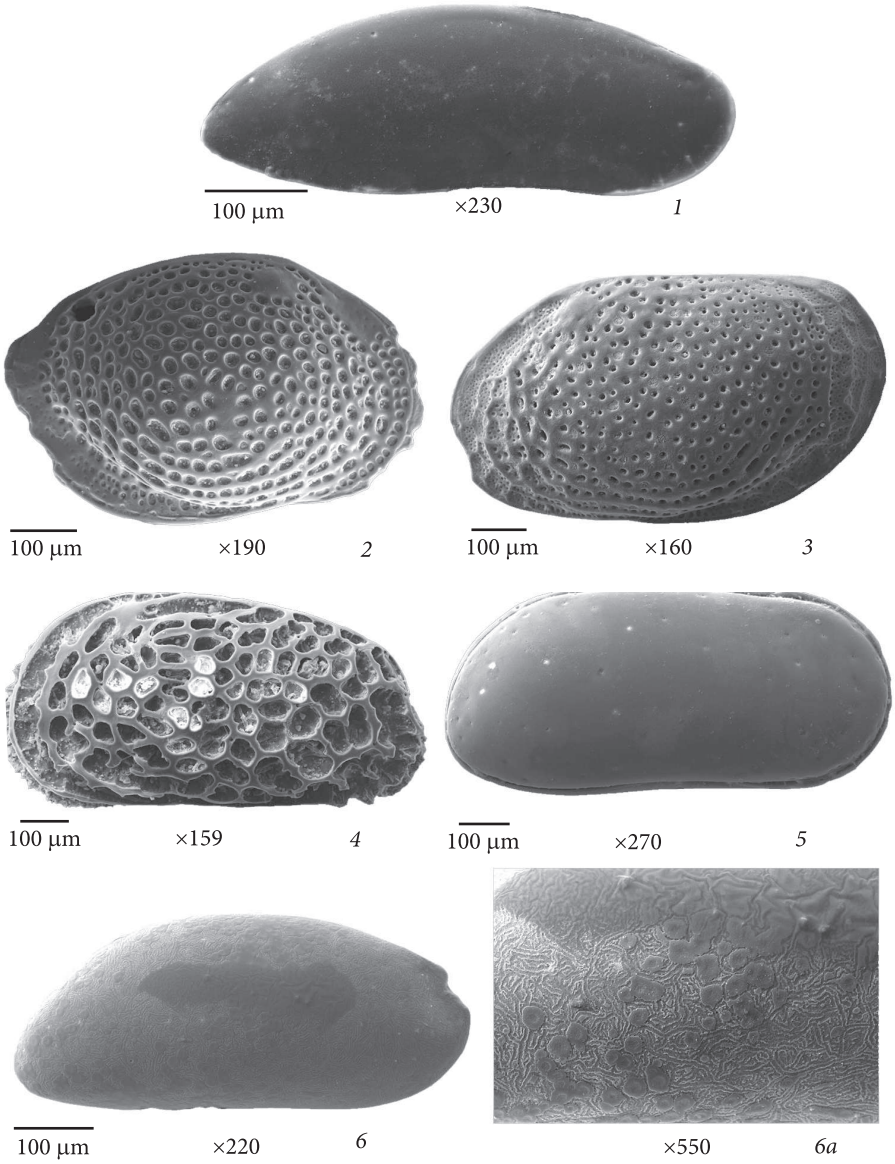

Fig. 5. SEM photographs of the shell of ostracods: Argilloecia sp.: *1* — 2589-389, adult, RV, external, ×230, sample D87-24, int. 70-74 cm, Upper Pleistocene. **Loxoconcha cf. rhomboidea (Fischer, 1855):** *2* — 2589-373, adult, RV, external, ×190, sample D87-96, int. 0-30 cm, Recent. **Loxoconcha sp.:** *3* — 2589-379, adult, LV, external, ×160, sample D87-10, int. 0-30 cm, Recent; **Baffinicythere ? sp.:** *4* — 2589-380, adult, LV, external, ×150, sample D87-10, int. 0-30 cm, Recent; **Sarsicytheridea cf. S. bradii (Norman, 1865):** *5* — 2589-292, adult, LV, external, ×270, sample D87-24, int. 60-64 cm, Upper Pleistocene; **Pontocytheroma sp.:** *6* — 2589-243, adult, RV, external, ×220, sample D87-24, int. 110-104 cm, Upper Pleistocene; *6a* — detail of finely patterned surface with normal pores, ×550

ecia acuminata (Praktycheskoe rukovodstvo, 1989, s. 93, tabl. III, fig. 50, Recent, Mediterranean Sea; Upper Pleistocene-Holocene, North Atlantic) in shape of dorsal end (low, narrow, with rounded top).

Stratigraphical position. Upper Pleistocene: southwestern part of the Tyrrhenian Sea. The genus *Argilloecia* ranges from Late Cretaceous-Recent.

Biostratigraphy. *Argilloecia* sp. 1 belongs to the Pleistocene species group. Its lower stratigraphic boundary (appearance) is the Upper Pleistocene in the Mediterranean Sea.

Geographical distribution. Mediterranean basin (Tyrrhenian Sea). This representative of the cosmopolitan genus *Argilloecia* occurs in the Arctic Ocean (coast of Norway), western part of the Atlantic Ocean, Indian Ocean (Arabian Sea).

Habitat conditions. Marine species, pelophilic. Tyrrhenian Sea, continental slope, 418 m water depth, silt. Representatives of the genus *Argilloecia*: 40-50 m water depth (Praktycheskoe rukovodstvo, 1989).

Zoogeography. Mediterranean species. Late Pleistocene: southwestern part of the Tyrrhenian Sea.

Suborder Cytherocopina Baird, 1850
Superfamily Cytheroidea Baird, 1850
Family Loxoconchidae Sars, 1925

Genus *Loxoconcha* Sars, 1866

***Loxoconcha* cf. *rhomboidea* (Fischer, 1855)**

Fig. 5, photo 2

Loxoconcha cf. *rhomboidea*: Dykan, 2020, S. 35, tab. 14, fig. 2.

Comparison. *Loxoconcha* cf. *rhomboidea* differs from *Loxoconcha rhomboidea* (Fischer, 1855) (Dykan, 2016, pp. 128-130, tab. 17, figs. 18-23; Black Sea, Pleistocene-Recent; Dykan, 2020, pp. 31-32, tabl. 2, fig. 7, Tyrrhenian Sea, Recent) in lack of overlap on dorsal margin, greater height of anterior margin, well-defined caudal process, wider flattened edge of the shell with uneven margin, pitted surface of visor. *Loxoconcha* cf. *rhomboidea* differs from *Loxoconcha* sp. 2 (Barbeito-Gonzàlez, 1971, Taf. 33, Abb. 1a) in straight dorsal margin, convex form of posterior end posteroventrally, clear pits on surface.

Stratigraphical position. Recent: southwestern part of the Tyrrhenian Sea.

Geographical distribution. Mediterranean basin (Tyrrhenian Sea).

Habitat conditions. Marine species, psammophilic. Tyrrhenian Sea, shelf, 65 m water depth, sand.

Zoogeography. Mediterranean species. Recent area: southwestern part of the Tyrrhenian Sea.

Loxoconcha sp.

Fig. 5, photo 3

Loxoconcha sp.: Dykan, 2020, S. 39, tab. 14, fig. 6.

Comparison. *Loxoconcha* sp. differs from *Loxoconcha* cf. *rhombovalis* Pokorny (Faranda et al., 2007, Fig. 3 (5), Upper Messinian, Italy) in medium-pitted surface, wide visor with a ribbed surface, more developed ribs at anterior and posterior ends. *Loxoconcha* sp. differs from *Loxoconcha* sp. sensu Gliozzi (1999: Pl. I (h), L = 0.53-0.57 mm, L/H = 1.66-1.72; Upper Messinian, Italy) in convex shape of the posterior end posteroventrally, medium-pitted surface in the middle part, presence of a wide flattened edge of the shell.

Stratigraphical position. Recent: southwestern part of the Tyrrhenian Sea.

Geographical distribution. Mediterranean basin (Tyrrhenian Sea).

Habitat conditions. Marine species, psammophilic. Tyrrhenian Sea, continental slope, 455 m water depth, sand.

Zoogeography. Mediterranean species. Recent area: southwestern part of the Tyrrhenian Sea.

Family Hemicytheridae Puri, 1953

Genus *Baffinicythere* Hazel, 1967

***Baffinicythere* ? sp.**

Fig. 5, photo 4

Baffinicythere? sp.: Cronin, 1991, Fig. 14, 5; Dykan, 2020, S. 50-51, tab. 3, fig. 8.

Comparison. *Baffinicythere*? sp. differs from *Baffinicythere*? sp. sensu Cronin (1991: Fig. 14, 5; North Atlantic Ocean, Iceland, Pleistocene) in slightly convex dorsal end, sloping to anterior end; pronounced caudal process.

Remarks. According to the author, consider differences of author's material from the one described by T. Cronin (1991: Fig. 14, 5) are the signs of sexual dimorphism and male.

Stratigraphical position. Pliocene: North Atlantic Ocean (Iceland; Cronin, 1991). Recent: southwestern part of the Tyrrhenian Sea.

Biostratigraphy. Ostracoda biozone *Cythere-Finmarchinella*, Upper Pleistocene (1.55-0.73 Ma), Iceland (Cronin, 1991).

Geographical distribution. Mediterranean basin (Tyrrhenian Sea).

Habitat conditions. Marine species, psammophilic. Tyrrhenian Sea, shelf, 186 m water depth, sand.

Paleoecology. The species existed on the coast of Iceland (North Atlantic Ocean) in marine climate with average summer temperatures between 3 °C and 8 °C and winter temperatures around –1.5 °C in the Pliocene (Cronin, 1991).

Zoogeography. North Atlantic species. Pleistocene, primary area: North Atlantic Ocean (Iceland). Recent: southwestern part of theTyrrhenian Sea.

Family Cytheridеidae Sars, 1925

Genus *Sarsicytheridea* Athersuch, 1982

***Sarsicytheridea* cf. *Sarsicytheridea bradii* (Norman, 1865)**

Fig. 5, photo 5

Sarsicytheridea cf. *S. bradii*: Cronin, 1991, Fig. 15, 1-4; Dykan, 2020, S. 51-52, tab. 3, fig. 7.

Comparison. *Sarsicytheridea* cf. *S. bradii* (Norman, 1865) (Dykan, 2020, S. 51-52, tab. 3, fig. 7, L = 0.43 mm, L/H = 2.05) is similar to that described by T. Cronin a valve of a male (1991, Fig. 15, 1, Pliocene, Iceland; no description and size of the species) in elongated-oval shape of the shell, rounded shape of the anterior end, narrower rounded posterior end in the posteroventral part, smooth surface of the shell; differs by less elongated shell and narrowly rounded posterior end in the posteroventral part. From *Parakrithe dactilomorpha* Ruggieri, 1962 (Dykan, 2020, S. 57-58, tab. 11, fig. 1, L/H = 2.61-2.65; Messinian, Mediterranean

Sea) differs by the shape of the shell, less degree of elongation of the shell, short and wider rounded posterior end.

Sexual dimorphism. Only male present in author's collection. Sexual dimorphism significantly pronounced, manifested in form (carapace elongate suboval in male, irregular suboval in female) and degree of elongation (degree of elongation less in female) (Cronin, 1991).

Stratigraphical position. Pliocene: North Atlantic Ocean (Iceland). Upper Pleistocene: southwestern part of the Tyrrhenian Sea.

Biostratigraphy. *Sarsicytheridea* cf. *S. bradii* belongs to the Pleistocene species group. Its lower stratigraphic boundary (appearance) is the Upper Pleistocene in the Mediterranean Sea. It is part (numerous dominant) of the ostracod biozone Sarsicytheridea-Thaerocythere, which includes the Mactra biozone and the base of the Serripes biozone, which correlates with Middle Pliocene deposits of the Coastal Plain of America (Cronin, 1991).

Geographical distribution. Mediterranean basin (Tyrrhenian Sea).

Paleoecology. Marine species, pelophilic. It existed in the northern part of the North Atlantic in conditions of strong warming (winter water temperature 3-6 °C, summer water temperature 14-20 °C in the Early-Middle Pliocene (3.0-4.5 Ma); it existed in conditions of cooling sea climate with summer and winter water temperature at –8 °C to –9 °C in the Late Pliocene (Cronin, 1991). It lived in biotopes of the mainland slope of the Tyrrhenian Sea at 418 m water depth on silt in the Late Pleistocene.

Zoogeography. North Atlantic species. Pliocene, primary area: North Atlantic (Iceland) (Cronin, 1991). Late Pleistocene, secondary area: southwestern part of the Tyrrhenian Sea.

Family Cytheromatidae Elofson, 1939

Genus *Pontocytheroma* Marinov, 1963

***Pontocytheroma* sp.**

Fig. 5, photo 6, 6a

Pontocytheroma sp.: Dykan, 2020, S. 55-56, tab. 10, fig. 3a, b.

Comparison. *Pontocytheroma* sp. differs from *Pontocytheroma arenaria* Marinov, 1963 (Shornikov, 1969, p. 197, tabl. XXIII, fig. 3; Black Sea, Recent) in larger size of carapace (L = 0.56 mm, Dykan, 2020, Tyrrhenian Sea, Recent; Shornikov, 1969, Black Sea, Recent, L = 0.28-0.31 mm), more sloping posterior end in posteroventral part, subtle patterned surface.

Stratigraphical position. Recent: southwestern part of the Tyrrhenian Sea.

Geographical distribution. Mediterranean basin (Tyrrhenian Sea).

Habitat conditions. Marine species, pelophilic. Tyrrhenian Sea, continental slope, 418 m water depth, silt. The close species *Pontocytheroma arenaria* Marinov occurs in the Black Sea (coasts of Caucasus region, Southern Crimea, Bulgaria), at 10-25 m water depth on silty and silted sands (Shornikov, 1969).

Zoogeography. Mediterranean species. Recent mosaic area: southwestern part of the Tyrrhenian Sea.

Family Trachyleberididae Sylvester-Bradley, 1948

Genus *Pterygocythereis* Blake, 1933

***Pterygocythereis abyssoides* Dykan, 2020**

Fig. 6, photo 1, 2, 3, 4, 5, 5a, 5b

Pterygocythereis abyssoides sp. nov.: Dykan, 2020, S. 72-73, tab. 19, figs. 1-4, 5a, b, c.

Etymology. From "abyssal" (deep-sea).

Type series. 2589-257 (holotype), Fig. 7, photo 1, LV, southwestern continental slope of the Tyrrhenian Sea, sample D87-25, lat. 36°35' N, long. 12°31' E, 1290 m water depth, int. 0-24 cm, silt, Recent; 2589-263 (paratype), LV; 2589-249 (paratype), LV; 2589-258 (paratype), J/last stages, LV; 2589-254 (paratype), J/last stages, LV.

Diagnosis. Surface smooth with spines. Numerous small spines in posterior part, spines of different shapes and sizes in ventral part, spines of different sizes along the entire margin of the valve.

Description. Carapace irregular subrectangular, large (L = 1.05-1.1 mm), moderately elongate (L/H = 1.68-1.78). Maximum height in anterior third. Maximum convexity in posterior third. Wide visor at anterior and posterior ends. Cardinal angles rounded. Anterior cardinal angle well pronounced, posterior cardinal angle slightly pronounced. Dorsal margin slightly convex in posterior half of the valve, slightly concave in anterior third. Ventral margin slightly concave closer to anterior third. Anterior end higher than posterior, gently rounded. Posterior end sloping posterodorsally and posteroventrally, rounded at the level of longitudinal axis. Surface smooth with spines. Numerous small spines on surface of posterior half of the

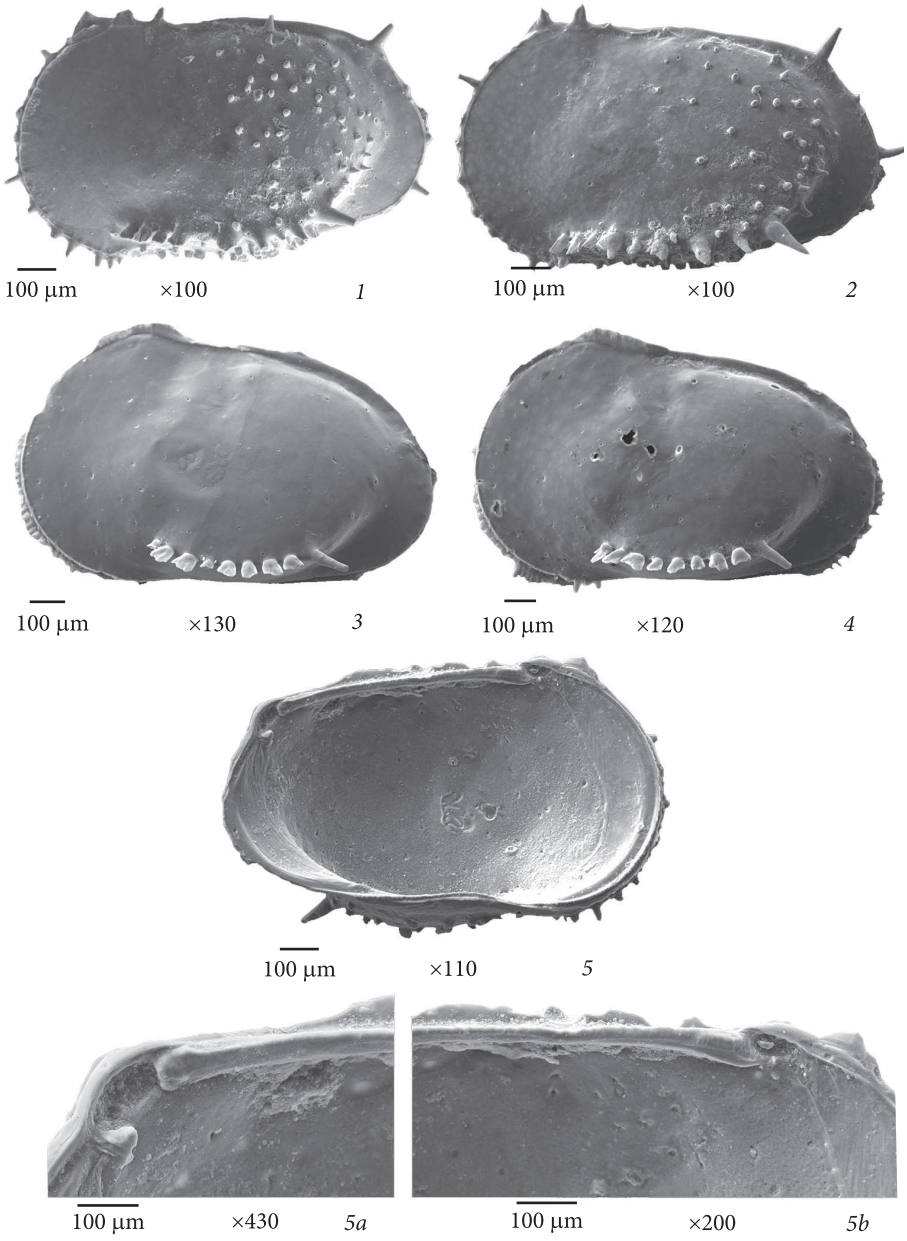

Fig. 6. SEM photographs of the shell of ostracods: Pterygocythereis abyssoides Dykan, 2020: *1* — 2589-257 (holotype), adult, LV, external, ×100, sample D87-25, int. 20-24 cm, Recent; *2* — 2589-249 (paratype), adult, LV, external, ×100, sample D87-24, int. 0-40 cm, Recent; *3* — 2589-258 (paratype), J/last stages, LV, external, ×30,sample D87-25, int. 10-14 cm, Recent; *4* — 2589-254 (paratype), J/last stages, LV, external, ×120, sample D87-25, int. 60-64 cm, Holocene; *5* — 2589-263 (paratype), adult, LV, internal, ×110; *5a* — terminal posterior and middle parts of hinge, ×200; *5b* — terminal anterior part of hinge, ×430, sample D87-25, int. 10-14 cm, Recent

valve. Nine large spines on surface of ventral part (spines size increases to posterior end). Spines of different shapes and sizes (from small to large) along margin of the valve: one to five spines along anterior end, two spines along posterior end, two to three spines along dorsal margin, up to 10 spines along ventral margin. Surface pore canals rare, simple, small, rounded without rim. Hinge holomphidont, left-bared.

Carapace of larvae of late stages widely flattened at anterior and posterior ends. Segmented rim with spines anterodorselly and anteroventrally. Surface smooth. Marginal spines absent. Nine spines on surface of posteroventral part of the valve. Spines of irregular shape, medium size, one large conical spine. Muscle scars distinct.

Dimensions. 2589-257 (holotype), LV, L = 1.09 mm, H = 0.65 mm, L/H = 1.68; 2589-249 (paratype), LV, L = 1.05 mm, H = 0.59 mm, L/H = 1.78; 2589-263 (paratype), LV, L = 1.1 mm, H = 0.65 mm, L/H = 1.69; 2589-258 (paratype), J/last stages, LV, L = 0.85 mm, H = 0.50 mm, L/H = 1.7; 2589-254 (paratype), J/last stages, LV, L = 0.88 mm, H = = 0.56 mm, L/H = 1.57.

Comparison. *Pterygocythereis abyssoides* Dykan, 2020 differs from *Pterygocythereis jonesii* (Baird, 1850) (Dykan, 2020, S. 70-72, tab. 18, figs. 1-4, Recent, Tyrrhenian Sea) in smaller size of the

valve, shape of dorsal margin and maximum convexity; number, shape and size of spines.

Variability. Negligible. Manifested in form of dorsal margin (slightly sloping to posterior end or parallel to ventral margin), degree of marginal spines development in anteroventral part and posterior end (small or large), presence or absence of spines in dorsomedian part.

Locality. Holocene: southwestern part of the Tyrrhenian Sea, 1290 m water depth, sample D87-25, int. 60-64 cm. Recent: southwestern part of the Tyrrhenian Sea, 418 m water depth, sample D87-24, int. 0-40 cm; 1290 m water depth, sample D87-25, int. 10-24 cm.

Stratigraphical position. Holocene-Recent: southwestern part of the Tyrrhenian Sea.

Biostratigraphy. *Pterygocythereis abyssoides* Dykan belongs to the Holocene species group. Its lower stratigraphic boundary (appearance) is Holocene in Mediterranean Sea.

Geographical distribution. Mediterranean basin (Tyrrhenian Sea).

Habitat conditions. Marine species, pelophilic. Tyrrhenian Sea, continental slope, 418 m water depth, silt; 1260 m water depth, silt.

Zoogeography. Mediterranean species. Holocene-Recent, primary area: southwestern part of the Tyrrhenian Sea.

Genus *Bosquetina* Kei, 1957
Bosquetina subpectinata Dykan, 2020

Fig. 7, photo 1, 2, 3, 4

Bosquetina subpectinata sp. nov.: Dykan, 2020, S. 30-31, tab. 23, figs. 1-4.

Type series. 2589-268 (holotype), Fig. 8, photo 1, female, RV, southwestern continental slope of the Tyrrhenian Sea, sample D87-27, lat. 36°23' N, long. 11°57' E, 339.5 m, int. 0-30 cm, sand, Recent; 2589-325, female, LV; 2589-326, male, LV; 2589-369, female, RV.

Diagnosis. Alate extension with three longitudinal ridges on surface in ventromedian part. Surface pitted in median part of the valve.

Description. Carapace irregular rounded subtrapezoid, large (L = 1.16-1.30 mm), moderately elongate (L/H = 1.71-1.83). Maximum height in anterior third. Anterior cardinal angle well pronounced. Carapace slightly convex, flattened at anterior end; with wide flat visor at posterior end. Alate extension with three longitudinal ridges on surface in ventromedian part. Central ridge long (from anterior to posterior part) with five small spines posteroventrally. Marginal spines of different sizes and shapes along anterior and posterior ends. Surface small-medium pitted in median part. Normal pore canals simple, small. Large pores with wide high rim and small rounded osculum near posteroventral rib. Hinge hemiamphidont, right-bared. Anterior tooth high, weakly notched; posterior tooth low, notched into seven parts in RV Adductor muscle scars distinct in internal view. The type of their location is single-row: four scars are large, irregularly oval, curved. There are two frontal muscle scars (large and small) in front and above the adductor muscle group.

Dimensions. 2589-268 (holotype), female, RV, L = 1.20 mm, H = 0.70 mm, L/H = 1.71; 2589-325 (paratype), female, LV, L = 1.30 mm, H = 0.76 mm, L/H = 1.71; 2589-269 (paratype), female, RV, L = = 1.16 mm, H = 0.67 mm, L/H = 1.73; 2589-326 (paratype), male, LV, L = 1.30 mm, H = 0.71 mm, L/H = 1.83; 2589-362 (paratype), RV, L = 1.27 mm, H = 0.70 mm, L/H = 1.81.

Sexual dimorphism. Weakly expressed. Manifested in size of the valve (male, L = 1.27-1.30 mm, larger than female, L = 1.16-1.30 mm), degree of elongation (in male, L/H = 1.81-1.83, more than in female, L/H = 1.71-1.73).

Variability. Manifested in size, shape and orientation of three ridges on alate extension; location and shape of spines on central rib; presence or absence of large pores posteroventrally; number, size and shape of marginal spines.

Comparison. *Bosquetina subpectinata* Dykan, 2020 differs from *Bosquetina pectinata* (Bosquet, 1852) Keij, 1957 (Dykan, 2020, S. 77-79, tab. 22, figs. 1-3, Tyrrhenian Sea, Recent) in larger absolute size, smaller degree of elongation and clear pitted surface in median part of the valve.

Locality. Recent: southwestern part of the Tyrrhenian Sea, 65 m water depth, sample D87-9, int. 0-30 cm; 185.5 m water depth, sample D87-26, int. 0-30 cm; 339.5 m water depth, sample D87-27, int. 0-30 cm.

Stratigraphical position. Recent: southwestern part of the Tyrrhenian Sea.

Geographical distribution. Mediterranean basin (Tyrrhenian Sea).

Habitat conditions. Marine species, psammophilic. Tyrrhenian Sea, shelf, 65 m and 185.5 m water depth, sand; continental slope, 339.5 m water depth, sand.

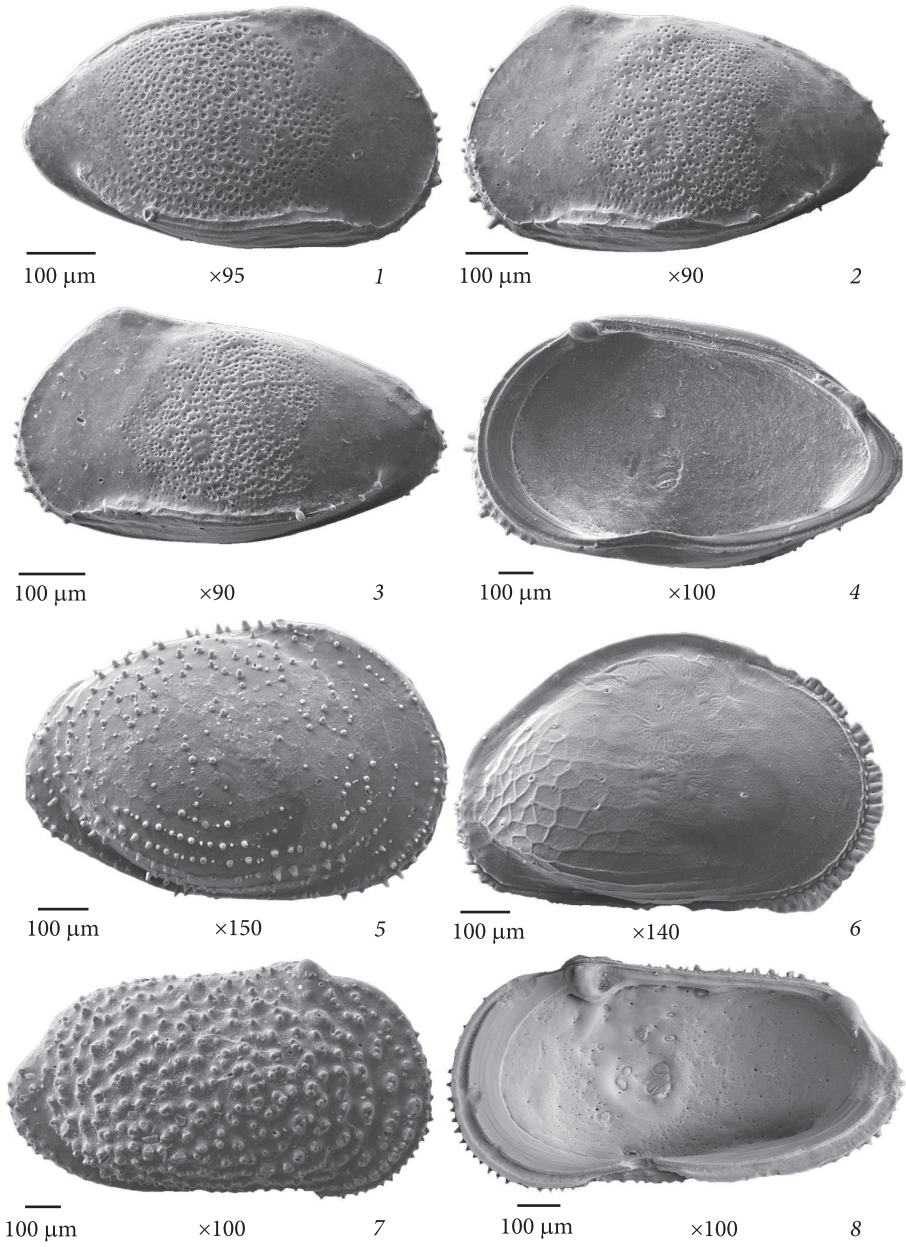

Fig. 7. SEM photographs of the shell of ostracods: Bosquetina subpectinata Dykan, 2020: *1* — 2589-268 (holotype), adult, female, RV, external, ×95, sample D87-27, int. 0-30 cm, Recent; *2* — 2589-325 (paratype), adult, female, LV, external, ×90, sample D87-26, int. 0-30 cm, Recent; *3* — 2589-326 (paratype), adult, male, LV, external, ×90, sample D87-26, int. 0-30 cm, Recent; *4* — 2589-269 (paratype), adult, female, RV, internal, ×100, sample D87-27, int. 0-30 cm, Recent. **Echinocythereis cf. echinata (Sars, 1866):** *5* — 2589-329, adult, RV, external, ×150, sample D87-15, int. 96-100 cm, Upper Pleistocene. **Pseudobosquetina sp.:** *6* — 2589-328, adult, RV, external, ×140, sample D87-15, int. 96-100 cm, Upper Pleistocene**. Echinocythereis ? sp.:** *7* — 2589-352, adult, RV, external, ×100, sample D87-9a, int. 0-30 cm, Recent; *8* — 2589-361, adult, RV, internal, ×100, sample D87-9a, int. 0-30 cm, Recent

Zoogeography. Mediterranean species. Recent area: southwestern part of the Tyrrhenian Sea.

Genus *Acantocythereis* Howe, 1963
Acantocythereis floridus Dykan, 2020

Fig. 8, photo 1, 1a, 1b

Acantocythereis floridus sp. nov.: Dykan, 2020, S. 76-77, tab. 21, figs. 3a, b, c.

Etymology. Referring to the word "flower-like".

Type series. 2589-335 (holotype), Fig. 9, photo 1, LV, southwestern deep-sea depression of the Tyrrhenian Sea, sample D87-15, lat. 37°53' N, long. 8°11' E, 2670 m water depth, int. 96-100 cm, silt, Upper Pleistocene.

Diagnosis. Dorsal margin strongly sloping to posterior end. Posterior end low. Surface smooth. Surface pore canals of complex flower-like and tubular shape.

Description. Carapace irregular subrectangular, medium (L = 0.75 mm), moderately elongate (L/H = 1.90), slightly convex. Maximum height in anterior third. Narrow, smooth, flattened visor at posterior end. Dorsal margin straight, strongly sloping to posterior end. Anterior end high, widely rounded. Posterior end low, narrowly rounded below the longitudinal axis. Eye tubercle distinct. Surface smooth. Normal pore canals of complex shape: flower-like on surface of the valve (three to

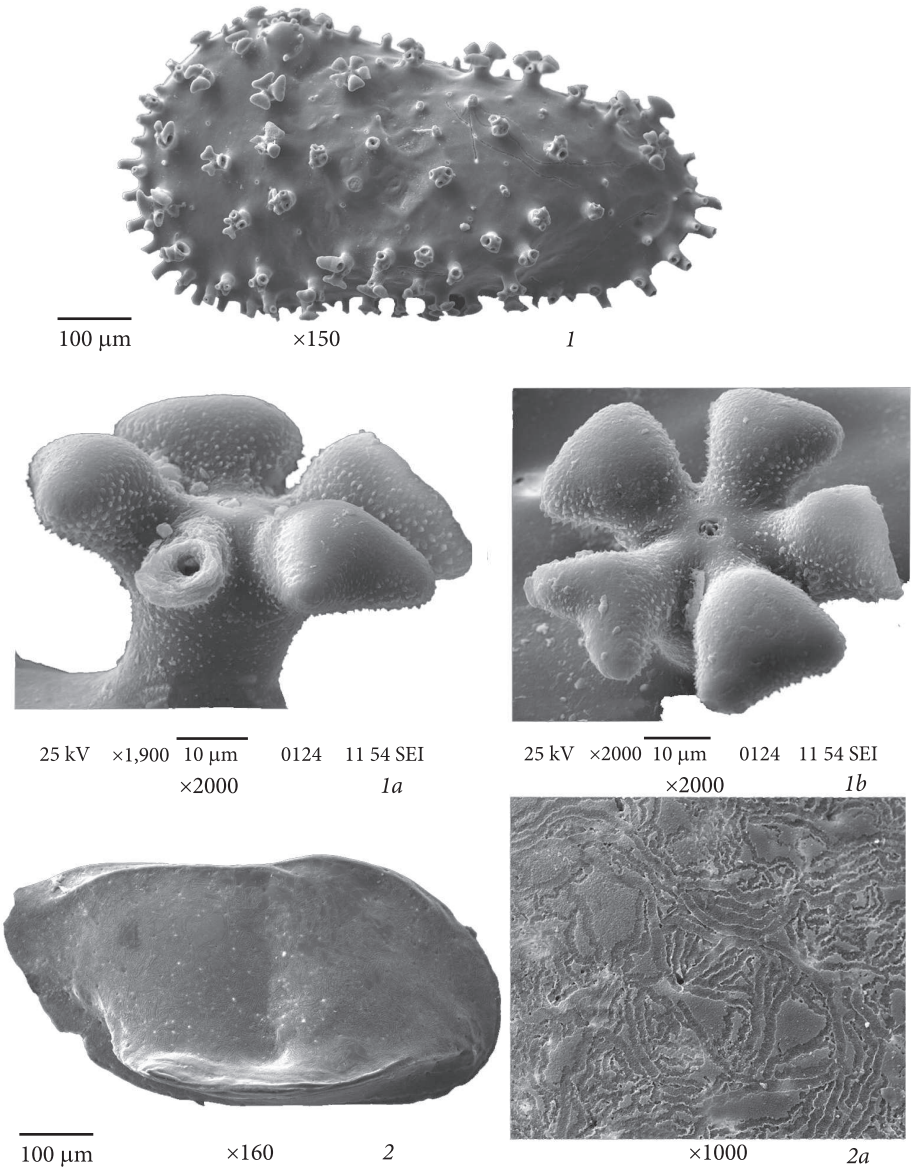

Fig. 8. SEM photographs of the shell of ostracods: Acantocythereis floridus Dykan, 2020: *1* —2589-335, adult, LV, external, ×150; *1a* — flower-shaped pore canal with osculum on "petal" surface, ×2000; *1b* — flower-shaped pore canal with osculum in central part of "flower", ×2000; sample D87-15, int. 96-100 cm, Upper Pleistocene. **Bythoceratina sp.:** *2* — 2589-245, adult, RV, external, ×160, sample D87-24, int. 0-40 mm, Recent; *2a* — fragment of mosaic sculpture on surface of the valve, ×1000

five branched "petals", two to five tubes or their combination); numerous, single, high tubes on entire margin of the valve. Osculum of canals located in central part of "flower", on surface of "petal", on apex of tube; rounded without rim.

Dimensions. 2589-335 (holotype), LV, L = 0.75 mm, H = 0.40 mm, L/H = 1.90.

Comparison. *Acantocythereis floridus* Dykan, 2020 differs from *Acantocythereis histrix* (Reuss, 1850) Sissingh, 1972 (Bonaduce, Russo, 1984, Pl. 4, Fig. 1, Mediterranean Sea, Sardinia, Middle Miocene-Recent; Babinot, Boukli-Hacene, 1998, Pl. 3, Fig. 12, Mediterranean Sea, Algeria, Cape Figalo, Upper Miocene, Messinian) in complex (flower-like, tubular) shape of pore canals, their location on the surface and along the margin of the valve.

Locality. Upper Pleistocene: southwestern part of the Tyrrhenian Sea, 2670 m water depth, sample D87-15, int. 96-100 m.

Stratigraphical position. Upper Pleistocene: southwestern part of the Tyrrhenian Sea.

Biostratigraphy. *Acantocythereis floridus* Dykan belongs to the Pleistocene species group. Its lower stratigraphic boundary (appearance) is the Upper Pleistocene in the Mediterranean Sea. The close species *Acantocythereis histrix* is the index-species of the Middle Miocene (Langhian, only NN4 zone; western part of Mediterranean Sea, Sardinia) (Bonaduce, Russo, 1984).

Geographical distribution. Mediterranean basin (Mediterranean, Tyrrhenian Sea).

Habitat conditions. Marine species, pelophilic.

Tyrrhenian Sea, deep-water depression, 2670 m water depth, silt. Recent species close to *Acantocythereis histrix* exist in the Mediterranean Sea (Sardinia) on fine-grained sand and sandy pelitic muds (high density populations).

Palaeoecology. *Acantocythereis floridus* Dykan existed in biotopes of the deep-water depression at 2670 m water depth on silt (single individuals) in the Late Pleistocene.

Zoogeography. Mediterranean species. Recent area: southwestern part of the Tyrrhenian Sea.

Subfamily Echinocythereidinae Hazel, 1967

Genus *Echinocythereis* Puri, 1954

***Echinocythereis* cf. *echinata* (Sars, 1866)**

Fig. 7, photo 5

Echinocythereis cf. *echinata*: Dykan, 2020, S. 80-81, tab. 23, fig. 5.

Comparison. *Echinocythereis* cf. *echinata* (Sars, 1866) differs from *Echinocythereis echinata* (Brandao, Karanovic, 2015, Fig. 3, A-B; Fig. 4, A-C; Fig. 5, A-F; Fig. 7, A-D; North Atlantic, Late Miocene-Recent) only in details of the tuberous-spiny sculpture. *Echinocythereis* cf. *echinata* (Sars, 1866) differs from the material figures by Zarikian (2009: Pl. 9, Fig. 4, North Atlantic Ocean, Upper Pleistocene) in presence of large spinesin posterodorsal and posteroventral parts.

Stratigraphical position. Upper Pleistocene: southwestern part of the Tyrrhenian Sea. Representatives of the genus *Echinocythereis* are described from Eocene-Recent: Atlantic Ocean (South and North Atlantic, Gulf of Mexico), Pacific Ocean (South China Sea), Southern Ocean, Mediterranean Sea (Brandao, Karanovic, 2015; Zarikian, 2009).

Biostratigraphy. *Echinocythereis* cf. *echinata* (Sars) is a biostratigraphic marker of the Upper Pleistocene in the Tyrrhenian Sea (known only from the Upper Pleistocene).

Geographical distribution. Mediterranean basin (Tyrrhenian Sea).

Habitat conditions. Marine species, pelophilic. Tyrrhenian Sea, deep-water depression, 2670 m water depth, silt. Representatives of the genus *Echinocythereis* Puri are most common in cold waters belonging to the eurybathic, shallow part of the shelf (Gulf of Mexico); 55-91 m water depth (Norwegian coast) — 550 m water depth (Lofoten Islands, Norway) (Brandao, Karanovic, 2015).

Zoogeography. Mediterranean species. Upper Pleistocene, primary area: southwestern part of the Tyrrhenian Sea.

***Echinocythereis* ? sp.**

Fig. 7, photo 7, 8

Echinocythereis ? sp.: Dykan, 2020, S. 82, tab. 23, fig. 6-7.

Stratigraphical position. Recent: southwestern part of the Tyrrhenian Sea.

Geographical distribution. Mediterranean basin (Tyrrhenian Sea).

Habitat conditions. Marine deep-sea species, pelophilic. Tyrrhenian Sea, shelf, 65 m water depth, sand.

Zoogeography. Mediterranean species. Recent area: southwestern part of the Tyrrhenian Sea.

Genus *Pseudobosquetina* Guernet & Moullade, 1994

***Pseudobosquetina* sp.**

Fig. 7, photo 6

Pseudobosquetina sp.: Dykan, 2020, S. 85-86, tab. 18, fig. 5.

Pseudobosquetina: Brandão, 2016, http://www.marinespecies.org/ostracoda/photogallery.php?album=5225&pic=117500

Stratigraphical position. Upper Pleistocene: southwestern part of the Tyrrhenian Sea.

Biostratigraphy. *Pseudobosquetina* sp. belongs to Pleistocene species group. Its lower stratigraphic boundary (appearance) is Upper Pleistocene in the Mediterranean Sea. *Pseudobosquetina* sp. is a biostratigraphic marker of Upper Pleistocene deposits in the Tyrrhenian Sea.

Geographical distribution. Southern Ocean, Mediterranean basin (Tyrrhenian Sea).

Palaeoecology. Marine species, pelophilic. It existed in biotopes of the deep-water depression of the Tyrrhenian Sea, at 2670 m water depth, on silts in Late Pleistocene.

Zoogeography. South Antarctic species. Late Pleistocene: southwestern part of the Tyrrhenian Sea. Recent mosaic area: Southern Ocean (http://www.marinespecies.org/ostracoda/photogallery.php?album=5225&pic=117500).

***Genus Paleoblitacythereis* Benson, 1977**

***Paleoblitacythereis* ? sp.**

Fig. 9, photo *1*, *2*, *3*, *3a*, *3b*

Paleoblitacythereis ? sp.: Dykan, 2020, S. 84-85, tab. 24, fig. 5, 6, 7a, b, c.

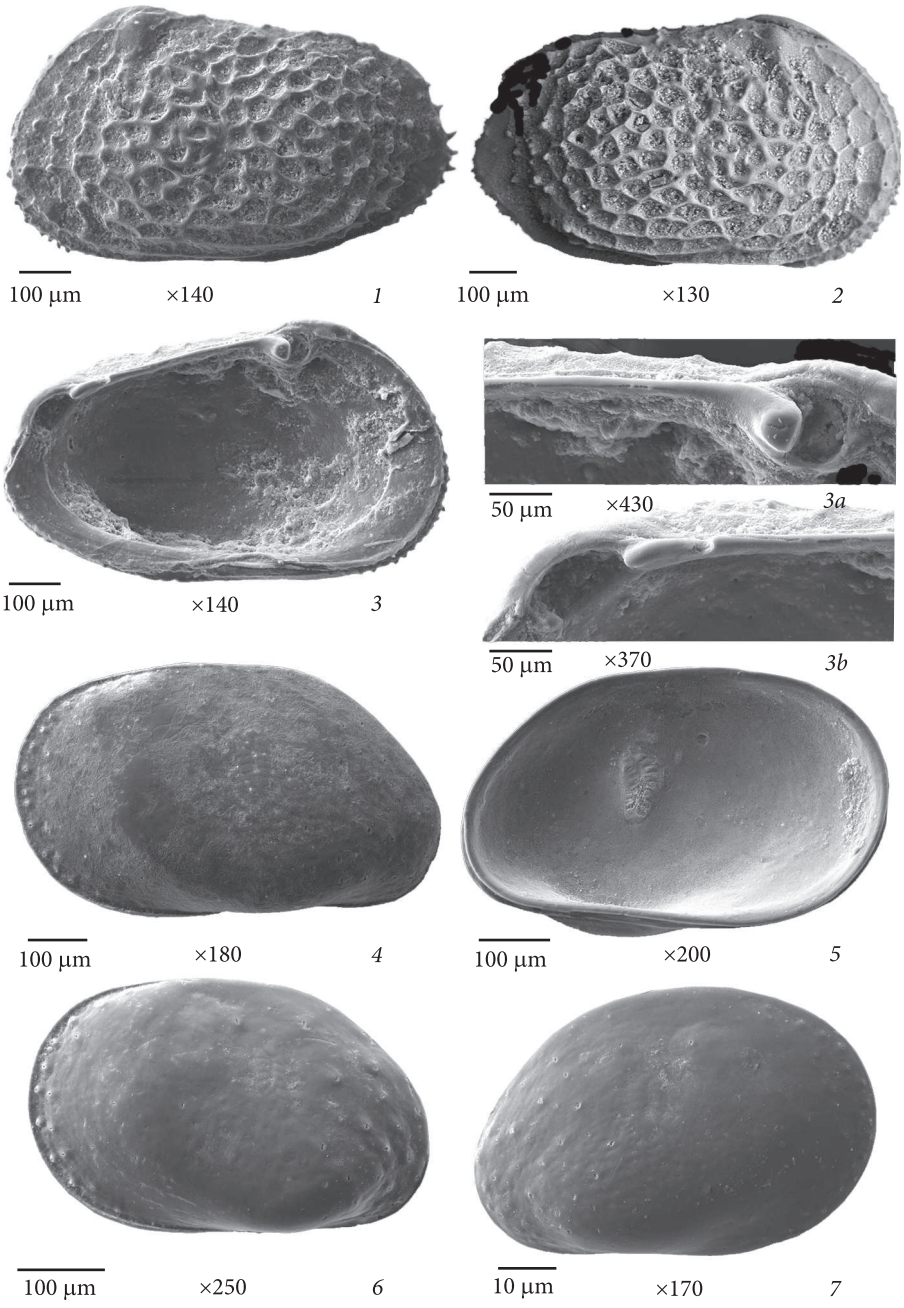

Fig. 9. SEM photographs of the shell of ostracods: Paleoblitacythereis ? sp.: *1* — 2589-303, adult, LV, external, × 140, sample D87-12, int. 0-30 cm, Recent; *2* — 2589-305, adult, RV, external, × 130, sample D87-12, int. 0-30 cm, Recent; *3* — 2589-304, adult, LV, internal, × 140; *3a* — terminal anterior part of hinge, × 430; *3b* — terminal posterior part of hinge, × 370; sample D87-12, int. 0-30 cm, Recent. **Cytherella ovoides Dykan, 2020:** *4* — 2589-338 (holotype), adult, LV, external, × 180, sample D87-25, int. 130-134 cm, Upper Pleistocene; *5* — 2589-339 (paratype), J, LV, internal, × 200, sample D87-25, int. 130-134 cm, Upper Pleistocene; *6* — 2589-345 (paratype), J, LV, external, × 250, sample D87-25, int. 140-144 cm, Upper Pleistocene; *7* — 2589-344 (paratype), adult, RV, external, × 170, sample D87-25, int. 140-144 cm, Upper Pleistocene

Variability. Manifested in carapace size (L = = 0.84-1.14 mm), size and shape of marginal spines.

Comparison. *Paleoblitacythereis* ? sp. differs from representatives of the genus *Paleoblitacythereis* in smaller degree of mesosculpture development. *Paleoblitacythereis* ? sp. differs from *Paleoblitacythereis ruggierii* (Russo) (Bonaduce, Russo, 1984, Pl. 3, figs. 4a, b, c; Mediterranean Sea, Sardinia, Miocene) in slightly pronounced fossae, size and shape of toothlets and spines at anterior and posterior ends, presence of ridges along ventral margin.

Stratigraphical position. Upper Pleistocene: southwestern part of the Tyrrhenian Sea. Representatives of the genus *Paleoblitacythereis* are described from Late Cenozoic deposits of the Atlantic Ocean (North Sea) and the Mediterranean Sea (Benson, 1977).

Biostratigraphy. *Paleoblitacythereis?* sp. belongs to the Pleistocene species group. Its lower stratigraphic boundary (appearance) is the Upper Pleistocene in the Mediterranean Sea. *Paleoblitacythereis?* sp. is a biostratigraphic marker of Upper Pleistocene deposits in the Tyrrhenian Sea.

Geographical distribution. Mediterranean basin (Tyrrhenian Sea).

Palaeoecology. Marine species, pelophilic. It existed in biotopes on continental slope, at 418 m water depth, on silts in the Late Pleistocene

Zoogeography. Mediterranean species. Upper Pleistocene: southwestern part of the Tyrrhenian Sea.

Family Bythocytheridae Sars, 1866

Рід *Bythoceratina* Hornibrook, 1952

***Bythoceratina* sp.**

Fig. 8, photo 2, 2a

Bythoceratina sp.: Dykan, 2020, S. 88-89, tab. 11, fig. 6a, b.

Comparison. *Bythoceratina* sp. differs from *Bythoceratina carinatum* Mostafawi, 1992 (Mostafawi, 1992, S. 265, Taf. VII, Figs. 162-164; L = 0.73-0.79 mm, L/H = 1.79-1.83; South China Sea between Malay Peninsula and Borneo, Recent) in shape of alate extension (wide, short; Dykan, 2020; long, rounded conical; Mostafawi, 1992). *Bythoceratina* sp. differs from *Cytheropteron* sp. (Cronin. 1983, Pl. 8, B; Atlantic Ocean, Florida coast, Upper Pleistocene) in shape of the dorsal and ventral margins, shape and location of caudal process, presence of middle depression and dorsal rib, shape of alate extension, sculpture.

Stratigraphical position. Recent: southwestern part of the Tyrrhenian Sea.

Geographical distribution. Mediterranean basin (Tyrrhenian Sea).

Habitat conditions. Marine species, pelophilic. Tyrrhenian Sea, shelf, 181 m water depth, silt; continental slope, 418 m water depth, silt.

Zoogeography. Mediterranean species. Recent area: southwestern part of the Tyrrhenian Sea.

Subclass Platycopida G.O. Sars, 1866

Order Platycopina G.O. Sars, 1866

Superfamily Cytherelloidea G.O. Sars, 1866

Family Cytherellidae G.O. Sars, 1866

Genus *Cytherella* Jones, 1849

***Cytherella ovoides* Dykan, 2020**

Fig. 9, photo 4, 5, 6, 7

Cytherella russoiforma sp. nov.: Dykan, 2020, S. 96-97, tab. 8, fig. 1-4.

Type series. 2589-338 (holotype), Fig. 10, photo 4, LV, southwestern continental slope of the Tyrrhenian Sea, sample D87-25, lat. 36°35' N, long. 12°31' E, 1290 m water depth, int. 130-134 cm, silt, Upper Pleistocene; 2589-344 (paratype), RV; 2589-345 (paratype), J, LV; 2589-339, J, LV.

Diagnosis. Carapace of asymmetrical shape, unevenly convex. Ventral short fold of maximum convexity, hangs over ventral margin.

Description. Carapace irregularly ovoid (RV) and irregular suboval (LV), medium size (L = 0.66-0.69 mm), short-cut (L/H = 1.47-1.68, degree of elongation greater in LV). Maximum height in middle part. Carapace unevenly convex. Left valve widely flattened in median part; arcuate maximum convexity along anterior and ventral margins, hangs over ventral margin in the posterior third of the valve. Right valve strongly convex in anterior, median and ventral parts, hangs over ventral margin in posterior third of the valve (degree of overhang is less). Dorsal margin convex (RV), short straight (LV). Ventral margin short and slightly concave in posterior third. Anterior end high, widely rounded. Posterior end low, strongly sloping in dorsal part, rounded below longitudinal axis. Wide flat visor along anterior margin in LV. Surface smooth, pustules at anterior and posterior ends contain pore canals. Normal pore canals distinct, simple, small. Muscle scars (two vertical, slightly curved rows of eight to nine scars) distinct in internal view.

Dimensions. 2589-338 (holotype), LV, L = = 0.69 mm, H = 0.41 mm, L/H = 1.68; 2589-344 (paratype), RV, L = 0.66 mm, H = 0.45 mm, L/H = = 1.47; 2589-345 (paratype), J, LV, L = 0.47 mm, H = 0.30 mm, L/H = 1.57; 2589-339 (paratype), J, LV, L = 0.57 mm, H = 0.35 mm, L/H = 1.63.

Comparison. *Cytherella ovoides* Dykan, 2020 differs from right valve species *Cytherella russoi* Sissingh, 1972 (Bonaduce, Russo, 1984, Pl. 2, fig. 2a, b, Mediterranean Sea, Miocene, zone Langhian) in shape of posterior end, location of maximum convexity; shape of normal pore canals, their presence and location at anterior end.

Locality. Upper Pleistocene: southwestern part of the Tyrrhenian Sea, 1290 m water depth, sample D87-25, int. 130-134 cm, 140-144 cm.

Stratigraphical position. Upper Pleistocene: southwestern part of the Tyrrhenian Sea.

Geographical distribution. Mediterranean basin (Tyrrhenian Sea).

Palaeoecology. Marine species, pelophilic. It existed in biotopes of the continental slope of the Tyrrhenian Sea, at 1290 m water depth, silts (single individuals) in the Late Pleistocene.

Zoogeography. Mediterranean species. Upper Pleistocene: southwestern part of the Tyrrhenian Sea.

Acknowledgments. *The author is grateful to Andrey Matoshko for providing necessary geological materials, Dr. Vitaliy Permyakov for photographing the ostracods, Prof. Peter Frenzel and an anonymous reviewer for their helpful comments.*

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Revised 30.12.2021
Received in revised form 22.02.2022
Accepted 26.02.2022

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ЧЕТВЕРТИННІ-РЕЦЕНТНІ ОСТРАКОДИ (PODOCOPIDA, PLATYCOPIDA)
ПІВНІЧНО-ЗАХІДНОЇ ЧАСТИНИ ТІРРЕНСЬКОГО МОРЯ (ІТАЛІЯ)

Подано систематичний опис восьми видів остракод, описаних Н.І. Дикань (2018, 2020), що відносяться до родів *Bythocypris, Pontocypris, Pterygocythereis, Bosquetina, Acantocythereis* та *Cytherella*, 11 видів у відкритій номенклатурі (sp., cf., ex gr.) родів *Argilloecia, Loxoconcha, Sarsicytheridea, Pontocytheroma, Echinocythereis, Paleoblitacythereis* та *Pseudobosquetina, Bythoceratina.* Остракоди описано з верхньочетвертинних, голоценових і сучасних відкладів південно-західної частини Тірренського моря (шельф, материковий схил, глибоководна западина; 65—3500 м). Систематичний опис містить синоніміку, детальний опис, екологію, географічне положення, стратиграфічне поширення. Надано зображення зовнішньої і внутрішньої будови черепашки — замка, поверхневих порових каналів, макро- і мезоскульптури. Розділ «Екологія» містить аналіз даних про поширення остракод латерально та за глибиною (літоральна, батіальна, абісальна зони) відношення до типу субстрату та інші умови існування остракод у північно-західній частині Тірренського моря та океанах. Зоогеографічний аналіз включає реконструкцію сучасних і давніх ареалів остракод у Середземноморській області та океанах з палеогену.

Ключові слова*: остракоди; систематика; Тірренське море; верхній плейстоцен; голоцен; сучасні відклади.*