

A new species of *Gibbula* (Gastropoda: Trochidae) from the Pleistocene of Killini (north-western Peloponnesus, Greece)

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KEY WORDS - *Gastropoda*, *Trochidae*, *Gibbula olympica* n. sp., *Mediterranean Pleistocene*, *Greece*.

ABSTRACT - A new species of the gastropod *Gibbula*, *G. olympica* n. sp., is described from the Pleistocene of Killini, (Elea, north-western Peloponnesus, Greece). Material comes from two sandy-muddy beds (N2 and H6) containing warm-temperate shallow marine mollusc assemblages (mainly trochids, rissoids and ceriths) related to the modern *Posidonia oceanica* (Linnaeus) Delile, 1813 biocenosis (HP). *Gibbula olympica* n. sp. appears particularly similar to *G. spratti* (Forbes, 1844) and *G. nivosa* Adams A., 1851, endemic to the Aegean Sea and the Island of Malta respectively. *G. olympica* n. sp. is also compared with some other congeneric similar species from the Mediterranean area.

RIASSUNTO - [Una nuova specie di *Gibbula* (Gastropoda: Trochidae) dal Pleistocene di Killini (Peloponneso nord-occidentale, Grecia)] - *Gibbula olympica* n. sp. è descritta sulla base di circa 160 esemplari, in buona parte così ben preservati da mostrare l'originaria colorazione. Il materiale proviene da due orizzonti stratigrafici prevalentemente sabbiosi (denominati H6 e N2), esposti lungo il tratto di costa distante circa 500 m dal piccolo villaggio di Killini (Elea, Peloponneso nord-occidentale, Grecia). Tali orizzonti giacciono circa 70 e 20 m sopra un livello pelitico contenente i nannofossili *Gephyrocypris* sp. 3 e *Crenolithus asanoi* (Sato & Takayama, 1992) e, pertanto, essi potrebbero essere attribuiti alla parte superiore del sottopiano Siciliano o, più verosimilmente, al Pleistocene medio-superiore. *G. olympica* n. sp. mostra notevoli affinità con *G. spratti* (Forbes, 1844) e *G. nivosa* Adams A., 1851, specie rispettivamente endemiche del Mar Egeo e dell'Isola di Malta. *G. olympica* n. sp. viene inoltre confrontata con le seguenti specie mediterranee con le quali presenta una certa affinità: le viventi *G. racketti* (Payraudeau, 1826), *G. turbinoides* (Deshayes, 1835) e la pliocenica *G. distefanoi* Crema, 1903. Sulla base del contenuto paleontologico associato alla specie descritta, prevalentemente *Jujubinus* spp. (tra cui la specie termofila *J. ? bullula* (Fischer, 1877), *Alvania* spp., *Bittium* spp. e frequenti resti di *Posidonia*, si ipotizza che la specie visse in una biocenosi riferibile a quella attuale della *Posidonia oceanica* (Linnaeus) Delile, in condizioni climatiche temperato-calde.

INTRODUCTION

In the Mediterranean Sea the trochid gastropod genus *Gibbula* Risso, 1826 ex Leach ms. is a common component of littoral environments especially in algal or phanerogam beds. It is also well represented in the uppermost Tertiary and Quaternary of the Mediterranean area. The richest assemblages are recorded for the Recent time: at least 30 Mediterranean living well-established taxa are recorded (Sabelli et al., 1990); little more than 20 species are recorded for the malacologically rich Pliocene of Tuscany (Chirli, 2004). In this article, which presents the second result of a wider research dealing with the study of the mollusc assemblages coming from the Plio-Pleistocene of the central Mediterranean area (Garilli, 2004), we describe a new species of *Gibbula*, *G. olympica* n. sp., based on specimens collected from the northern part of the sedimentary sequence cropping out along the cliffed coast between Killini (also transliterated from the modern Greek as Kyllene) and Cape Troupito (Elea, NW Peloponnesus, Greece, Fig.1).

MATERIAL EXAMINED

One hundred sixty specimens, covering complete ontogenetic series, of *Gibbula olympica* n. sp. (type material included) come from two sandy-muddy layers, outcropping near the village of Killini. They were obtained by hand-picking or washing six bulk samples, each one of about 15 lt., on a sieves battery (diameter 0.5, 1, 2 mm). As a whole, specimens are very well preserved usually showing the original coloration.

The following comparative material was studied:

Gibbula distefanoi Crema, 1903, one specimen, ex coll. Palazzi, Pliocene of Pietrafitta (Siena, North Italy).

G. nivosa Adams A., 1851, five specimens, ex coll. Lugli, Recent, Isle of Malta.

G. racketti (Payraudeau, 1826), forty-three specimens, ex coll. Garilli, Recent, Capo Gallo, Palermo, NW Sicily; one specimen, same coll., Recent, Marina di Cinisi, Palermo.

G. spratti (Forbes, 1844), eleven specimens, ex coll. Tenekidis, Recent, Aegean Sea, Goulandris National History Museum (GNHM), Kifissia, Athens, Greece;

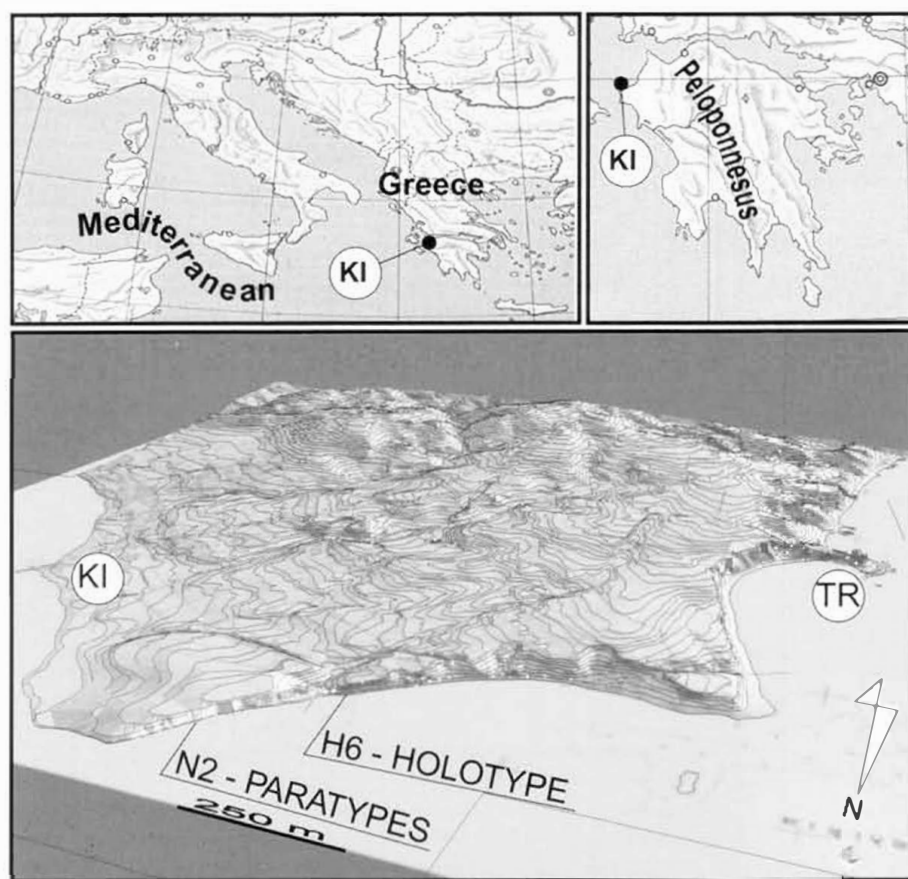


Fig. 1 - Site, type material and H6 and N2 layers locations; KI = Killini; TR = Cape Troupito.

two specimens (GNHM-A 11.62), ex coll. Tenekidis, Isle of Dilos, Aegean Sea (specimen figured by Tenekidis, 1989, fig. 6 as "*Gibbula spratti* var. *alveolata*") and Anavyssos, Saronikos gulf, Aegean Greece (specimen figured by Tenekidis, 1989, fig. 6 as "*Gibbula spratti* typus"); two specimens, ex coll. Delamotte, GNHN, Marpissa, Isle of Paros, Cyclades, Aegean Greece.

G. turbinoides (Deshayes, 1835), ten specimens, ex coll. Garilli, Recent, Capo Gallo, Palermo.

STRATIGRAPHIC AND PALEOECOLOGICAL SETTING

The sequence Killini-Troupito is a part of an anticline structure originated by a diapiric intrusion of Triassic halite and gypsum (Christodoulou, 1969, 1971; Hageman, 1976; Underhill, 1988). It was referred by Hageman (1976) to the upper part of the Vounargon formation. In particular, material comes from two yellow-grey sandy-muddy beds, here named N2 and H6 (Fig. 2), laterally changing in a yellow sand with *Lucinoma boreale* (Linnaeus, 1767) in life position (H6) or in a yellow, almost sterile calcarenite (N2). Both layers, inclined along the cliff plane of about 8-9° northward, are characterized by having a rich shallow marine mollusc assemblage related to the modern *Posidonia oceanica* (Linnaeus) Delile, 1813 biocoenosis (HP, *sensu* Pérès & Picard, 1964), being dominated by

trochids (mainly *Jujubinus* spp.), rissoids (mainly *Alvania* spp.) and ceriths (mainly *Bittium* spp.). With regard to the genus *Gibbula*, the following species were collected from N2 and H6 layers: *G. ardens* (Von Salis, 1793), *G. magus* (Linnaeus, 1758), *G. fanulum* (Gmelin, 1791), and *G. guttadauri* (Philippi, 1836). *Posidonia* remains (both leaves and rhizomes) also abundantly occur, mainly at the base of N2 bed. From a paleoclimatic point of view, it is noteworthy to remark that both levels contain the trochid *Jujubinus ? bullula* (Fischer, 1877) (see Ruggieri & Unti, 1988 for the interesting information about its stratigraphical distribution) which can be considered a thermophilic species related to warm-temperate conditions (Garilli, 1998). Layers N2 and H6 respectively crop out at about 70 and 20 m above a turritellid-rich blue-greyish muddy level containing the nannofossils *Gephyrocapsa* sp. 3 and *Crenalithus asanoi* (Sato & Takayama, 1992) (Fig. 2), whose Mediterranean distributions are respectively recorded between 0.990 Ma B.P. (uppermost part of Early Pleistocene) and 0.584 Ma B.P. (Middle Pleistocene) (Castradori, 1993; Sprovieri, 1993; Di Stefano, 1998) and between 1.122 Ma B.P. (lower part of the Early Pleistocene Sicilian Substage, *sensu* Ruggieri et al., 1984) and 0.781 Ma B.P. (lower part of Middle Pleistocene) (De Kaenel et al., 1999). Consequently an upper Sicilian Substage or, more likely, an Middle-Late Pleistocene age could be likely assigned to N2 and H6 layers.

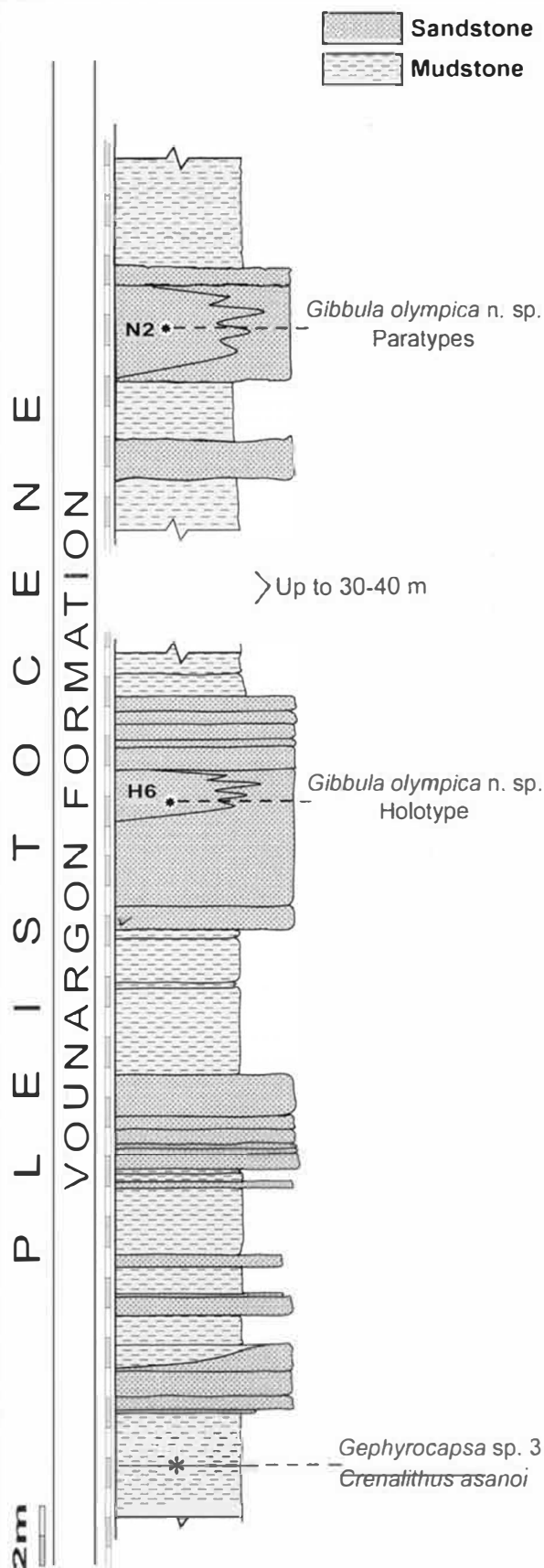


Fig. 2 - Partial columnar section of the upper part of Vounargon formation (Killini, NW Peloponnesus, Greece) illustrating the stratigraphical position of type material and H6 and N2 layers.

SYSTEMATICS

Phylum MOLLUSCA Linnaeus, 1758
 Classis GASTROPODA Cuvier, 1797
 Familia TROCHIDAE Rafinesque, 1815
 Genus *Gibbula* Risso, 1826 ex Leach ms.

Type species *Trochus magus* Linnaeus, 1758 by subsequent designation, Herrmannsen, 1847.

Gibbula olympica n. sp.
 (Figs. 3a-c; Pl. 1, figs. 1a-b, 4a-b, 5a-b)

Type material - Holotype (GNHM-52/18), paratypes 1 (GNHM-53/19) and 2 (GNHM-54/20) are housed in the Goulandris Natural History Museum (GNHM), Kifissia, Athens, Greece. Paratypes 3 (KIGR003) and 4 (KIGR004) are housed in the Dipartimento di Geologia e Geodesia of the University of Palermo, Italy. Fifteen unnumbered paratypes are in Palazzi coll. (Modena).

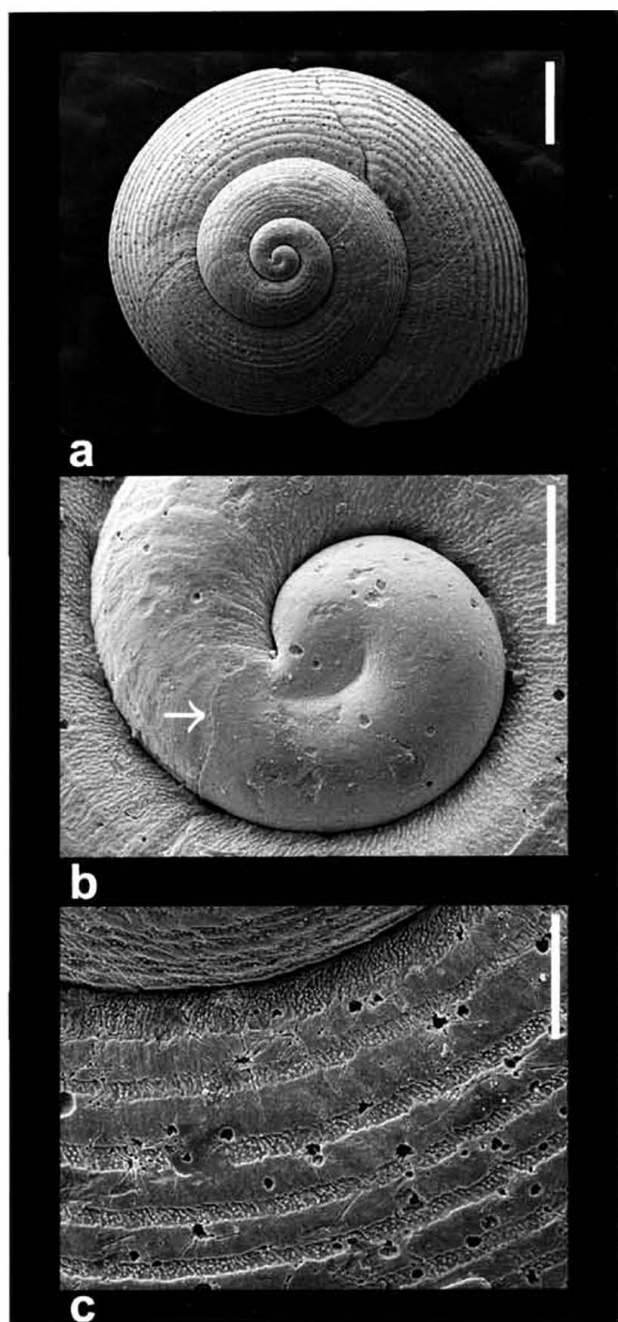
Measurements - Holotype, height (H) 8.2 mm, diameter of last whorl (D) 7.95 mm; paratype 1, H 7.5 mm, D 7.4 mm; paratype 2, H 7.3 mm, D 6.85 mm; paratype 3, H 7.1 mm, D 6 mm; paratype 4, H 8.5 mm, D 7.8 mm.

Locus typicus - Pleistocene of Killini (Elea, NW Peloponnesus, Greece), Vounargon formation (according to Hageman, 1976). Holotype is from the yellow-greyish sandy-muddy bed (H6) outcropping at about 0.5 Km East from the village of Killini (Elea, NW Peloponnesus, Greece, UTM 34S 511793E 4199216N, Fig. 1). All paratypes are from layer N2, similar for lithology and paleontological contents to the underlying H6 (Fig. 2).

Derivatio nominis - *G. olympica* n. sp. is named after the ancient town of Olympia (Peloponnesus, Greece) where the first Olympic Games took place.

Diagnosis - Sturdy, small, conical shell reaching about 9 mm in height. Protoconch paucispiral, consisting of about one whorl. Protoconch/teleoconch demarcation is marked and slightly sinuated. Teleoconch consists of more or less convex whorls, bearing irregular and fine spiral cords separated by very narrow interspaces which are sculptured by microscopical dots. Body whorl well developed. Aperture is subquadrangular. Outer lip rounded. Inner lip straight. Base moderately convex crossed by very fine concentric threads and with a deep, wide umbilicus. Pattern of coloration usually consisting of rectangular-rhomboidal white spiralling mottles in a reddish background.

Description - Sturdy, conical shell reaching 8.9 mm in height (8.2 mm in holotype). Height/maximum diameter ratio (H/D) ranges from 0.95 to 1.15 (1.03 in holotype). Protoconch paucispiral, consisting of about 1.1 smooth whorls (counted according to Verduin, 1977). Diameter ranges between 230 μ m and 265 μ m. Protoconch/teleoconch demarcation is well marked and slightly sinuated. Among specimens with height over 6



mm. teleoconch consists of 4 to 4.6 whorls. These are sculptured by fine, flat, sometimes irregular, spiral cords usually numbering 14 to 18 in the penultimate whorl. Cords are separated by very narrow interspaces which are sculptured by microscopical dots. Numerous, prosocline incremental scars, running from suture to suture, are present. Sutures are incised and very slightly inclined. Body whorl rather developed, making up about 0.7 to 0.8 of total height (0.73 in holotype). Aperture is subquadrangular and large, making up about 0.35 to 0.46 of total height (0.42 in holotype) and 0.5 to 0.63 of body whorl height (0.6 in holotype). Outer lip internally smooth, rounded and thickened close to the edge. Inner lip straight and moderately arcuated, usually more thickened in the central portion. Base is moderately convex, sculptured by concentric fine cords separated by narrow interspaces, and with a deep and large umbilicus, bordered by a moderately marked keel. Most of the examined material shows a characteristic pattern of coloration, present on the entire surface of the shell. It consists of rather, usually large, regular, sub rectangular or rhomboidal white spiralling mottles in a reddish background (maybe originally bright red). According to their size, mottles may form 3 to 6 spiral bands in the body whorl.

Remarks - The characteristic coloration pattern of *Gibbula olympica* n. sp. strongly resembles that shown by the species *G. spratti* (Forbes, 1844) and *G. nivosa* A. Adams, 1851 which are the most similar species. *G. spratti* (Pl. 1, figs. 3a-b and 6a-b), known only from the Aegean Sea (Beck, 1997; Giannuzzi-Savelli et al., 1997), usually has white rectangular to rhomboidal mottles in a very dark, almost black, or reddish

Fig. 3 - Scanning electronic microscope pictures illustrating a subadult specimen of *Gibbula olympica* n. sp. from N2 layer, Pleistocene of Killini (Elea, NW Peloponnesus, Greece). a) Teleoconch sculpture. b) Protoconch. c) Teleoconch microsculpture.

The white arrow indicates the protoconch/teleoconch demarcation.

Scale bars: 500 μ m in Fig. a, 100 μ m in Figs. b and c.

EXPLANATION OF PLATE I

Figs. 1, 4-5 - *Gibbula olympica* n. sp., Pleistocene of Killini (Elea, NW Peloponnesus, Greece).

1 - Holotype (GNHM-52/18).

4 - Paratype 1 (GNHM-53/19). Apertural (a) and basal (b) views.

5 - Paratype 2 (GNHM-54/20). Apertural (a) and basal (b) views.

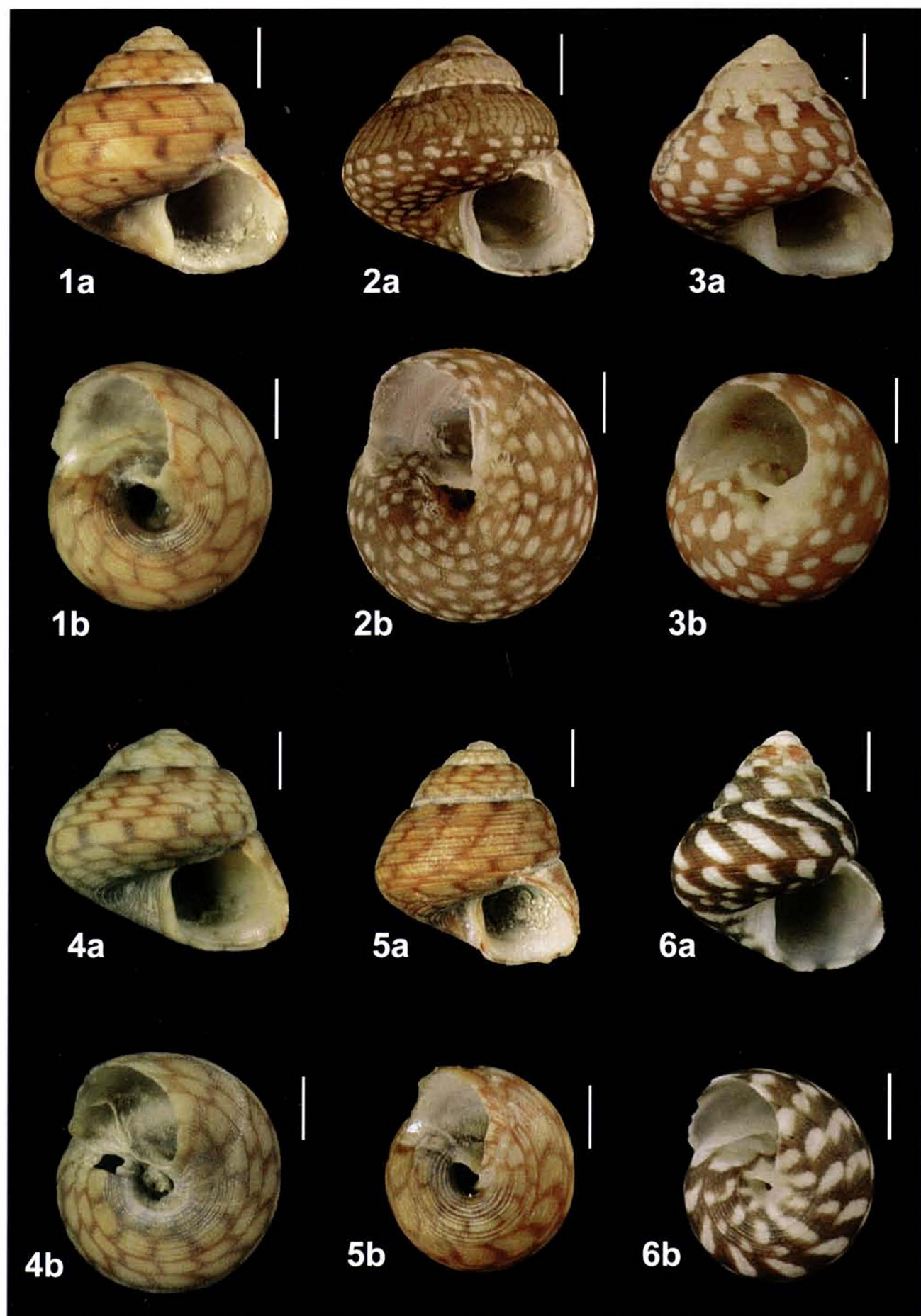
Fig. 2 - *Gibbula nivosa*, Isle of Malta. Apertural (a) and basal (b) views.

Figs. 3, 6 - *Gibbula spratti*, Aegean Sea

3 - Apertural (a) and basal (b) views.

6 - Apertural (a) and basal (b) views

Scale bars correspond to 2 mm.



background. It mainly differs from *G. olympica* n. sp. in having stronger spiral cords on early teleoconch whorls (see Beck, 1997, pl. 100, figs. 3, 4), a narrower umbilicus and a larger shell, about 12 mm in height (in examined material from Tenekidis coll.) vs. 8-9 mm. *G. nivosa* (Pl. 1, figs. 2a-b) represents an extreme case of endemism being present only in the Island of Malta (Ghisotti, 1976; Palazzi, 1978; Beck, 1997). It differs from *G. olympica* n. sp. in having an obsolete spiral sculpture and more convex whorls, with particular regard to the body whorl which is also broader. White subrectangular mottles, smaller than in *G. olympica* n. sp., cover homogeneously the adapical and the abapical area of each whorl and the base, while very small whitish spots, often fused, are usually showed in the central portion of the whorls.

Some less marked resemblances in coloration and/or shell shape may be also traced in the living *G. racketti* (Payraudeau, 1826) and *G. turbinoides* (Deshayes, 1835) and in the Pliocene *G. distefanoi* Crema, 1903. Differences between *G. olympica* n. sp. and these species as follows:

G. distefanoi (see Chirli, 2004, pl. 30, figs. 10-12 and pl. 31, figs. 1-5) shows a similar coloration, having series of spiralling white mottles in a reddish background, but it has a more depressed shell characterized by a lower H/D ratio (0.76 in the examined specimen), a very developed body whorl and a proportionally larger and deeper umbilicus. Also the sculpture is quite different consisting of very fine spiral cords covering the base, while the remaining surface of the shell is almost smooth bearing few, very flat, irregular and almost imperceptible spiral threads separated by extremely narrow interspaces.

G. racketti (see Giannuzzi-Savelli et al., 1997, figs. 197-202), always rather smaller than *G. olympica* n. sp., differs in having a markedly step-wise shell shape with an almost keeled base and a smaller umbilicus. Also its sculpture is different consisting of very flat subsutural cords becoming narrower and more marked in the abapical part of the teleoconch whorls.

G. turbinoides (see Giannuzzi-Savelli et al., 1997 figs. 203-206) usually does not show a pattern of regular mottles except for the base. Furthermore, its sculpture is formed by very few strong cords and fine secondary threads.

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