

The identity of *Murex tubercularis* Montagu, 1803 and description of one new genus and two new species of the Cerithiopsidae (Gastropoda: Triphoroidea)

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Abstract

Murex tubercularis Montagu, 1803, type species of the genus *Cerithiopsis* Forbes & Hanley, 1851, is re-considered on the basis of its original material, other relevant specimens in museum collections, and pertinent literature and personal data. Since there is a general agreement on teleoconch characters, this work focuses on the protoconch. The latter is conical, of 4.15-4.75 moderately convex whorls, with subsutural and suprasutural spiral rows of granular microprotuberances. It results that a number of specimens with differently sculptured larval shells, hitherto identified as *Cerithiopsis tubercularis*, do not belong to it. Major issues of this study are: 1) the type lot of *Cerithiopsis tubercularis* contains more than one taxon, 2) the identity of the syntype formerly designated lectotype of *Cerithiopsis tubercularis* is much doubtful, and 3) the existing name-bearing type of *Cerithiopsis tubercularis* is not in taxonomic accord with the prevailing usage of the name. Accordingly, a possible syntype in Natural History Museum (London) is selected as neotype of *Cerithiopsis tubercularis*. In this paper, the genus *Cerithiopsis* is intended rather strictly, to accommodate species with general protoconch characters basically conforming to those of the type species. The new genus *Nanopsis*, with type species *Cerithiopsis nana* Jeffreys, 1867, is proposed along with the new species *Nanopsis buzzurroi* and *Nanopsis denticulata*.

Riassunto

Murex tubercularis Montagu, 1803, specie tipo del genere *Cerithiopsis* Forbes & Hanley, 1851, viene criticamente revisionata sulla base del suo materiale originale, di altri esemplari significativi contenuti in collezioni museali, di informazioni pertinenti fornite dalla letteratura e di dati personali. Dal momento che vi è un sostanziale accordo sui caratteri della teleoconca, questo lavoro si focalizza sulla protoconca che risulta essere conica, di 4.15-4.75 giri convessi, con protoconca fornita di microgranuli suprasuturali e subsuturali grossolanamente disposti in file spirali. Ne consegue che vari esemplari la cui protoconca presenta una differente microscultura, di solito attribuiti a *Cerithiopsis tubercularis*, non possono appartenere a questa specie. I principali risultati di questo lavoro sono: 1) i sintipi di *Cerithiopsis tubercularis* non sono conspecifici e rappresentano più di una specie, 2) l'identità del sintipo in precedenza designato come lectotipo di *Cerithiopsis tubercularis* appare alquanto dubbia, 3) il lectotipo esistente di *Cerithiopsis tubercularis* è tassonomicamente discrepante dal concetto prevalente di *Cerithiopsis tubercularis*. Di conseguenza, un possibile sintipo presente nel Natural History Museum di Londra viene qui proposto come neotipo di *Cerithiopsis tubercularis*. L'esame dei sintipi di *Cerithiopsis barleei* Jeffreys, 1867 ha permesso di rilevare che questa specie ha una protoconca con caratteri molto diversi da quella di *Cerithiopsis tubercularis* e, quindi, di respingere la sinonimia di *Cerithiopsis barleei* con la specie di Montagu postulata da alcuni autori. In questo lavoro, la specie *Cerithiopsis barleei* è attribuita al genere *Prolixodens* Marshall, 1978. Il genere *Cerithiopsis* viene interpretato in maniera restrittiva e in esso vengono incluse solo specie con caratteri della protoconca sostanzialmente simili a quelli della specie tipo. Si introduce il nuovo genere *Nanopsis*, con specie tipo *Cerithiopsis nana* Jeffreys, 1867, e si propongono le due nuove specie *Nanopsis buzzurroi* e *Nanopsis denticulata*.

Key words

Gastropoda, Cerithiopsinae, protoconch, new genus, new species, Mediterranean.

Introduction

Subsequent to its introduction, *Murex tubercularis* Montagu, 1803 (currently *Cerithiopsis tubercularis*) has been cited or described and illustrated in a number of papers dealing with Recent and/or fossil mollusc faunas. Fossil occurrences were recorded from Neogene and Quaternary deposits throughout Europe (Wood, 1848; Monterosato, 1872; Sacco, 1895; Cerulli Irelli, 1912; Glibert, 1958; Baluk, 1975; Landau et al., 2006; Chirli, 2009 among others). The species was reported to range at present from northern North Sea to Ireland and southward to the Azores as well as in the Mediterranean (Fretter & Graham, 1982).

Most papers just cite the species; others provide quite brief descriptions and poor illustrations (line drawings) of the protoconch; a few, issued during the last decades, offer exhaustive descriptions of the teleoconch and SEM images of the protoconch. From a review of the literature, it appears that *C. tubercularis* has been variously interpreted since shells with similar teleoconch characters, but having significantly different protoconchs were assigned to it. This caused a considerable confusion concerning the identity of Montagu's species. Marshall's (1978) designation of a lectotype from the existing syntypes of *C. tubercularis*, with the aim of eliminating "any future doubt" about the characters of the species, enhanced the confusion. In fact, in the following it will be

demonstrated that the selected lectotype does not represent *C. tubercularis*. Consequently, *C. tubercularis* needs to be reconsidered in order to define its identity.

Cerithiopsis Forbes & Hanley, 1851 has been mostly used as a “catch-all” genus to include a number of species with clearly different protoconch features. It is intended here more strictly and much relevance is accorded to the characters of the type species (*C. tubercularis*), which is reviewed below. One new genus is introduced in order to better allocate some species currently assigned to *Cerithiopsis*, but having larval shells markedly discrepant from that of *C. tubercularis*. In this study, genera are based primarily on protoconch characters, combined with those of the teleoconch.

For the purpose of the present paper, the syntypes of *Cerithiopsis tubercularis* in the City Museum, Exeter (EX-EMS), those of *Cerithiopsis barleei* Jeffreys, 1867 and of *Cerithiopsis tubercularis* var. *nana* Jeffreys, 1867 in the Smithsonian Institution, National Museum of Natural History, Washington (USNM), along with relevant specimens in the Natural History Museum, London (BM-NH) and material from throughout the Mediterranean in the authors’ (AC) and other private collections have been examined. Specimens erroneously included in *C. tubercularis* have been considered too and some of them are assigned to species herein proposed as new.

Brief history of *Cerithiopsis tubercularis*

Montagu (1803: p. 270) proposed *Murex tubercularis* on the basis of Recent specimens found “at the mouth of the Ann in Devonshire” and “on the coast of Sandwich”, and provided only a brief diagnosis without any illustration. The original description reads: “*M.* with nine or ten, slender, taper, tuberculated volutions, separated only by a slight depression: colour chestnut-brown: apex pointed; aperture small, oval, ending in a canal, somewhat enclosed by the columella turning inward. Length a quarter of an inch”. Montagu’s text is scarcely informative and fails to define unambiguously the species; the chestnut-brown color is the sole useful character pointed out.

Forbes & Hanley (1851: p. 364) introduced the new genus *Cerithiopsis* for Montagu’s species (hence the type species of *Cerithiopsis* by original designation). They were the first to delineate (p. 365) the main characters of *Cerithiopsis tubercularis* reported to have a uniform dark or chocolate-brown colour, three to four smooth and semitransparent apical whorls, 3 spiral rows of beads on the spire whorls, and 2-3 basal spirals.

Other descriptions and illustrations specified the following distinctive characters of *C. tubercularis*. The protoconch is narrowly conical, of 4-5 smooth whorls (Jeffreys, 1867; Bucquoy, Dautzenberg & Dollfus, 1884; Watson, 1886; Locard, 1892; Locard, 1903; Kobelt, 1908; Lebour, 1933; Thiriote-Quévieux, 1969; Fretter & Pilkington, 1970; Hubendick & Waren, 1972). The SEM examination allowed also to note the presence of subsutural and suprasutural patterns of granular microprotuber-

ances (Thiriote-Quévieux & Rodriguez Babio, 1975; Nordsiek, 1976; Fretter & Graham, 1982). The sculpture of spire whorls consists of 3 spiral cords crossing collabral ribs and forming bead-like nodes at the intersections; a fourth spiral cord, either smooth or weakly tuberculated, occurs on the last whorl (at the level of the suture) and bounds the base; another 1-2 upper basal spirals may be present (Wood, 1848; Sowerby, 1859; Jeffreys, 1867; Bucquoy, Dautzenberg & Dollfus, 1884; Watson, 1886; Locard, 1892; Locard, 1903; Kobelt, 1908; Nordsiek, 1976; Fretter & Graham, 1982). The colour was said to be chestnut-brown or chocolate-brown (Sowerby, 1859; Jeffreys, 1867; Bucquoy, Dautzenberg & Dollfus, 1884; Locard, 1892; Kobelt, 1908; Nordsiek, 1976; Fretter & Graham, 1982). It is worthy to note that the characters described and/or figured by the cited authors basically match those mentioned by Forbes & Hanley (1851); only some sculptural details of the protoconch (granular microprotuberances) were discovered more recently because of the advent of scanning electron microscopy.

While there is a general agreement about the teleoconch characters of *C. tubercularis*, remarkable discrepancies exist concerning the sculpture of the larval shell. In particular, Jeffreys (1885: p. 59) wrote “The apical whorls in fresh and perfect specimens, when examined under a microscope, are seen to be very finely and closely ribbed lengthwise”. This description dissents from the former one published by the same author (1867: p. 266), who said the protoconch to be smooth. Marshall (1978), aiming to correctly interpret *C. tubercularis*, examined a syntype from Montagu Collection in EXEMS and designated it as lectotype of *C. tubercularis*. Marshall (p. 83) provided the following detailed description of the protoconch of the lectotype. “Protoconch of planktotrophic larval type, clearly demarcated from teleoconch whorls. Last half-whorl with a sharp peripheral carina and evenly spaced brephic riblets on shoulder. First 1^{1/2} (embryonic) whorls minutely granulate throughout. Subsequent whorls traversed over abapical two-thirds by fine, crisp, evenly spaced prosocline riblets; each riblet with about 5 evenly spaced triangles extending in the direction of coiling for about width of rib from apertural side. Sinusigera sinus deep, opisthocyrt-opisthocline.” Marshall figured the entire shell of the lectotype of *C. tubercularis* (fig. 13 C) without any SEM image of its protoconch. According to van Aartsen et al. (1984), the lectotype of *C. tubercularis* selected by Marshall “most probably belongs to the species so far known as *C. barleei* Jeffreys, 1867”. The same opinion was expressed by Bouchet, who in 1986 saw the two syntypes of *C. tubercularis* in EXEMS (David Bolton, pers. comm., 2008). Further, Pliocene specimens from Spain (Landau et al., 2006) and Italy (Chirli, 2009) as well as the Recent ones from the Gulf of Naples (Richter & Thorson, 1975) and from Croatia (Prkić & Mariottini, 2009) identified as *C. tubercularis* have multispiral larval shells with 1-2 abapical spiral cordlets; the subsutural granular microprotuberances may be present or replaced by short, axial bars.

Since 1) Marshall’s designation of lectotype results open to doubt (see also remarks below) and 2) in cerithiop-

sides the larval shell is most important for species discrimination, it is advisable to reconsider Montagu's original material along with other relevant specimens in order to ascertain the protoconch characters of *C. tubercularis*.

The syntypes in Exeter Museum and other relevant material

Montagu's original material in EXEMS consists of one box with two specimens glued to a small piece of paper attached to the original manuscript label (Fig. 1A); these specimens are collectively numbered 4235 (Fig. 1B). The first syntype (Fig. 1C, D) lacks the protoconch. Its teleoconch of about 10 whorls conforms to the concept of *Murex tubercularis* followed for nearly two centuries by most authors and is not discrepant with the short description published by Montagu; there are no upper basal spirals and the color is reddish-brown. The second syntype retains only the last protoconch whorl (Fig. 1E) sculptured with sparse granules and unevenly spaced, broken prosocline riblets on the abapical three-quarters; remnants of minute granules occur subsuturally. The teleoconch (Fig. 1F) of about 8 whorls is identical to that of the first syntype; the color is whitish. This specimen was designated lectotype of *C. tubercularis* by Marshall (1978). Two notes are to be made. Firstly, the illustration of the lectotype published by Marshall (fig. 13 C) shows a shell with a complete protoconch; thus, it must be inferred that the protoconch went broken after Marshall's examination of this specimen. Secondly, the sculpture observed on the preserved whorl (the last) of the protoconch scarcely agrees with the description of the larval shell of the lectotype provided by Marshall; instead, it matches that reported by Marshall (p. 84) for his new species *Cerithiopsis powelli* (see also fig. 13 B of Marshall).

When looking for specimens of *C. tubercularis* in BMNH, Amelia MacLellan found a possible syntype of Montagu's species (Reg.No. 20090384). Amelia MacLellan (pers. comm., 2009) informed that "it is considered so as the labelling on the specimen is the same as other material thought to be Montagu's types". The locality of this possible syntype is "British Coast". The specimen is nicely preserved and retains the last 2 whorls of the larval shell. The protoconch whorls are convex, showing only remnants of subsutural and suprasutural granular microprotuberances; there is no trace of either axial sculpture or carination of the last half-whorl (Fig. 1H, I). These characters fully agree with the SEM images and the descriptions of the protoconch of *C. tubercularis* published by some recent workers (Thiriou-Quévèreux & Rodriguez Babio, 1975; Nordsiek, 1976; Fretter & Graham, 1982). The teleoconch (Fig. 1G) conforms in shape and sculpture to the current concept of *C. tubercularis*; the color is slightly pale reddish-brown. Another relevant shell in BMNH (Reg.No. 20090383) is that possibly figured by Sowerby (1855). Concerning this specimen, Amelia MacLellan (pers. comm., 2009)

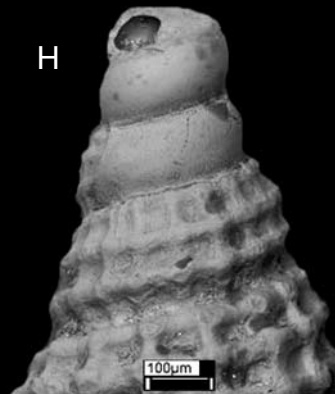
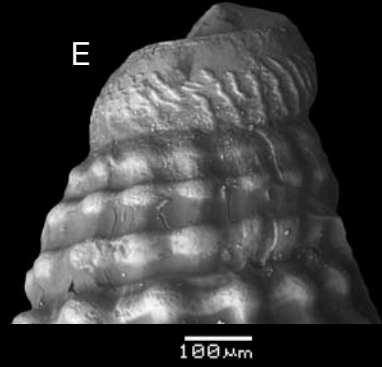
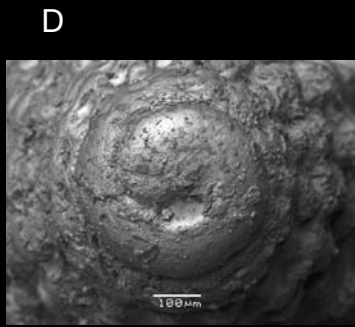
informed that it "is considered so as it is Cuming material which was often figured by Sowerby; admittedly the size of the specimen does not match the scale in Sowerby's original figure (hence the prefix possible), we have not yet located any material more likely to be Sowerby's figured specimen". The locality of this possible figured specimen is "Europe". The shell (Fig. 1J) retains only the last protoconch whorl, which is identical to that of the possible syntype; the teleoconch of 7.5 whorls is light reddish-brown in color. Exactly the same remarks reported above for the possible syntype can be made also for this specimen.

Examination of the considered specimens has shown that 1) only one of the two syntypes in EXEMS retains part of the protoconch (last whorl) with sculptural characters closely similar to those of *C. powelli* Marshall, 1978 and 2) the other relevant specimens have similarly sculptured larval shells, which differ markedly from that of the just cited syntype. It is noteworthy that one syntype in EXEMS, the possible syntype in BMNH and the specimen possibly figured by Sowerby (1855) have the teleoconch of reddish-brown color, whereas that of the second syntype in EXEMS (designated lectotype of *C. tubercularis* by Marshall) is whitish.

Discussion and concluding remarks

Marshall (1978: p. 83) remarked that the protoconch of the lectotype of *Cerithiopsis tubercularis* "is exactly like those figured and described by Rodriguez Babio & Thiriou-Quévèreux (1974; p. 536, pl. 3, fig. F) and Richter & Thorson (1975; p. 130, pl. 4, fig. 24, 25) as *C. barleei* Jeffreys, 1867". Van Aartsen et al. (1984: p. 29) commented that the reference to Richter & Thorson made by Marshall is an error since the protoconchs illustrated by these authors (pl. 4, figs 24 and 25) were referred to as *C. tubercularis* and do not agree with Marshall's description of the protoconch of the lectotype of *C. tubercularis*. Actually, the protoconch of *Cerithiopsis barleei* was correctly figured by Richter & Thorson on their plate 5 (figs 28, 29). On the basis of the observation reported above, Marshall supposed that "*C. barleei* Jeffreys or auctorum is synonymous with or very closely related to *C. tubercularis*". A similar conclusion was reached also by van Aartsen et al. (1984) who wrote "it seems that the most common European *Cerithiopsis* species, which has been known for many years as *C. tubercularis* (Montagu, 1803) should change its name, whereas the much more rare *C. barleei* should be called *C. tubercularis*". In the following it will be demonstrated that the synonymy of *C. barleei* with *C. tubercularis* is untenable.

Ellen Strong (USNM) kindly provided excellent photographs of the syntypes of *Cerithiopsis barleei* Jeffreys, 1867 (Fig. 2A); they are all glued to small pieces of paper and are divided into two lots. One lot (Reg.No. 62164) includes 5 syntypes collected at Plymouth, the other (Reg.No. 62168) comprises 4 syntypes from an unknown locality and apparently contains the figured specimen. Ellen Strong (pers. comm., 2009) noted that



“all the syntypes appear to be conspecific as far as I can tell of the specimens that have a protoconch”. One syntype (in lot 62164) having the best preserved protoconch (Fig. 2B, C) is designated here lectotype of *C. barleei*; the protoconchs of the other syntypes (paralectotypes) are etched and/or have the sculpture eroded to varying degrees and are not suitable for SEM examination.

As a matter of fact, the larval shell of the lectotype of *Cerithiopsis tubercularis* as described by Marshall (1978) perfectly conforms to that of the lectotype of *C. barleei* herein designated (Fig. 2C). This would indicate a probable mixture of taxa in the type lot of *C. tubercularis* and that the syntype dealt with by Marshall could be *C. barleei*. However, as formerly noted, the sculpture on the last protoconch whorl (the preserved one) of the lectotype of *C. tubercularis* in EXEMS is closer to that of *Cerithiopsis powelli* Marshall, 1978 than to that of *C. barleei*. Because of this remarkable discrepancy, it is unclear which specimen Marshall actually examined and the taxonomic identity of *C. tubercularis* cannot safely be determined from the existing lectotype (the whitish syntype) presently in EXEMS. The possible syntype and the specimen possibly figured by Sowerby (1855), both in BMNH, can be more useful in defining the identity of *Cerithiopsis tubercularis*. Their protoconchs (see descriptions in the preceding chapter), even if not completely preserved, differ markedly from that described by Marshall and that of the existing lectotype of *C. tubercularis*, whereas they conform perfectly to the characters prevalently described for *C. tubercularis* by many authors, as reported above.

Cerithiopsis barleei (here included in *Prolixodens* Marshall, 1978) can be readily separated from *C. tubercularis* primarily on the basis of the characters of its protoconch. In fact, *C. barleei* has the larval shell with prosocline riblets and the last half-whorl medially carinated (Fig. 2C); that of *C. tubercularis* has convex whorls throughout and the sculpture consists of subsutural and suprasutural patterns of granular microprotuberances (Fig. 1I). The lighter color of the teleoconch (pale yellowish-white or pale yellowish-brown) may be another distinguishing element of *C. barleei*. Consequently, the synonymy of *C. barleei* with *C. tubercularis* supposed by some authors (Marshall, 1978; van Aartsen et al., 1984) is to be rejected.

From the above, it appears that 1) the type lot of *C. tu-*

bercularis in EXEMS contains more than one taxon, 2) the identity of Marshall's lectotype is much doubtful, and 3) the existing name-bearing type of *Murex tubercularis* is not in taxonomic accord with the prevailing usage of the name (see also Palazzi & Villari, 2001, p. 15). We conclude that the name *tubercularis* remains available (ICZN, 1999, Article 17 of the Code) and that the existing name-bearing type of *Cerithiopsis tubercularis* should be set apart and a neotype be designated (ICZN, 1999, Article 75 of the Code). The reddish-brown syntype in EXEMS most probably is *C. tubercularis*, but it is not eligible for the neotype of the species since it lacks the protoconch (ICZN, 1999, Recommendation 75A of the Code). We think it wiser to select the better preserved possible syntype (BMNH 20090384) as neotype of *Cerithiopsis tubercularis*. The International Commission on Zoological Nomenclature will be asked to use its plenary power concerning the neotype designation proposed herein.

Systematics

The studied specimens are partly deposited in the Museo Civico di Storia Naturale, Milano (MCSN) and in the Muséum National d'Histoire Naturelle, Paris (MNHN). The remainder is kept as reference material in the authors' collection, Milano (AC). Abbreviations for other institutions cited throughout the text as repositories of material are reported in the introduction. In the following, genera are listed in alphabetic order as are species within genera. Citations that are verifiable in that they include adequate descriptions and/or illustrations of the species, and other quotations referring to material that has been directly examined by the present authors, are included in the synonymies. Other citations, poorly documented or not documented at all, are considered uncertain references and are excluded from the synonymies. The angular measurements are according to Cox (1960) and the related symbols are: AP, apical angle; MSA, mean spiral angle; the term spiral angle (SA) is used when apical angle and mean spiral angle are virtually coincident. The sutural slope (SS) is the angle formed by the suture and a line perpendicular to the teleoconch axis. Other abbreviations are: spm., specimen; spms., specimens; coll., collection.

Fig. 1. A-F. Syntypes of *Murex tubercularis* Montagu, 1803, Montagu collection, EXEMS 4235 (2 specimens), mouth of the Ann in Devonshire and coast of Sandwich, Recent. **A.** Original manuscript label. **B.** EXEMS labels. **C, D.** Reddish-brown syntype conforming to the current concept of *Cerithiopsis tubercularis*. **C.** Shell. **D.** Apical view showing lack of protoconch. **E, F.** White syntype designated by Marshall (1978) lectotype of *Cerithiopsis tubercularis* (= *C. barleei* Jeffreys, 1867 or *C. powelli* Marshall, 1978, see text). **E.** Detail of last protoconch whorl (preserved one). **F.** Shell. **G-I.** Possible syntype of *Cerithiopsis tubercularis*, Montagu's types, BMNH 20090384, British coast, Recent; this specimen is here proposed as neotype of *Cerithiopsis tubercularis*. **G.** Shell. **H.** Preserved part of protoconch. **I.** Detail of sutural area of **H** showing remnants of granular microprotuberances. **J.** Shell possibly figured by Sowerby (1855) and referred to as *Cerithium tuberculare*, Cuming collection, BMNH 20090383, Europe, Recent.

Fig. 1. A-F. Sintipi di *Murex tubercularis* Montagu, 1803, collezione Montagu, EXEMS 4235 (2 esemplari), foce dell'Ann, Devonshire e costa di Sandwich, Attuale. **A.** Etichetta originale manoscritta. **B.** Etichette di EXEMS. **C, D.** Sintipo bruno-rossastro corrispondente al concetto prevalente di *Cerithiopsis tubercularis*. **C.** Conchiglia. **D.** Veduta apicale che mostra l'assenza di protoconca. **E, F.** Sintipo biancastro designato da Marshall (1978) come lectotipo di *Cerithiopsis tubercularis* (= *C. barleei* Jeffreys, 1867 o *C. powelli* Marshall, 1978, vedere testo). **E.** Dettaglio dell'ultimo giro della protoconca (unico conservato). **F.** Conchiglia. **G-I.** Probabile sintipo di *Cerithiopsis tubercularis*, tipi di Montagu, BMNH 20090384, costa inglese, Attuale; questo esemplare viene qui proposto come neotipo di *Cerithiopsis tubercularis*. **G.** Conchiglia. **H.** Porzione conservata della protoconca. **I.** Dettaglio dell'area suturale di **H** che mostra residui di microgranuli. **J.** Conchiglia probabilmente figurata da Sowerby (1855) come *Cerithium tuberculare*, collezione Cuming, BMNH 20090383, Europa, Attuale.

Superfamily Triphoroidea Gray, 1847
 Family Cerithiopsidae H. Adams & A. Adams, 1853
 Subfamily Cerithiopsinae H. Adams & A. Adams, 1853
 Genus *Cerithiopsis* Forbes & Hanley, 1851
 (type species *Murex tubercularis* Montagu,
 1803 by original designation)

The genus concept adopted by most authors appears to be rather broad and unsatisfactory since *Cerithiopsis* has been currently used to accommodate number of species sharing the main teleoconch characters, but likely unrelated because of their remarkably different protoconchs (cf. Nordsieck, 1976; Cachia et al., 1996; Coppini, 2008; Prkić & Mariottini, 2009 among others). On the basis of the type species as defined herein and of those most closely related to it, the main characters of the genus *Cerithiopsis* can be specified as follows. Protoconch multi-spiral reflecting a planktotrophic larval development, conical, with convex whorls. Protoconch I apparently smooth. Protoconch II with subsutural and suprasutural patterns of granular microprotuberances. Transition to teleoconch abrupt, marked by an opisthocline sinusigera lip and by sudden appearance of adult sculpture. Teleoconch turruculate, with cyrtocoid spire (straight-sided in some species), whorls flatly convex, sutures deeply impressed in most species. Abapical canal short, inclined to shell axis. Adult sculpture of collabral ribs overridden by 3 more or less robust spiral cords forming bead-like nodes at intersections; a fourth spiral, beaded or smooth, occurs on last whorl at level of suture; 1-2 upper-basal spirals are present in fully grown specimens.

It is worthy to note that the protoconch may look smooth or retains only remnants of the microsculpture close to the sutures in most adult specimens. The loss of protoconch microsculpture in adult shells is quite normal. In this respect, we recall that Hickman (2004) stated that "dissolution of protoconch features begins to occur shortly after metamorphosis, so that fine details of protoconch sculpture are available only on larval shells".

The Recent Caribbean species *Cerithium gemmulosum* Adams, 1850, *Cerithiopsis dominguezi* Rolán & Espinosa, 1995 and *Cerithiopsis aimen* Rolán & Espinosa, 1995 (cf. Rolán & Espinosa, 1995; Redfern, 2001; Rolán et al., 2007), the Mediterranean *Cerithiopsis annae* Cecalupo & Buzzurro, 2004 and *Cerithium minimum* Brusina, 1865, along with the Indo-West Pacific *Cerithium pulvis* Issel, 1869 and *Bittium tenthrenois* Melvill, 1896 appear to agree with the characters of *Cerithiopsis*.

The genera *Conciliopsis*, *Synthopsis* and *Tubercliopsis*, introduced by Laseron (1956), were originally described as having multispiral, conical or narrowly conical (that of *Synthopsis* nearly mammillated), smooth protoconchs, cyrtocoid to straight-sided teleoconchs sculptured with collabral riblets and three overriding spiral cords forming more or less clear bead-like nodes at intersections; a fourth spiral, smooth or weakly beaded was reported to occur on the last whorl at level of the suture; no upper basal spirals were either mentioned or depicted in the illustrations published by Laseron. Considering the possible loss of protoconch microsculpture cited

above, these genera would appear strikingly close to *Cerithiopsis*, the sole difference being the lack of upper basal spiral(s). A decision on whether they are synonyms of *Cerithiopsis* seems premature. We simply recall that Marshall (1978, p. 82, 84) placed *Conciliopsis* in the synonymy of *Cerithiopsis* and tentatively included in *Synthopsis* (p. 88) three New Zealand species with "minutely granulate" protoconchs.

Joculator was introduced by Hedley (1909, p. 442) as a subgenus of *Cerithiopsis*. The brief original diagnosis reads "shell small, dextral, of ovate or bulbous contour, with smooth subulate many-whorled protoconch". Concerning the protoconch, Marshall (1978, p. 85) noted that "in the type species and other species examined it is minutely granulate, at least on the embryonic whorl". This statement would support a possible synonymy of *Joculator* with *Cerithiopsis*, but the slender, mammillated larval shell and the barrel-shaped teleoconch of *Joculator* easily separate it from *Cerithiopsis*. Surprisingly, Marshall (1978) included in *Joculator* his new species *Joculator sublima*, which seems better allocated in *Prolixodens* Marshall, 1978 because of its broadly conical, axially ribbed protoconch. The genus *Clathropsis* Laseron, 1956 somewhat resembles *Cerithiopsis* in terms of protoconch features, but the species on which it was based invariably have convex, rather tall teleoconch whorls with clearly clathrate sculpture and "ill defined" tubercles at intersections. These characters readily distinguishes *Clathropsis* from *Cerithiopsis*.

Cerithiopsis appears to be surely represented in the Pliocene of Italy (cf. Chirli, 2009 sub *C. minima*). Some specimens from the Miocene of the North Sea Basin assigned to *Cerithiopsis* (see Janssen, 1967, 1984) probably belong to this genus, but others deserve a different generic assignment. There are many other quotations from the fossil record, which are poorly documented or not documented at all (no exhaustive descriptions or SEM illustrations of the protoconch) and need to be confirmed. The genus occurs at present in the Caribbean Sea, in the eastern Atlantic, in the Mediterranean and in the Indo-West Pacific.

Cerithiopsis tubercularis (Montagu, 1803) (Figs 1A-D, G-J, 2D-G)

Murex tubercularis Montagu, 1803: p. 270.

? *Cerithium tuberculare* Montagu - Wood, 1848: p. 70, pl. 8, figs 5-5c.

Cerithiopsis tuberculare Montagu - Forbes & Hanley, 1851: p. 365, pl. OO, figs 1, 2 (animal, in vol. 1); pl. 91, figs 7, 8 (shell, in vol. 4).

Cerithium tuberculare Montagu - Sowerby, 1855: p. 878, pl. 184, fig. 222.

Cerithiopsis tuberculare Montagu - Sowerby, 1859: pl. 15, fig. 11.

Cerithiopsis tubercularis Montagu - Jeffreys, 1867: p. 266, pl. 4, fig. 5.

Cerithiopsis tubercularis - Jeffreys, 1869: p. 217, pl. 81, fig. 1.

Cerithiopsis tubercularis Montagu - Bucquoy et al., 1884: p. 204, pl. 27, figs 1, 2.

not *Cerithiopsis tubercularis* Montagu - Jeffreys, 1885: p. 59 (= ? *Cerithiopsis barleei* Jeffreys, 1867).

- Cerithiopsis tubercularis* Montagu - Watson, 1886, p. 90, pl. 4, figs 1, 1a.
- Cerithiopsis tubercularis* Montagu - Locard, 1892: p. 117, text-fig. 105.
- Cerithiopsis tubercularis* Montagu - Locard, 1903: p. 114.
- Cerithiopsis tubercularis* Montagu - Kobelt, 1908: p. 116, pl. 120, figs 1-3, 6, 7.
- Cerithiopsis tubercularis* (Montagu) - Lebour, 1933: p. 496, pl. 1, figs 8-11.
- Cerithiopsis tubercularis* Montagu - Thiriot-Quévieux, 1969: p. 338, pl. 1, fig. 8.
- Cerithiopsis tubercularis* (Montagu) - Fretter & Pilkington, 1970: p. 10, fig. 9.
- Cerithiopsis tubercularis* (Montagu) - Parenzan, 1970: p. 110, fig. 376.
- Cerithiopsis tubercularis* (Montagu) - Hubendick & Waren, 1972: p. 45, figs 135-137.
- not *Cerithiopsis* (s.s.) *tubercularis* (Montagu) - Glibert, 1973: p. 50, text-fig. 14 (= *Cerithiopsis buzzurroi* sp. n.).
- Cerithiopsis tubercularis* (Montagu) - Thiriot-Quévieux & Rodriguez Babio, 1975: p. 141, pl. 5, figs D, E, G, H.
- not *Cerithiopsis tubercularis* (Montagu) - Richter & Thorson, 1975: p. 130, pl. 4, fig. 24, 25 (= *C. buzzurroi*).
- not *Cerithiopsis* (*Cerithiopsis*) *tubercularis* (Montagu) - Baluk, 1975: p. 155, pl. 19, figs 1-5 (likely a species to be named).
- Cerithiopsis tubercularis* (Montagu) - Nordsiek, 1976: p. 6, fig. 1.
- not *Cerithiopsis tubercularis* (Montagu) - Marshall, 1978: p. 83, fig. 13C (= *C. barleei* Jeffreys, 1867 or *C. powelli* Marshall, 1978).
- Cerithiopsis tubercularis* (Montagu) - Fretter & Graham, 1982: p. 366, figs 257, 258.
- not *Cerithiopsis tubercularis* (Montagu) - Grecchi, 1984: p. 22, pl. 2, fig. 11 (= *Cerithiopsis denticulata* sp. n.).
- Cerithiopsis tubercularis* auct. - Van Aartsen et al., 1984: p. 28, fig. 130.
- Cerithiopsis tubercularis* (Montagu) - Graham, 1988: p. 466, text-fig. 196.
- Cerithiopsis tubercularis* (Montagu) - Cachia et al., 1996: p. 133, pl. 14, fig. 3.
- not *Cerithiopsis tubercularis* (Montagu) - Giribet & Peñas, 1997: p. 50, fig. 28 (= *C. buzzurroi* sp. n.), fig. 30 (= *Cerithiopsis nana* Jeffreys, 1867).
- not *Cerithiopsis tubercularis* (Montagu) - Giannuzzi-Savelli et al., 1999 p. 38, fig. 50 (= *C. denticulata* sp. n.).
- not *Cerithiopsis* (s.l.) cf. *tubercularis* (Montagu) - Landau et al., 2006: p. 13, pl. 3, figs 4, 5 (likely a species to be named).
- Cerithiopsis tubercularis* (Montagu) - Coppini, 2008: p. 22, figs on same page, right.
- not *Cerithiopsis tubercularis* (Montagu) - Frias Martins et al., 2009: p. 59, pl. 5, figs 67, 68 (= *Cerithiopsis* sp.).
- not *Cerithiopsis tubercularis* (Montagu) - Chirli, 2009: p. 11, pl. 5, figs 8-15; pl. 6, figs 1-11 (likely three species to be named).
- Cerithiopsis oculisfictis* Prkić & Mariottini, 2009: p. 4, figs 1-9, 47, 52, 57.
- Cerithiopsis petanii* Prkić & Mariottini, 2009: p. 5, figs 10-19, 48, 53, 58.
- not *Cerithiopsis tubercularis* (Montagu) sensu auct. nec Marshall (1978) - Prkić & Mariottini, 2009: p. 6, figs 20-36, 54-55, 59-61 (= *C. buzzurroi* sp. n.).

Type material

Syntypes of *Murex tubercularis* Montagu, 1803 (2 spms.), Montagu coll., EXEMS 4235, mouth of the Ann in Devonshire and coast of Sandwich, Recent (**Fig. 1A-F**).

Relevant material examined

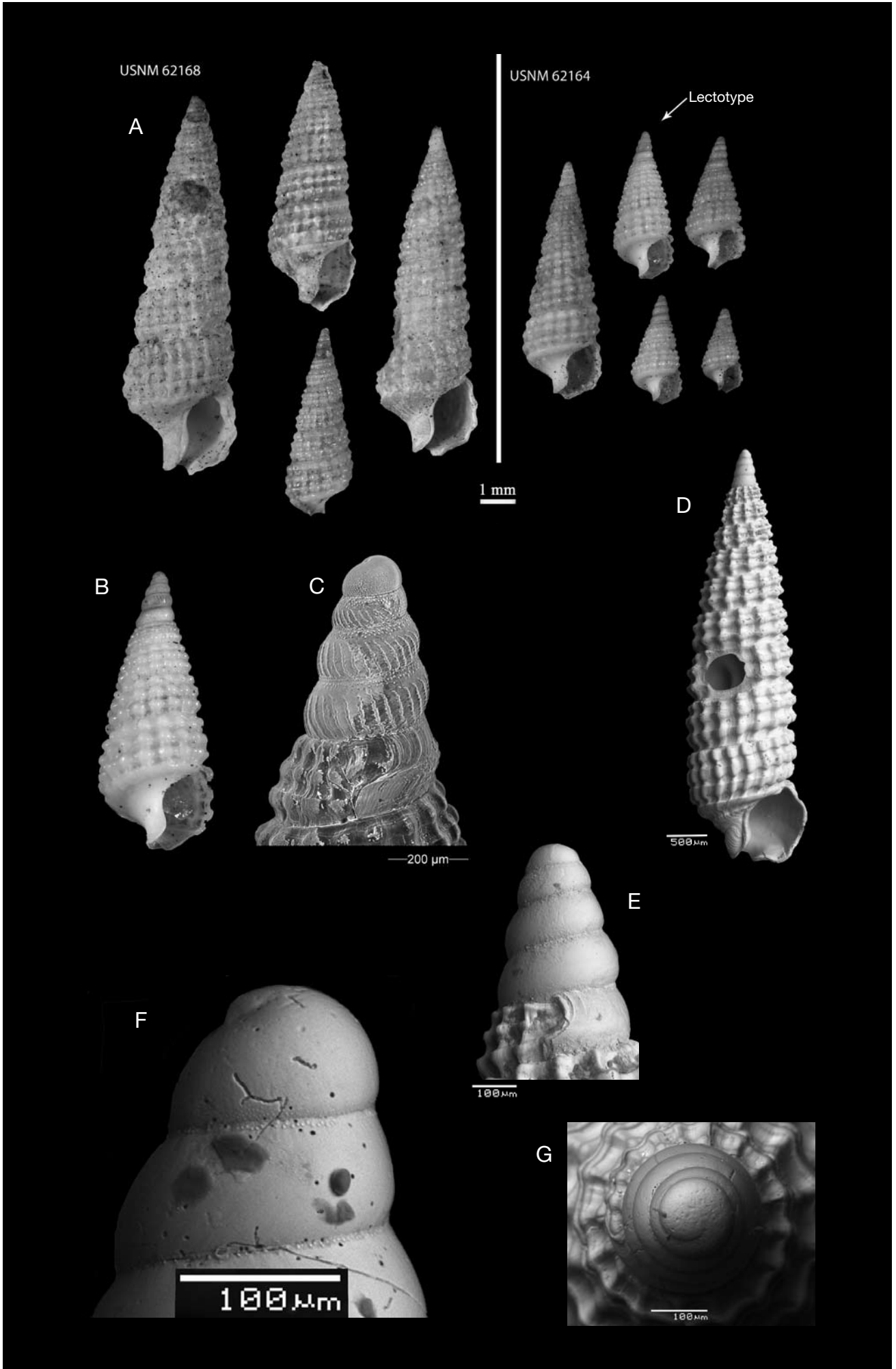
Possible syntype, Montagu's types, BMNH 20090384, British coast, Recent (**Fig. 1G-I**); this specimen is here proposed as neotype of *Murex tubercularis* (see discussion above). Shell possibly figured by Sowerby (1855) and referred to as *Cerithium tuberculare*, Cuming coll., BMNH 20090383, Europe, Recent (**Fig. 1J**).

Other material examined

Charrane, Melilla, Morocco, 9 m: 16 spms., private coll.; Hammamet, Tunisia, 5 m: 15 spms., AC; Kerkennah, Tunisia, 2 m: 85 spms., AC, 20 spms., private coll.; Gabès, Tunisia, 1 m: 4 spms., AC; Alboran Island, Spain, 22-24 m: 1 spm., private coll.; Malaga, Spain, 2 m: 4 spms., private coll.; Estepona, Spain, 2 m: 1 spm., private coll. (**Fig. 2D, E**), 6 spms., private coll.; Getares, Spain, 1-4 m: 6 spms., private coll.; Herradura, Spain, 9 m: 1 spm., private coll.; Herradura, Spain, 32 m: 5 spms., AC; Juan Les Pines, France, 2 m: 1 spm., AC, 4 spms., private coll.; Secca S. Stefano, San Remo, 30 m: 4 spms., AC; Secca dell'Isuela, Genova, 40 m: 1 spm., AC; Seno dell'Olivetta, Genova, 27 m: 3 spms., AC; Capo di Fonza, Elba Island, 2 m: 12 spms., private coll.; Bonifacio, Sardinia, 7 m: 8 spms., AC, 3 spms., private coll.; Bonifacio, Sardinia, 20 m: 3 spms., AC; Scilla, Reggio Calabria, 50 m: 9 spms., private coll.; Cala Rotonda, Favignana Island, Palermo, 30 m: 1 spm., private coll.; Cannizzaro, Catania, 40 m: 1 spm., AC; Cannizzaro, Catania, 42 m: 11 spms., private coll.; Carini, Palermo, 3 m: 1 spm., private coll.; Messina, 7 m: 6 spms., private coll.; Porto Palo di Capo Passero, Siracusa, 1 m: 3 spms., AC; Ognina, Siracusa, 50 m: 21 spms., AC; Cala Guitgia, Lampedusa Island, 3 m: 1 spm., AC (**Fig. 2G**), 12 spms., AC, 4 spms., private coll.; Otranto, Lecce, 3 m: 6 spms., private coll.; Ostuni, Brindisi, 1 m: 2 spms., private coll.; Porec, Istria, Croatia, 3 m: 2 spms., private coll.; Kanegra, Istria, Croatia, 2 m: 18 spms., private coll.; Istria, Croatia, 6 m: 4 spms., private coll.; Umago, Croatia, 6 m: 1 spm., private coll.; Korkula, Vela Luka, Croatia, 3-6 m: 18 spms., private coll.; Calcidia, Greece, 2-6 m: 6 spms., private coll.; Bogsac, Turkey, 7 m: 8 spms., private coll.; Tasuçu, Turkey, 7 m: 1 spm., AC (**Fig. 2F**), 11 spms., AC; Akko, Israel, 1 m: 5 spms., private coll.

Description

Protoconch conical, of 4.15-4.75 moderately convex whorls, with subsutural and suprasutural spiral rows of granular microprotuberances, subsutural ones coarser; diameter averaging 0.27 mm. Transition to teleoconch abrupt, marked by a slightly opisthocline sinusigera lip and by sudden appearance of adult sculpture. Teleoconch turriculate; spire elevated, moderately cyrtocoid, straight-sided in some specimens, AP 25°-38°, MSA averaging 18°; whorls up to 12, nearly flat-sided, less tall than one half their diameter; sutures rather deeply impressed, SS 14°. Last whorl ovate-cylindrical, 30-35% of total height in fully grown specimens, subangular at pe-



riphery; base short, more or less excavated to obconical, imperforated, with distinct neck. Aperture broadly oval ending in a short abapical canal inclined to shell axis; outer lip thin, crenulated by spiral cords; columella slightly concave, with rather thick callus; abapical sinus broad and shallow. Sculpture of thin collabral ribs and overriding, robust spiral cords forming bead-like nodes at intersections. The ribs, 14-15 on first whorl, 18-22 on last whorl, are straight, gently opisthocyrte on last whorl of some specimens, and vanish just adapical to or at peripheral angulation; the spirals, 3 on spire whorls, start immediately, are of same strength and markedly broader than intervening furrows; a fourth cord weakly beaded or smooth occurs on last whorl at level of suture; fully grown shells have another (fifth) spiral cord on upper base, bisected by a faint longitudinal groove in some specimens and separated from fourth spiral by a furrow of variable depth and breadth. Color bright reddish-brown, paler on adapical spiral of fresh shells.

Remarks

Cerithiopsis tubercularis exhibits a moderate variability as regards the teleoconch shape (cyrtconoid to conical) and the amplitude of the apical angle. We do not see any ground for consistently separate *Cerithiopsis oculifictis* and *Cerithiopsis petanii*, both of Prkić & Mariottini (2009), from *C. tubercularis*. The Mediterranean species *Cerithiopsis minima* (Brusina, 1865) and *Cerithiopsis annae* Cecalupo & Buzzurro, 2004 differ from *C. tubercularis* by a smaller size and a narrowly conical protoconch with sides not in line with those of the teleoconch; moreover, the latter species is devoid of upper basal spirals. Several species (*Cerithium acicula* Brusina, 1865, *Cerithium neglectum* Adams, 1852, *Cerithium pygmaeum* Philippi, 1844 among others) have been considered synonyms of *C. tubercularis* by most authors. However, in the absence of reliable information on respective protoconch characters, their relationships with Montagu's species remain pending.

Distribution

The species, as reviewed herein, appears to range at present in the eastern Atlantic, from Shetland Islands to Ireland, the English Channel and southward to the Bay of Biscay; it occurs infralittorally throughout the Mediterranean. There are many records from Neogene and Quaternary deposits of Europe, but in the lack of reliable information on larval shells they need to be confirmed.

Genus *Nanopsis* gen. n.
(type species *Cerithiopsis nana* Jeffreys, 1867)

Derivation of name

The name of the genus reflects the fact that it includes cerithiopsine species sharing their protoconch type and general teleoconch characters with *Cerithiopsis nana* Jeffreys, 1867.

Description

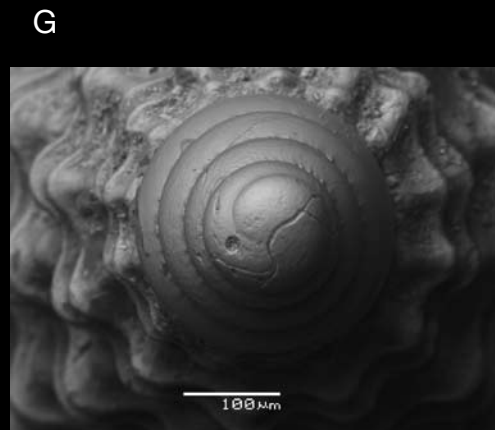
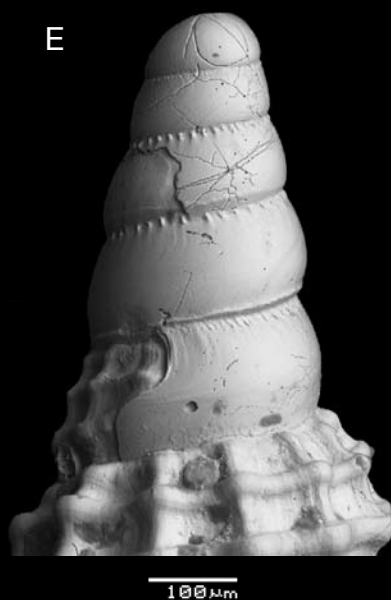
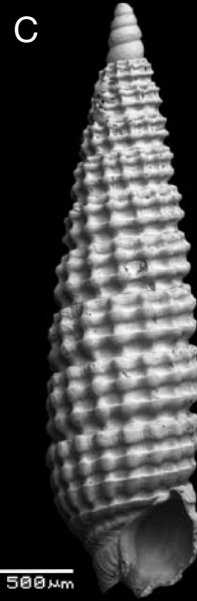
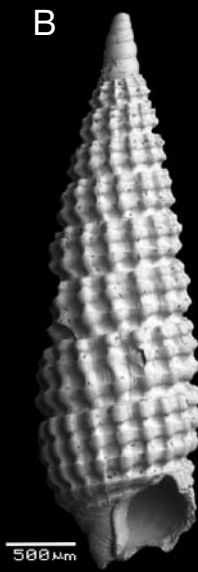
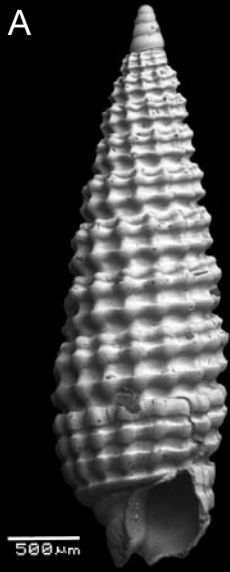
Protoconch conical, multispiral; whorls convex, with very weak mid-abapical angulation on last quarter of whorl in some species. Protoconch I with uneven, subsutural granular microprotuberances or apparently smooth. Protoconch II with short, slightly prosocline subsutural axial riblets or axial denticles; 1 suprasutural cord-like spiral followed downward by 1-2 threads present in some species. Transition to teleoconch abrupt, marked by opisthocline sinusigera lip and by the sudden appearance of adult sculpture. Teleoconch bottle-shaped to turriculate; spire more or less elevated, cyrtconoid or straight-sided; whorls rather depressed, nearly flat-sided; sutures impressed. Last whorl cup-shaped to ovate-cylindrical; base short, convex to flatly obconical, imperforated, with distinct neck. Aperture oval, with short or very short abapical canal inclined to shell axis. Sculpture of collabral ribs overridden by 3 robust spiral cords forming nodes at intersections; a fourth spiral, either weakly beaded or smooth, occurs on last whorl at level of suture; a fifth cord is present on upper base, bounded on both sides (only adapically in some species) by a shallow spiral depression.

Remarks

The genus is introduced here to accommodate species having a multispiral larval shell with protoconch II characterized by a subsutural row of axial riblets or denticles. Besides the type species (*Cerithiopsis nana*), *Nanopsis* gen. n. includes the Caribbean species *Cerithiopsis beneitoi* Rolán, Espinosa & Fernández-Garcés, 2007, *Cerithiopsis familiarum* Rolán, Espinosa & Fernández-Garcés, 2007, *Cerithiopsis juxtafuniculata* Rolán, Espinosa & Fernández-Garcés, 2007, *Cerithium albovittatum* C.B. Adams, 1850, *Cerithiopsis parvada* Rolán, Espinosa & Fernández-Garcés, 2007 and *Cerithiopsis* sp. 2 (of Rolan et al., 2007), the Red Sea *Cerithium pulvis* Issel, 1869 (re-

Fig. 2. A-C. *Prolixodens barleei* (Jeffreys, 1867). **A.** Syntypes of *Cerithiopsis barleei* Jeffreys, 1867, Jeffreys collection, USNM 62164 (5 specimens), Plymouth, Recent and USNM 62168 (4 specimens), locality unknown, Recent. **B, C.** Syntype from lot USNM 62164 (indicated by white arrow in **A**) designated herein lectotype of *Cerithiopsis barleei*, USNM 1147924. **B.** Shell. **C.** Protoconch. **D-G.** *Cerithiopsis tubercularis* (Montagu, 1803). **D, E.** Estepona, Spain, 2 m, private collection. **D.** Shell. **E.** Protoconch. **F.** Tasuçu, Turkey, 7 m, AC; detail of protoconch showing remnants of granular microprotuberances. **G.** Cala Guitgia, Lampedusa Island, 3 m, AC; apical view of protoconch.

Fig. 2. A-C. *Prolixodens barleei* (Jeffreys, 1867). **A.** Sintipi di *Cerithiopsis barleei* Jeffreys, 1867, collezione Jeffreys, USNM 62164 (5 esemplari), Plymouth, Attuale e USNM 62168 (4 esemplari), località sconosciuta, Attuale. **B, C.** Sintipo del lotto USNM 62164 (indicato dalla freccia bianca in **A**) qui designato come lectotipo di *Cerithiopsis barleei*, USNM 1147924. **B.** Conchiglia. **C.** Protoconca. **D-G.** *Cerithiopsis tubercularis* (Montagu, 1803). **D, E.** Estepona, Spagna, 2 m, collezione privata. **D.** Conchiglia. **E.** Protoconca. **F.** Tasuçu, Turchia, 7 m, AC; dettaglio della protoconca che mostra residui di microgranuli. **G.** Cala Guitgia, Lampedusa, 3 m, AC; veduta apicale della protoconca.



cently entered into the Mediterranean), and the Indian Ocean species *Cerithiopsis hadfieldi* Jay & Drivas, 2002, ? *Cerithiopsis lamyi* Jay & Drivas, 2002, *Joculator myia* Jay & Drivas, 2002 and *Joculator granata* Kay, 1979. In addition, two new Mediterranean species of *Nanopsis* are herein described. Pliocene specimens erroneously referred to as *Cerithiopsis tubercularis* (Montagu, 1803) by Landau et al. (2006, pl. 3, fig. 4) and Chirli (2009, pl. 6, figs 1-9), along with that described as *Cerithiopsis* sp. 2 by Bernasconi & Robba (1994, pl. 7, fig. 3) also belong here. The sculptural characters of the protoconch unambiguously distinguish *Nanopsis* from the other cerithiopsine genera having basically similar teleoconchs. Fossil records show that *Nanopsis* was already represented in the Pliocene of Spain and Italy. Modern species of *Nanopsis* are surely present in the Caribbean Sea, in the Mediterranean and in the Indian Ocean.

***Nanopsis buzzurroi* sp. n.**
(Fig. 3A-G)

? *Cerithiopsis* (s.s.) *tubercularis* (Montagu) - Glibert, 1973: p. 50, text-fig. 14 (not *Murex tubercularis* Montagu, 1803).
Cerithiopsis nana Jeffreys - Giribet & Peñas, 1997: p. 50, fig. 29 (not *Cerithiopsis nana* Jeffreys, 1867).
Cerithiopsis nana Jeffreys - van der Linden, 2000: p. 40 (pars), fig. 6, left (not *C. nana* Jeffreys, 1867).
Cerithiopsis tubercularis (Montagu) sensu auct. nec Marshall (1978) - Prkić & Mariottini, 2009: p. 6, figs 20-36, 54-55, 59-61 (not *Murex tubercularis* Montagu, 1803).

Holotype

Cannizzaro, Catania, Italy, MCSN Mo35228 (Fig. 3A, D).

Type locality

Ionian Sea, coast of Cannizzaro, 42 m depth.

Paratypes

Hammamet, Tunisia, 5 m: 19 spms., AC; Kerkennah, Tunisia, 2 m: 36 spms., AC; Gabès, Tunisia, 1 m: 1 spm., AC; Herradura, Spain, 32 m: 11 spms., AC; Juan Les Pins, France, 2 m: 1 spm., MNHN 23027 (Fig. 3C, F); Bonifacio, Sardinia, 20 m: 1 spm., AC (Fig. 3G), 2 spms., AC; Secca dei Gabiberi, Genova, 27 m: 1 spm., AC; Seno dell'Olivetta, Genova, 27 m: 1 spm., AC; Scoglio della Manza, Grosseto, 27 m: 1 spm., AC; Cannizzaro, Catania, 40 m: 2 spms., AC; Ognina, Siracusa, 50 m: 20 spms., AC; Cala Guitgia, Lampedusa Island, 3 m: 4 spms., AC; Cala Croce, Lampedusa Island, 2 m: 1 spm., AC; Bogsac, Turkey, 7 m: 4 spms., AC; Tasuçu, Turkey, 7 m: 1 spm., AC; Agaya Napa, Cyprus, 3 m: 1 spm., MCSN Mo35229 (Fig. 3B, E); Kirenia, Cyprus, 7 m: 13 spms., AC.

Other material examined

Charrane, Melilla, Morocco, 9 m: 20 spms., private coll.; Alboran Island, Spain, 22-24 m: 1 spm., private coll.; Majorca Island, Spain, 1 m: 3 spms., private coll.; Malaga, Spain, 22 m: 1 spm., private coll.; Estepona, Spain, 2 m: 3 spms., private coll.; Estepona, Spain, 23-25 m: 2 spms., private coll.; Andalusia, Spain, 2 m: 1 spm., private coll.; Centuri, Corsica Island, 2-4 m: 2 spms., private coll.; Lacona, Livorno, 4 m: 3 spms., private coll.; Formiche di Grosseto, 42 m: 27 spms., private coll.; Scilla, Reggio Calabria, 42 m: 5 spms., private coll.; Scilla, Reggio Calabria, 50 m: 2 spms., private coll.; Carini, Palermo, 80 m: 2 spms., private coll.; Messina, 7 m: 8 spms., private coll.; Cannizzaro, Catania, 22 m: 11 spms., private coll.; Cannizzaro, Catania, 42 m: 23 spms., private coll.; Cannizzaro, Catania, 45-46 m: 27 spms., private coll.; Acitrezza, Catania, 6 m: 1 spm., private coll.; Vendicari, Siracusa, 34 m: 2 spms., private coll.; Bahar ic-Caghaq, Malta, 5 m: 4 spms., private coll.; Otranto, Lecce, 3 m: 5 spms., private coll.; Adra, Central Adriatic Sea, 90 m: 1 spm., private coll.; Kanegra, Istria, Croatia, 2 m: 9 spms., private coll.; Porec, Istria, Croatia, 3 m: 23 spms., private coll.; Proizd, Vela Luka, Korkula, Croatia, 3-6 m: 9 spms., private coll.; Elefaniss, Greece, 2 m: 2 spms., private coll.; Lambiri, Greece, 23 m: 1 spm., private coll.; Agaya Napa, Cyprus, 3 m: 4 spms., private coll.

Derivation of name

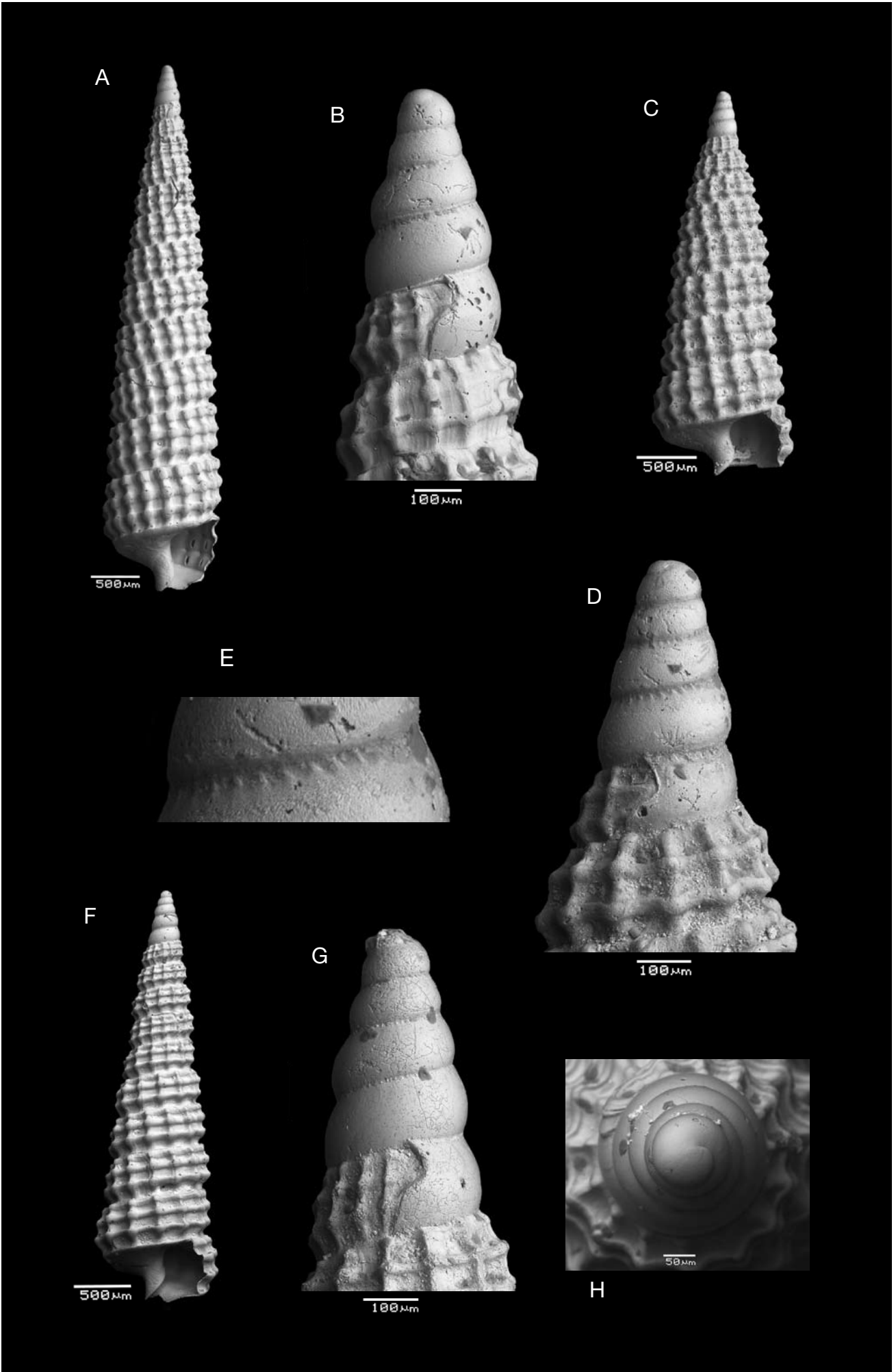
The species is named after the late Giovanni Buzzurro, a friend and Mediterranean malacologist.

Description

Larval shell conical, blunt-tipped, of 4.75-5.00 gently convex whorls, with very weak mid-abapical angulation on last quarter of whorl in some specimens; protoconch I with uneven, subsutural granular microprotuberances; protoconch II with short, slightly prosocline subsutural axial riblets and 1 suprasutural cord-like spiral followed downward by 2 threads, which emerge from adapical suture of first adult whorl (in some specimens) being soon overlapped by climbing up of the latter; diameter averaging 0.29 mm. Transition to teleoconch abrupt, marked by sinusigera lip and by sudden appearance of adult sculpture. Teleoconch turriculate; spire rather elevated, moderately cyrtocoid, AP 28°-35°, MSA averaging 18°; whorls up to 11, nearly flat-sided, as tall as about one half their diameter; sutures deeply impressed, SS 12°. Last whorl 30-34% of total height in fully grown specimens, cup-shaped, with maximum diameter at its adapical end, gradually taper-

Fig. 3. A-G. *Nanopsis buzzurroi* sp. n. **A, D.** Holotype, Cannizzaro, Catania, Italy, 42 m, MCSN Mo35228. **A.** Shell. **D.** Protoconch. **B, E.** Paratype, Agaya Napa, Cyprus, 3 m, MCSN Mo35229. **B.** Shell. **E.** Protoconch. **C, F.** Paratype, Juan Les Pins, France, 2 m, MNHN 23027. **C.** Shell. **F.** Protoconch. **G.** Paratype, Bonifacio, Sardinia, 20 m (AC); apical view of protoconch.

Fig. 3. A-G. *Nanopsis buzzurroi* sp. n. **A, D.** Olotipo, Cannizzaro, Catania, Italia, 42 m, MCSN Mo35228. **A.** Conchiglia. **D.** Protoconca. **B, E.** Paratipo, Agaya Napa, Cipro, 3 m, MCSN Mo35229. **B.** Conchiglia. **E.** Protoconca. **C, F.** Paratipo, Juan Les Pins, Francia, 2 m, MNHN 23027. **C.** Conchiglia. **F.** Protoconca. **G.** Paratipo, Bonifacio, Sardegna, 20 m (AC); veduta apicale della protoconca.



ing downward; base short, convex, imperforated, with distinct neck. Aperture oval, rather small, ending in a short abapical canal inclined to shell axis; outer lip thin, crenulated by spiral cords; columella slightly concave, with thick callus; abapical sinus rather narrow and deep. Sculpture of rather thin collabral ribs and over-riding, robust spiral cords forming bead-like nodes at intersections. The ribs, 12-14 on first whorl, 18-23 on last whorl, are straight, very slightly prosocline, thinner and more close together toward aperture, vanishing just adapical to lower suture. Three spirals start immediately, adapical thinner than other two and approximated to median one on spire whorls, of same strength and subequally spaced on last whorl; a fourth cord weakly beaded or smooth occurs on last whorl at level of suture; fully grown shells have another (fifth) spiral on upper base, bisected by a faint longitudinal groove in some specimens, bounded by 2 shallow spiral depressions separating it respectively from fourth cord and from adapical end of neck. Color bright reddish-brown, paler on adapical spiral of fresh shells.

Remarks

Nanopsis buzzuroi sp. n. superficially resembles *Cerithiopsis tubercularis* (Montagu, 1803) and has been mistaken for it by some workers. The differently sculptured protoconch stands as the most obvious distinguishing character. Moreover, the present new species differs from *C. tubercularis* because of its cup-shaped last whorl (that of *C. tubercularis* is ovate-cylindrical) and its spire whorls with approximated adapical and median spirals. Compared to *Nanopsis nana* (Jeffreys, 1867), *N. buzzuroi* sp. n. attains a larger size and has a differently sculptured protoconch II.

Distribution

N. buzzuroi sp. n. is a sublittoral element occurring throughout the Mediterranean Sea. Its presence in the Pliocene of Belgium (Glibert, 1973 sub *C. tubercularis*, see the above synonymy) needs to be confirmed.

Nanopsis denticulata sp. n. (Fig. 4A-H)

Cerithiopsis tubercularis (Montagu) - Grecchi, 1984: p. 22, pl. 2, fig. 11 (not *Murex tubercularis* Montagu, 1803).

Cerithiopsis tubercularis auct. - van Aartsen et al., 1984: p. 28, fig. 130.

Cerithiopsis tubercularis (Montagu) - Giannuzzi-Savelli et al., 1999: p. 38, fig. 50 (not *M. tubercularis* Montagu, 1803).

Fig. 4. A-H. *Nanopsis denticulata* sp. n. **A, B.** Holotype, Cannizzaro, Catania, Italy, 42 m, MCSN Mo35191. **A.** Shell. **B.** Protoconch. **C-E.** Paratype, Porto Palo di Capo Passero, Siracusa, 1 m, MCSN Mo35192. **C.** Shell. **D.** Protoconch. **E.** Detail of sutural area of **D** showing subsutural axial denticulations. **F, G.** Paratype, Agaya Napa, Cyprus, 3 m, MNHN 23028. **F.** Shell. **G.** Protoconch. **H.** Paratype, Occhio di Pellaro, Reggio Calabria, 20-25 m, AC; apical view of protoconch.

Fig. 4. A-H. *Nanopsis denticulata* sp. n. **A, B.** Olotipo, Cannizzaro, Catania, Italia, 42 m, MCSN Mo35191. **A.** Conchiglia. **B.** Protoconca. **C-E.** Paratipo, Porto Palo di Capo Passero, Siracusa, 1 m, MCSN Mo35192. **C.** Conchiglia. **D.** Protoconca. **E.** Dettaglio dell'area suturale di **D** mostrante le denticellature assiali subsuturali. **F, G.** Paratipo, Agaya Napa, Cipro, 3 m, MNHN 23028. **F.** Conchiglia. **G.** Protoconca. **H.** Paratipo, Occhio di Pellaro, Reggio Calabria, 20-25 m, AC; veduta apicale della protoconca.

Holotype

Cannizzaro, Catania, Italy, MCSN Mo35191 (Fig. 4A, B).

Type locality

Ionian Sea, coast of Cannizzaro, 42 m depth.

Paratypes

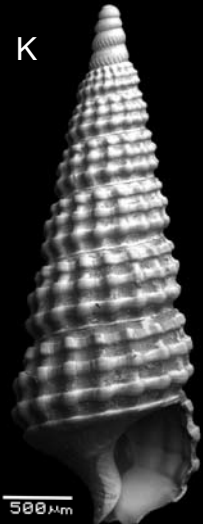
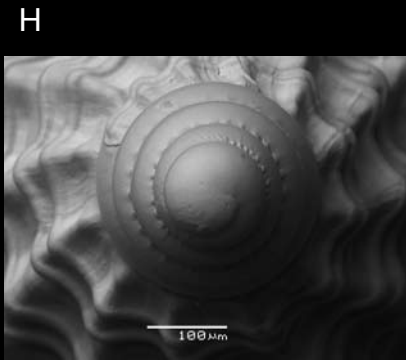
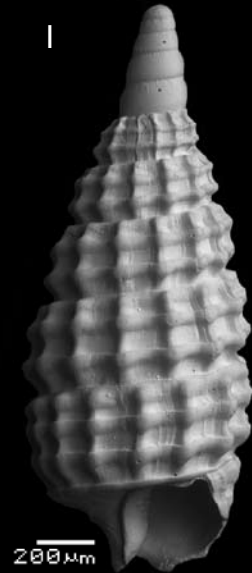
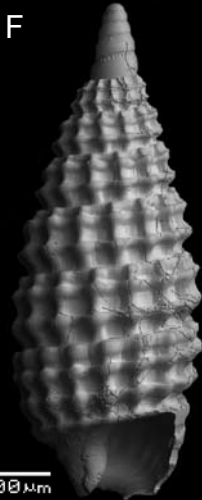
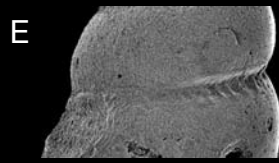
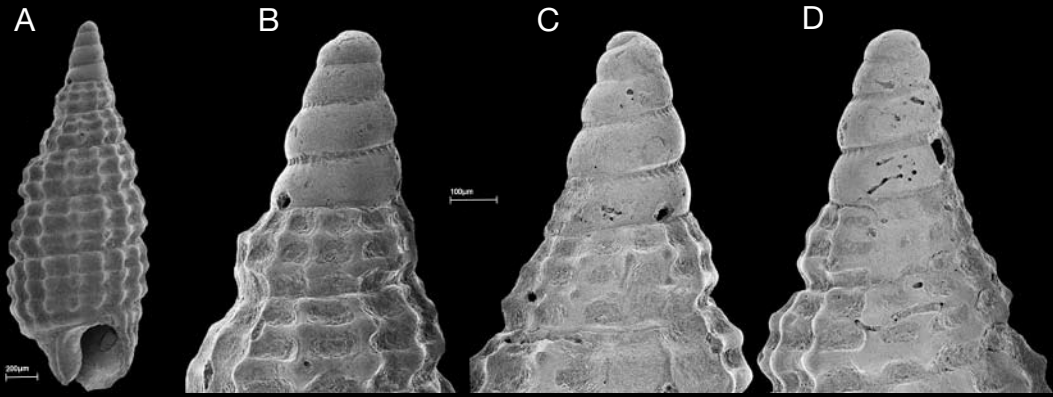
Hammamet, Tunisia, 5 m: 5 spms., AC; Kerkennah, Tunisia, 1 m: 110 spms., AC; Gabès, Tunisia, 1 m: 1 spm., AC; Herradura, Spain, 32 m: 1 spm., AC; Bonifacio, Sardinia, 20 m: 4 spms., AC; Secca dei Gabiberi, Genova, 27 m: 1 spm., AC; Seno dell'Olivetta, Genova, 27 m: 1 spm., AC; Capraia Island, 25 m: 5 spms., AC; Occhio di Pellaro, Reggio Calabria, 20-25 m: 1 spm., AC (Fig. 4H); Scilla, Reggio Calabria, 42 m: 5 spms., AC; Porto Palo di Capo Passero, Siracusa, 1 m: 1 spm., MCSN Mo35192 (Fig. 4C-E), 2 spms., AC; Ognina, Siracusa, 50 m: 20 spms., AC; Lampedusa Island, 2 m: 7 spms., AC; Tasuçu, Turkey, 7 m: 1 spm., AC; Agaya Napa, Cyprus, 3 m: 1 spm., MNHN 23028 (Fig. 4F, G); Kirenia, Cyprus, 7 m: 20 spms., AC.

Other material examined

Charrane, Melilla, Morocco, 9 m: 2 spms., private coll.; Estepona, Spain, 23-25 m: 2 spms., private coll.; Getares, Spain, 3 m: 11 spms., private coll.; Fuengirola, Spain, 20 m: 1 spm., private coll.; Centuri, Corsica Island, 2-4 m: 2 spms., private coll.; Lacona, Livorno, 4 m: 9 spms., private coll.; Scoglio della Manza, Grosseto, 27 m: 3 spms., private coll.; Scilla, Reggio Calabria, 50 m: 3 spms., private coll.; Carini, Palermo, 3 m: 11 spms., private coll.; Pace, Messina, 3 m: 1 spm., private coll.; Cannizzaro, Catania, 22 m: 7 spms., private coll.; Cannizzaro, Catania, 42 m: 26 spms., private coll.; Cannizzaro, Catania, 45-46 m: 17 spms., private coll.; Capo Murro, Siracusa, 2-4 m: 3 spms., private coll.; Vendicari, Siracusa, 2-3 m: 1 spm., private coll.; Torre Suda Racale, Lecce, 86 m: 2 spms., private coll.; Kanegra, Istria, Croatia, 2 m: 2 spms., private coll.; Bogsac, Turkey, 7 m: 4 spms., private coll.; Agya Napa, Cyprus, 3 m: 32 spms., private coll.; Akko, Israel, 1 m: 1 spm., private coll.

Derivation of name

From Latin *denticulatus* = with denticles, with reference to the subsutural denticles of the protoconch.



Description

Protoconch conical, rather blunt-tipped, of 4.75-5.15 gently convex whorls, weakly constricted adapically in some specimens; protoconch I apparently smooth; protoconch II with subsutural prosocline axial denticles; diameter averaging 0.27 mm. Transition to teleoconch abrupt, marked by sinusigera lip and by sudden appearance of adult sculpture. Teleoconch turruculate; spire elevated, straight-sided, SA averaging 17°; whorls up to 12, nearly flat-sided, less tall than one half their diameter; sutures deeply impressed, SS 13°. Last whorl ovate-cylindrical, 27% of total height in fully grown specimens, angular at transition to base, which is very short, flatly obconical, imperforated, with distinct neck. Aperture oval, ending in a very short abapical canal inclined to shell axis; outer lip thin, crenulated by spiral cords; columella straight, with thin callus; abapical sinus rather shallow. Sculpture of rather thin collabral ribs and overriding, robust spiral cords forming bead-like nodes at intersections. The ribs, 13-16 on first whorl, 14-19 on last whorl, are straight to slightly opisthocyrt, gently prosocline and vanish at the abapical suture; the spirals, 3 on spire whorls, start immediately, adapical and median ones more approximated on earlier whorls, of same strength and as broad as interspaces on middle and later whorls; a fourth thin and prominent, smooth cord occurs on last whorl at level of suture; fully grown shells have another (fifth) weak spiral on upper base, separated from the fourth by a shallow depression; base with coarse growth markings. Color bright reddish-brown.

Remarks

Also *Nanopsis denticulata* sp. n. has been confused with *Cerithiopsis tubercularis* (Montagu, 1803); again, the protoconch constitutes the primary distinguishing element. The species differs from the closely related *Nanopsis buzzurroi* sp. n. because of its larval shell devoid of suprasutural cordlet and having subsutural axial denticles instead of riblets, its straight-sided instead of cyrtocoid spire, its ovate-cylindrical instead of cup-shaped last whorl, its shorter abapical canal, and in details of teleoconch sculpture.

Distribution

N. denticulata sp. n. occurs in the infralittoral and upper circalittoral zones throughout the Mediterranean Sea.

Nanopsis nana (Jeffreys, 1867) comb. n. (Fig. 5A-I)

- Cerithiopsis tubercularis* var. *nana* Jeffreys, 1867: p. 267.
Cerithiopsis tubercularis var. *nana* - Jeffreys, 1885: p. 59.
not *Cerithiopsis nana* (S.V. Wood) - van Regteren Altena et al., 1955: p. 30, pl. 6, fig. 64 (= *Cerithium minimum* Brusina, 1865).
Cerithiopsis tubercularis var. *nana* Jeffreys - Waren, 1980: p. 25, pl. 4, fig. 16.
Cerithiopsis nana Jeffreys - van Aartsen et al., 1984: p. 29, fig. 133.
? *Cerithiopsis nana* (Jeffreys) - Palazzi, 1994: p. 79.
not *Cerithiopsis nana* Jeffreys - Cachia et al., 1996: p. 132, pl. 14, fig. 1.
Cerithiopsis nana Jeffreys - Giribet & Peñas, 1997: p. 50, figs 25.
Cerithiopsis tubercularis (Montagu) - Giribet & Peñas, 1997: p. 50, fig. 30 (not *Murex tubercularis* Montagu, 1803).
not *Cerithiopsis nana* Jeffreys - Giribet & Peñas, 1997: p. 50, fig. 29 (= *Cerithiopsis buzzurroi* sp. n.).
not *Cerithiopsis nana* sensu Auctores - Giannuzzi-Savelli et al., 1999: p. 40, fig. 66 (= *Cerithium minimum* Brusina, 1865).
Cerithiopsis nana Jeffreys - van der Linden, 2000: p. 40 (pars), fig. 6, right.
not *Cerithiopsis nana* Jeffreys - van der Linden, 2000: p. 40 (pars), fig. 5 (= *C. minimum* Brusina, 1865), fig. 6, left (= *C. buzzurroi* sp. n.).
not *Cerithiopsis* (s.l.) *nana* sensu van Aartsen et al., 1984 - Landau et al., 2006: p. 12, pl. 3, fig. 3 (likely a species to be named).
Cerithiopsis sp. 1 Baldoví, 2007: p. 36, figs 17, 18.
Cerithiopsis tubercularis var. *nana* sensu AA non Jeffreys - Cecalupo et al., 2008: pl. 38, fig. 5.
Cerithiopsis nana Jeffreys - Coppini, 2008: p. 9, fig. 133 (uppermost right); p. 16, figs on same page, lower row.
not *Cerithiopsis nana* Jeffreys - Coppini, 2008: p. 16, figs on same page, upper row (= *C. minimum* Brusina, 1865).

Type material

Syntypes of *Cerithiopsis tubercularis* var. *nana* Jeffreys, 1867, Jeffreys coll., USNM 62142 (3 specimens), Guernsey Island, Recent. One syntype, renumbered USNM 1147923, is here designated lectotype of *Cerithiopsis nana* (Fig. 5A-E). The other two syntypes are paralectotypes.

Other material examined

Sidi Frei, Kerkennah, Tunisia, 2 m: 1 spm., AC (Fig. 5I); Alboran Island, Spain, 22-24 m: 1 spm., AC (Fig. 5F-H); Getares, Spain, 2 m, 1 spm., AC; Juan Les Pins, France, 50 m: 1 spm., private coll.; Cannizzaro, Catania, 40 m: 1 spm., private coll.; Cannizzaro, Catania, 45-46 m: 2

Fig. 5. A-I. *Nanopsis nana* (Jeffreys, 1867). **A-E.** Syntype of *Cerithiopsis tubercularis* var. *nana* Jeffreys, 1867 herein designated lectotype of *Cerithiopsis tubercularis* var. *nana*, USNM 1147923. **A.** Shell. **B-D.** Three views of protoconch from different angles. **E.** Detail of **C** showing axial microsculpture. **F-H.** Alboran Island, Spain, 22-24 m (AC). **F.** Shell. **G.** Protoconch. **H.** Apical view of protoconch. **I.** Sidi Frei, Kerkennah, Tunisia, 2 m (AC). **J, K.** *Prolixodens barleei* (Jeffreys, 1867), Hvar Channel, Croatia, 3 m (AC). **J.** Protoconch. **K.** Shell.

Fig. 5. A-I. *Nanopsis nana* (Jeffreys, 1867). **A-E.** Sintipo di *Cerithiopsis tubercularis* var. *nana* Jeffreys, 1867 qui designato come lectotipo di *Cerithiopsis tubercularis* var. *nana*, USNM 1147923. **A.** Conchiglia. **B-D.** Tre vedute della protoconca da differenti angolazioni. **E.** Dettaglio di **C** che mostra la microscultura assiale. **F-H.** Isola di Alboran, Spagna, 22-24 m (AC). **F.** Conchiglia. **G.** Protoconca. **H.** Veduta apicale della protoconca. **I.** Sidi Frei, Kerkennah, Tunisia, 2 m (AC). **J, K.** *Prolixodens barleei* (Jeffreys, 1867), Canale di Hvar, Croazia, 3 m (AC). **J.** Protoconca. **K.** Conchiglia.

spms., private coll.; Otranto, Lecce, 25 m: 4 spms., private coll.; Bahar ic-Caghaq, Malta, 5 m: 3 spms., private coll.; Kanegra, Istria, Croatia, 3 m: 2 spms., private coll.; Porec, Vela Luka, Korkula, Croatia, 3-6 m: 14 spms., private coll.; Proizd, Vela Luka, Korkula, Croatia, 3-6 m: 4 spms., private coll.; Calcidia, Greece: 19 spms., private coll.; Kirenia, Cyprus, 7 m, 1 spm., AC.

Description

Protoconch conical to narrowly conical, of 4.00-4.50 gently convex whorls with subangular periphery at abapical one fifth; protoconch I apparently smooth; protoconch II with subsutural prosocline very short riblets; diameter averaging 0.29 mm. Transition to teleoconch abrupt, marked by sinusigera lip and by sudden appearance of adult sculpture. Teleoconch small, bottle-shaped; spire moderately elevated, cyrtoconoid, SA averaging 28°; whorls up to 6, weakly convex, as tall as about one half their diameter; sutures impressed, SS 10°. Last whorl ovate-cylindrical, 40% of total height in fully grown specimens; base quickly tapering, imperforated, with distinct neck. Aperture oval, ending in a very short abapical canal inclined to shell axis; outer lip thin, crenulated by spiral cords, produced abapically; columella straight, with thick, broad callus; abapical sinus deep and rather narrow. Sculpture of moderately thin collabral ribs and overriding, robust spiral cords forming bead-like nodes at intersections. The ribs, 14 on first whorl, 19 on last whorl, are straight, orthocline and vanish at abapical suture; the spirals, 3 on spire whorls, start immediately, are of increasing strength downward on earlier whorls, of same strength and equally spaced on last whorl, broader than interspaces; a fourth robust, weakly beaded cord occurs on last whorl at level of suture; fully grown shells have another (fifth) spiral on upper base, bounded by 2 shallow spiral depressions separating it respectively from fourth cord and from adapical end of neck. Color bright yellowish-brown or reddish-brown, darker on adapical spiral (less so on median one) in some specimens.

Remarks

The name *nana* Jeffreys, 1867 raises two nomenclatural problems. The first is easily solved; the second is complex and requires a ruling of the International Commission on Zoological Nomenclature

1) *Cerithiopsis tubercularis* var. *nana* Jeffreys would be a junior secondary homonym of *Cerithium tuberculare* var. *nanum* Wood, 1848 (Marquet, 1997; Landau et al., 2006). According to the description and the illustration published by Marquet (1997, p. 81, pl. 5, fig. 2), Wood's variety results to be a distinct species belonging to the genus *Bittium* Leach in Gray, 1847 because of its paucispiral protoconch and its apertural characters. Since the var. *nana* Jeffreys was never renamed in *Cerithium*, there is no necessity of a substitute name (I.C.Z.N., 1999, Article 59 of the Code).

2) Mayer (1864, p. 66) described the new species *Cerithi-*

opsis nana from Pleistocene deposits (cf. Garcia-Talavera, 1990 and Ávila et al., 2002) at Prainha, Santa Maria Island, Azores Archipelago. On the basis of the original diagnosis, the clear illustration (pl. 6, fig. 46) and the remarks published by Mayer, the species appears to differ markedly from *Cerithiopsis tubercularis* var. *nana* Jeffreys, 1867 and is better allocated in the genus *Bittium* Leach in Gray, 1847 on account of its paucispiral protoconch and sculptural characters. Whatever the actual generic assignment of Mayer's species, the name *nana* Jeffreys, 1867 results to be a junior primary homonym of *nana* Mayer and would be permanently invalid (Article 57.2 of the Code).

However, the junior homonym *nana* Jeffreys appears to meet the conditions of Article 23.9.1.2 of the Code since it has been used as a valid name (*Cerithiopsis tubercularis* var. *nana* Jeffreys or *Cerithiopsis nana* Jeffreys) and dealt with or cited in a number of papers during the last 50 years (Waren, 1980; van Aartsen et al., 1984; Sabelli et al., 1990; Poppe & Goto, 1991; Cachia et al., 1993; Palazzi, 1994; Arduino et al., 1995; Cachia et al., 1996; Giribet & Peñas, 1997; Cecalupo & Villari, 1997; Campani, 1999; Vio & De Min, 1999; van der Linden, 2000; Callapez & Ferreira Soares, 2000; Peñas & Almera, 2001; Tarruella Ruestes, 2002; Cecalupo & Buzzurro, 2004; Cachia et al., 2004; Terlizzi et al., 2005; Repetto et al., 2005; Tarruella Ruestes & Lopez Soriano, 2006; Prkic & Buzzurro, 2007; Coppini, 2008; Prkic & Mariottini, 2009; Capdevila & Folch, 2009 among others). To our knowledge, the senior homonym *nana* Mayer was listed twice after 1899 (Garcia-Talavera, 1990 and Ávila et al., 2002) and, consequently, the conditions in Article 23.9.1.1 of the Code are not met. Nevertheless, considering that Mayer's species is to be removed from *Cerithiopsis* and be assigned to *Bittium*, that the name *nana* Jeffreys meets the conditions of Article 23.9.1.2 and that the name *nana* Mayer after its introduction has appeared only in two lists, we think that the younger but prevalently used name *nana* Jeffreys is to be maintained in order to avoid confusion and promote stability. We shall refer the matter to the Commission for a ruling under the plenary power.

Subsequent to its creation, *Cerithiopsis tubercularis* var. *nana* Jeffreys, 1867 has been regarded either as a dwarf, bottle-shaped form (hence a synonym) of *Cerithiopsis tubercularis* (Montagu, 1803) or as a distinct species. We consider it to be a species readily separated from *C. tubercularis* primarily on the basis of its clearly different protoconch bearing subsutural axial riblets instead of spiral rows of granular microprotuberances; the small, pupoid teleoconch of adult specimens is another distinguishing character. *Nanopsis pulvis* (Issel, 1869) is related, but differs in protoconch characters (whorls with rounded periphery, more delicate subsutural axials, more opisthocline sinusigera lip) and in color pattern. *Cerithium minimum* Brusina, 1865 is closely similar in terms of teleoconch shape, but is clearly separated from the present species because of its larval shell devoid of subsutural axials; it belongs to the genus *Cerithiopsis* Forbes & Hanley, 1851.

Distribution

N. nana is an infralittoral element occurring in the eastern Atlantic and throughout the Mediterranean Sea.

Genus *Prolixodens* Marshall, 1978

(type species *Cerithiopsis infracolor* Laseron, 1951)

On the basis the species originally assigned to *Prolixodens* and of others herein included in it (see below), the characters of the genus can be outlined as follows. Protoconch conical, multispiral; whorls convex, last or last half whorl medially carinated and with a few opisthocyrt brepthic axials in some species. Protoconch I with minute granular microprotuberances. Protoconch II with prosocline, crisp axial riblets on mid-abapical part and substratal granules obscurely arranged into spiral rows. Transition to teleoconch abrupt, marked by opisthocline sinusigera lip and by sudden appearance of adult sculpture. Teleoconch turriculate; spire more or less elevated, slightly cyrtocoid; whorls rather depressed, nearly flat-sided; sutures impressed. Last whorl ovate-cylindrical; base flatly obconical to excavated, imperforated, with distinct neck. Aperture ovate to ovate-quadrangular, with short abapical canal inclined to shell axis. Sculpture of collabral ribs overridden by 3 spiral cords forming nodes at intersections; a fourth spiral, either beaded or smooth, occurs on last whorl at level of suture; base unsculptured or with an upper basal spiral in some species.

The genus is characterized by the sculptural characters of the larval shell and by the lack of basal sculpture occurring in most species. Besides the Australian and New Zealand species originally included in *Prolixodens* (*Cerithiopsis dannevigii* Hedley, 1911, *C. infracolor* Laseron, 1951, *Prolixodens benthica* Marshall, 1978 and *P. crassa* Marshall, 1978), the genus is used here to accommodate the Caribbean species *Cerithiopsis apexcostata* Rolán, Espinosa & Fernández-Garcés, 2007 and *Cerithiopsis ara* Dall & Bartsch, 1911, the eastern Atlantic and/or Mediterranean species *Cerithiopsis barleei* Jeffreys, 1867, *Cerithiopsis cecalupoi* Chirli, 2009 (a Pliocene fossil), *Cerithiopsis fayalensis* Watson, 1886, *Cerithiopsis scalaris* Locard, 1892 and *Cerithiopsis tarruellasi* Peñas & Rolan, 2006, and the New Zealand species *Joculator sublima* Marshall, 1978. It is of note that the protoconchs of Australian and New Zealand species are more densely and roughly sculptured, whereas those of western species are of light built, i.e. are in comparison more delicately sculptured. The Caribbean and Atlantic/Mediterranean species herein assigned to *Prolixodens* have been currently included in *Cerithiopsis* Forbes & Hanley, 1851. However, the species of *Cerithiopsis* (*sensu stricto*, as herein defined) differ markedly primarily because of their protoconchs, also multispiral, but devoid of ribs and bearing only granular microprotuberances or looking smooth; moreover, they have 1-2 upper basal spiral cords that do not occur in most species of *Prolixodens*.

Horologica was introduced by Laseron (1956, p. 172) for

a lot of Australian species having multispiral, apparently smooth protoconchs, small, bottle-shaped teleoconch with 2 spiral cords on spire whorl, 4 on the last whorl including the uppermost basal one. Marshall (1978, p. 86) expanded the genus concept assigning to *Horologica* the New Zealand species *Cerithiopsis dirempta* Odhner, 1924, which also has 2 cords on spire whorls. The larval shell of *C. dirempta* somewhat resembles that of *Prolixodens*, but has the protoconch II with clearly shouldered whorls and definitely coarser sculpture. Whatever the actual meaning of *Horologica*, this genus appears to differ from *Prolixodens* because it combines protoconch characters (whorls smooth or shouldered and ribbed below shoulder) with sculptural features of the teleoconch (2 cords on spire whorls, 1 upper basal cord) that are unlike those of *Prolixodens*.

Prolixodens appears to have existed in the Pliocene of Italy, Spain and Belgium (cf. Bernasconi & Robba, 1994, pl. 7, fig. 1; Marquet, 1997; Landau et al., 2006; Chirli, 2009). Its modern representatives occur in the Caribbean Sea, in the eastern Atlantic, in the Mediterranean and in Australian and New Zealand waters.

Prolixodens barleei (Jeffreys, 1867) comb. n. (Figs 2A-C, 5J, K)

Cerithiopsis barleei Jeffreys, 1867: p. 268.

Cerithiopsis barleei - Jeffreys, 1869: p. 217, pl. 81, fig. 2.

Cerithiopsis barleei Jeffreys - Jeffreys, 1885: p. 307.

Cerithiopsis barleei Jeffreys - Watson, 1886: p. 91, pl. 4, fig. 4a.

Cerithiopsis barleei Jeffreys - Kobelt, 1908: p. 117, pl. 120, fig. 8.

Cerithiopsis barleei Jeffreys - Lebour, 1933: p. 497, pl. 1, figs 12, 13; pl. 2, figs 1-16.

Cerithiopsis barleei (Jeffreys) - Fretter & Pilkington, 1970: p. 10, fig. 8.

Cerithiopsis barleei Jeffreys - Parenzan, 1970: p. 110, fig. 375.

Cerithiopsis barleei Jeffreys - Hubendick & Waren, 1972: p. 47.

Cerithiopsis barleei Jeffreys - Rodriguez Babio & Thiriot-Quévieux, 1974: p. 536, pl. 3, fig. F.

Cerithiopsis barleei Jeffreys - Richter & Thorson, 1975: p. 162, pl. 5, figs 28, 29.

not *Cerithiopsis* cf. *barleei* (Jeffreys) - Nordsieck, 1976: p. 6, fig. 4 (likely a species to be named).

? *Cerithiopsis tubercularis* (Montagu) - Marshall, 1978: p. 83, fig. 13C (not *Murex tubercularis* Montagu, 1803; see the above discussion on *C. tubercularis*).

Cerithiopsis barleei Jeffreys - Waren, 1980: p. 25, pl. 4, fig. 13.

Cerithiopsis barleei Jeffreys - Fretter & Graham, 1982: p. 369, fig. 259.

Cerithiopsis barleei Jeffreys - Graham, 1988: p. 468, text-fig. 197.

? *Cerithiopsis barleei* Jeffreys - Cachia et al., 1996: p. 129, pl. 13, figs 5, 5a.

Cerithiopsis barleei Jeffreys - Marquet, 1997: p. 82, pl. 5, fig. 1.

Cerithiopsis barleei Jeffreys - Giannuzzi-Savelli et al., 1999: p. 35, fig. 36.

Cerithiopsis (*s.l.*) *barleei* Jeffreys - Landau et al., 2006: p. 12, pl. 3, fig. 2.

Cerithiopsis barleei Jeffreys - Coppini, 2008: p. 10, figs on same page, lower right.

Cerithiopsis barleei Jeffreys - Chirli, 2009: p. 4, pl. 1, figs 8-15.

Cerithiopsis barleei Jeffreys - Peñas et al., 2009: p. 31, fig. 9.

Type material

Syntypes of *Cerithiopsis barleei* Jeffreys, 1867, Jeffreys coll., USNM 62164 (5 spms.), Plymouth, Recent and USNM 62168 (4 spms.), locality unknown, Recent (Fig. 2A). One syntype from lot USNM 62164, renumbered USNM 1147924, is here designated lectotype of *Cerithiopsis barleei* (Fig. 2B, C). The rest of the syntypes are paralectotypes.

Material examined

Harredura, Spain, 20 m: 7 spms., private coll.; Getares, Spain, 3 m: 1 spm., private coll.; Le Grau du Roi, France, 2 m: 2 spms., private coll.; Punta Chiappa, 45-50 m: 4 spms., private coll.; Gorgona Island, 45 m: 4 spms., private coll.; Gorgona Island, 80-90 m: 9 spms., private coll.; Bonifacio, 25 m: 2 spms., AC; Bonifacio, 45 m: 4 spms., AC; Bonifacio, 80 m: 2 spms., AC; Porto Torres, Sassari, 5 m: 13 spms., private coll.; Carini, Palermo: 3 spms., private coll.; Cannizzaro, Catania, 42 m: 12 spms., private coll.; Vendicari, Siracusa, 2-3 m: 1 spm., private coll.; River Po delta area, 1 m: 2 spms., private coll.; Chioggia, Venezia, 3 m: 5 spms., private coll.; Hvar Channel, Croatia, 3 m: 1 spm., AC (Fig. 5J, K), 8 spms., AC; Tasuçu, Turkey, 2 m: 3 spms., private coll.; Tasuçu, Turkey, 7 m: 1 spm., AC; Tasuçu (Silifke), Turkey, 1.5 m: 7 spms., private coll.

Description

Protoconch conical, rather blunt-tipped, of 4.50-5.00 convex whorls, with maximum diameter at about mid-way between sutures; last half whorl (or less) medially carinated and with a few opisthocyrt brephic axials on shoulder slope; protoconch I with minute granular microprotuberances forming irregular spiral rows; protoconch II with about 30 prosocline, crisp axial riblets on mid-abapical part of whorls and subsutural coarser granules obscurely arranged into spiral rows; a smooth band of variable breadth intervenes in between adapical end of riblets and subsutural granules. Transition to teleoconch abrupt, marked by sinusigera lip and by sudden appearance of adult sculpture. Teleoconch turriculate; spire elevated, straight-sided, SA 18°-22°; whorls up to 10, nearly flat-sided, as tall as one half their diameter or slightly more so; sutures impressed, SS 17°. Last whorl ovate-cylindrical, 40% of total height in fully grown specimens, subangular at transition to base, which is very short, flatly obconical, imperforated, with evident neck. Aperture ovate-quadrangular, ending in a short abapical canal inclined to shell axis; outer lip thin, crenulated by spiral cords; columella straight, with very narrow, thin callus; abapical sinus moderately broad and rather shallow. Sculpture of collabral ribs and overriding spiral cords forming bead-like nodes at intersections. The ribs, 15-18 on first whorl, 18-24 on last whorl, are straight, orthocline and vanish close to abapical suture; the cords, 3 on spire whorls, start immediately, are equal, equally spaced and as broad as interspaces; a fourth flat-topped, nearly smooth spiral occurs on last whorl at level of suture (it slightly emerges from

abapical suture on later spire whorls); base smooth except for growth markings. Color light reddish-yellow.

Remarks

Cerithiopsis fayalensis Watson, 1886 and *Cerithiopsis scalaris* Locard, 1892 (herein included in *Prolixodens*) appear to be closely related to *Prolixodens barleei*. According to the original remarks provided by Watson (1886, pp. 91, 92), the former species would differ from *P. barleei* in having the protoconch with stronger and fewer riblets (about 20 instead of 30) and in minor details of teleoconch sculpture. *C. scalaris* seems to have fewer protoconch riblets too and a telescope-shaped teleoconch. However, the descriptions and SEM illustrations of the protoconch published in recent literature for both Watson's and Locard's species are somewhat discrepant from one another. Consequently, the examination of respective type material is necessary in order to correctly interpret these taxa and safely state their relationships with *P. barleei*. *Cerithiopsis tarruellasi* Peñas & Rolan, 2006 has the protoconch similar to that of *P. barleei* in shape, but with more distinctly shouldered whorls and with the axials crossed by 4-5 fine spiral threads; moreover, the teleoconch of *C. tarruellasi* is clearly cyrtocoid whereas that of *P. barleei* is straight-sided. The Pliocene *Cerithiopsis cecalupoi* Chirli, 2009 (also included in *Prolixodens*) is readily distinguished from *P. barleei* because of its bottle-shaped teleoconch.

Distribution

C. barleei was confidently recovered from Pliocene deposits of Belgium, Spain and Italy; other fossil records are not verifiable and need to be confirmed. The species ranges at present in the eastern Atlantic and throughout the Mediterranean.

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