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Cretan subspecies of  
*Metafruticicola nicosiana*  
Neubert & Hirschfelder  
(p.60)

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# A new mathildid from Saint Helena Island, South Atlantic Ocean (Gastropoda, Heterobranchia, Mathildidae)

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A new species of the family Mathildidae Dall, 1889, *Mathilda brownae* spec. nov. from Saint Helena Island, South Atlantic Ocean is herein described. Based on shell characters, the new species is clearly distinguishable from all the Recent members of the family by the shape and sculpture of the teleoconch and the peculiar protoconch morphology.

Key words: Gastropoda, Heterobranchia, Mathildidae, *Mathilda*, taxonomy, protoconch, South Atlantic Ocean.

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## INTRODUCTION

The family Mathildidae Dall, 1889, is a group of marine gastropods with a wide geographic distribution. Mathildids are probably associated with cnidarians on which they feed because their sister group, the Architectonicidae Gray, 1840, shows similar anatomical features (Bieler, 1993). The larval shell morphology suggests a long pelagic phase. Mathildid shells are high-spined, usually with a hyperstrophic protoconch and with teleoconch sculpture consisting of intersecting axial and spiral ribs (Haszprunar, 1988; Bieler, 1992; 1995). The Mathildoidea Dall, 1889, is reported from the Triassic (Bieler, 1995). At present, there is no phylogenetic relationship reconstruction at the species-level of this group of gastropods reported so far.

Several authors have implied an amphi-Atlantic distribution for some mathildid species (Bieler, 1995), e.g. *Mathilda gemmulata* Semper, 1865, sub nomen *M. canariensis* Dautzenberg, 1898 (Nordsieck & Talavera, 1979), and *M. gemmulata* Semper, 1865, sub nomen *M. barbadensis* Dall, 1889 (Talavera-Casas, 1982) by synonymizing western Atlantic species with one or several eastern Atlantic and Mediterranean forms (Talavera-Casas, 1982; Bieler, 1995 and references therein; Smriglio et al., 2007; Hernández et al., 2011). In particular, *M. barbadensis* Dall, 1889, was reported for the Mediterranean Sea (Rocchini, 2004), but this was a still undescribed species, which was described later on as *M. letei* Prkic & Smriglio 2007 (Smriglio et al., 2007).

From Saint Helena, the genus *Mathilda* Semper, 1865, is represented by a single species, reported by Smith (1890) as *Cingulina (Mathilda) quadricarinata* Brocchi, 1814. Smith (1890) discussed the systematic position of the genus *Mathilda*, considering it a subgenus of *Cingulina* A. Adams, 1860 (sic!). According to WoRMS (2016) the two taxa *Mathilda* and *Cingulina* are not considered subgenera and are ascribed to different families, viz. Mathildidae Dall, 1889, and Pyramidellidae J. E. Gray, 1840, respectively. Gofas et al. (2011) reported the geographical distribution of *M. quadricarinata*, which ranges from Sao Vicente Cape (Portugal) to Angola in the eastern Atlantic Ocean, and also occurs in the Mediterranean Sea. We had the

opportunity to examine four shells of a mathildid collected from Saint Helena Island that are described here as *Mathilda brownae* spec. nov.

Abbreviations: CS-PM, Carlo Smriglio and Paolo Mariottini (Rome, Italy); FIB/SEM, Focused Ion Beam/Scanning Electron Microscopy; FS, Frank Swinnen (Lutlommel, Belgium); LIME, Laboratorio Interdipartimentale Microscopia Elettronica, Università Roma Tre (Rome, Italy); MNHN, Museum National d'Histoire Naturelle (Paris, France); RBINS, Royal Belgian Institute of Natural Sciences (Brussels, Belgium). For shell characters: D, diameter; H, height; PD, protoconch diameter (in  $\mu\text{m}$ ); TW, teleoconch whorls (number).

#### MATERIAL AND METHODS

Shells of *Mathilda brownae* spec. nov. were extracted from sediment collected by SCUBA diving along the coast of Saint Helena Island. Comparative material of *M. quadricarinata* from the collection of CS-PM was from: Anzio, Latium, Italy, 50 m (4 shells); Trapani, Sicily, Italy, 90 m (1 specimen); Alboran sea, Spain, 60 m (1 shell); Malaga, Spain, 80/90 m (1 shell); West Sahara, 50/60 m (1 shell). Comparative material of *M. gemmulata* from the same collection was from: Linosa Island, Sicily, Italy (1 shell); Canary Islands, Spain (1 shell).

For sorting and to investigate the gross morphology a stereo microscope was used. The micro morphology of the specimens was examined with the Dualbeam FIB/SEM - Helios Nanolab (FEI Company, Eindhoven, The Netherlands) at the LIME (Rome, Italy).

Current systematics is based on WoRMS (<http://www.marinespecies.org/about.php>) and diagrams of spiral sculpture of *Mathilda* shells on Bieler (1995).

#### SYSTEMATICS

Mathildidae Dall, 1889

##### *Mathilda* Semper, 1865

Type species (by subsequent designation of De Boury, 1883: 112): *Turbo quadricarinatus* Brocchi, 1814; Pliocene, Italy.

##### *Mathilda brownae* spec. nov. (Figs 1a-2f; 3a-4b; 5a-e)

Type series. — Holotype (MNHN IM-2000-32513), Long Ledge, Saint Helena Island, South Atlantic Ocean, (15°56' S, 5°42' W), 11-29 m depth, bioclastic sediment. Paratype A (RBINS I.G. 33276), Egg Island, 29 m depth; paratypes B (FS) and C (CS-PM) from Bernetts Point towards Lady's Chair, 23 m depth. A post-metamorphic specimen (CS-PM) has been screened in a sediment collected at the Ascension Island, English Bay, in Lava Tunnel, 9 m depth.

Description. — Shell small for the family (H 3.3 × D 1.5 mm, holotype), high-spined, cone-shaped, moderately slender; last whorl about 0.4 times of total height. Protoconch globular, transparent whitish, hypertrophic, approximately diverging 40-45° from teleoconch axis, adorned by radial wrinkles on both apical and umbilical sides. Apical radial wrinkles are longer than the umbilical ones. Embryonic whorls exposed (the first whorl visible, only partially covered), multi-spiral, consisting of approximately two whorls; protoconch diameter 420  $\mu\text{m}$  (holotype).

Teleoconch milky-white, spotted by large orange blotches, translucent, semitransparent; cone shaped with convex whorls. Suture not distinct. Pattern of spiral (more prominent) and axial ribs (24 on last whorl) crossing at approximately right angles in the upper part of the whorl, spirals ribs are slightly opisthoclinal in the lower part. Spiral and axial ribs forming prominent nodules that to some extent are nearly aculeate at several intersections. Regular spacing between axial and spiral ribs, their crossing form a well ordered narrower rhomboidal arrangement in the upper part of the whorl, while more regular rhomboids in the lower part. The larger rows of rectangles and rhomboids are above and below the most prominent primary spiral rib that is positioned almost in the centre of the spire. Spiral sculpture consisting in a rib pattern as "1+1+2". The four ribs on the upper part of the whorl are quite evident, the first one is thin, near the suture and exposed at the base of shell; the second one is very thin, while the robust third and fourth show twice the strength of the first one. The lower half of the whorl displays the strongest ribs, while in the upper part of the whorl the smaller ribs are present. One strong and exposed basal rib (fig. 2c) and five fine spiral regular threads are visible at the base, crossed by many axial growth lines. Umbilicus closed. Aperture small, rounded, columellar and outer lips thin.

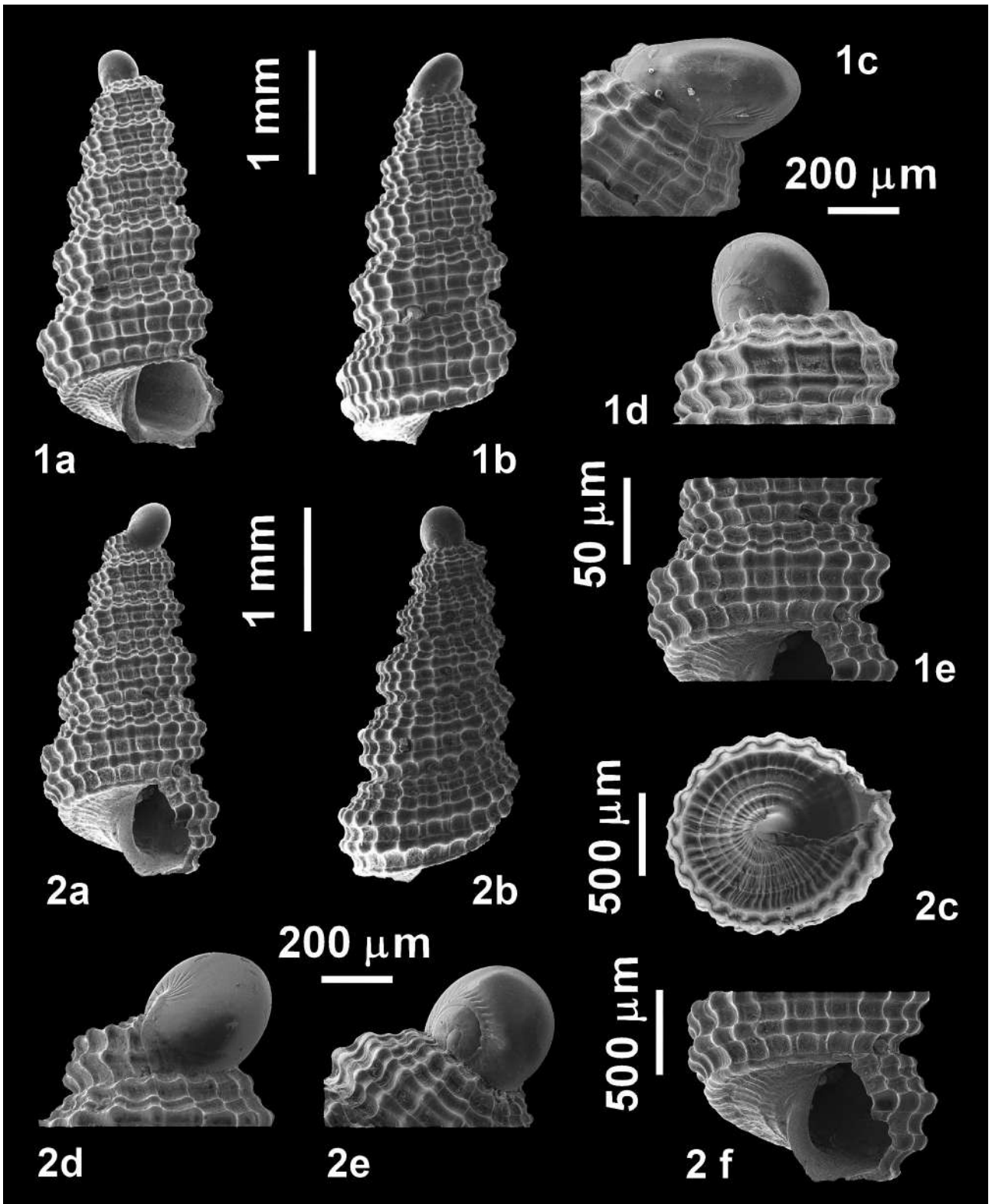
Distribution. — So far only known from the islands of St. Helena and Ascension.

Etymology. — The species is named for Dr Judith Brown, project manager of the Darwin Initiative research project 'Mapping St Helena's marine biodiversity to create a marine management plan'.

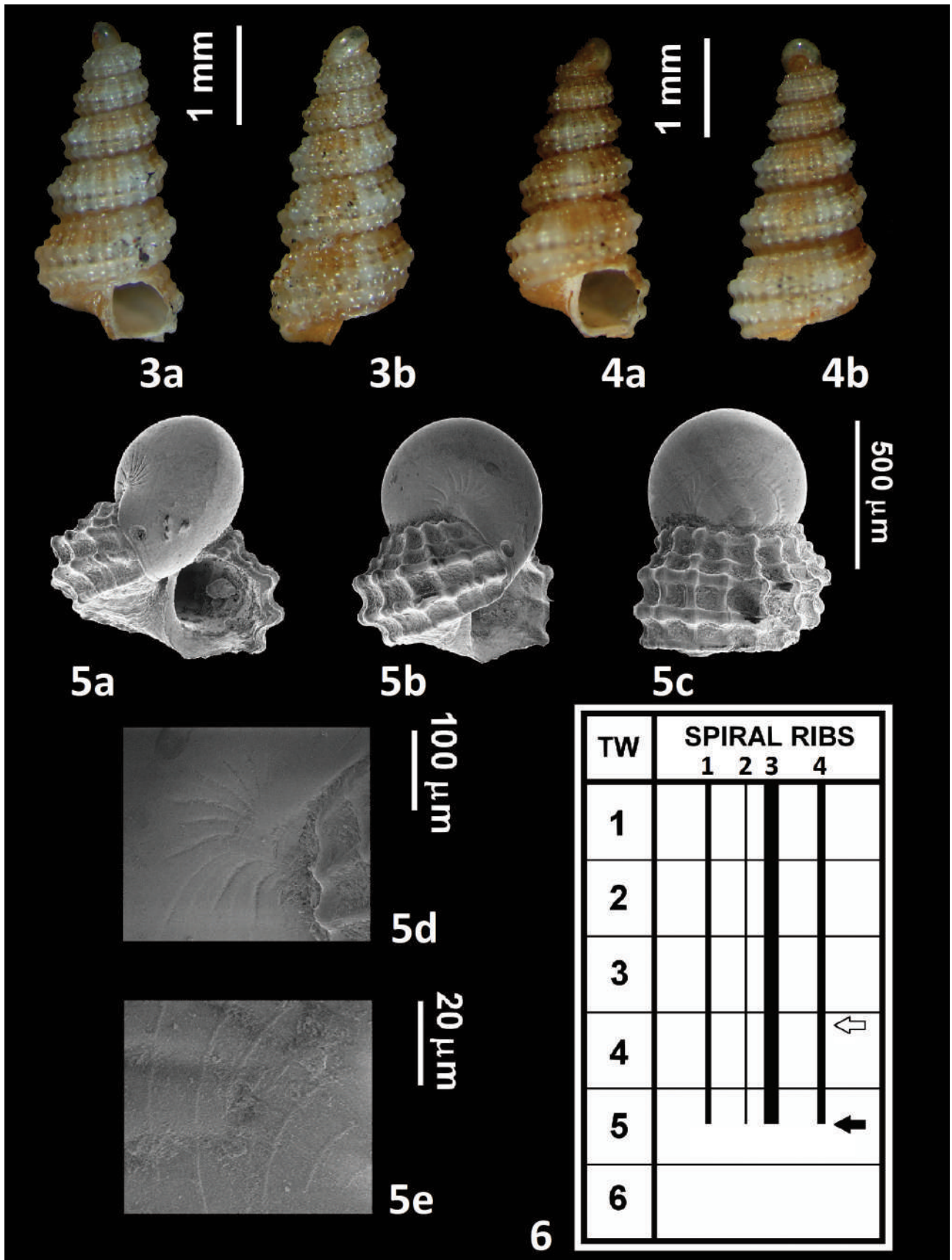
Dr Brown collected the marine sediment samples in which the shells were discovered.

#### DISCUSSION

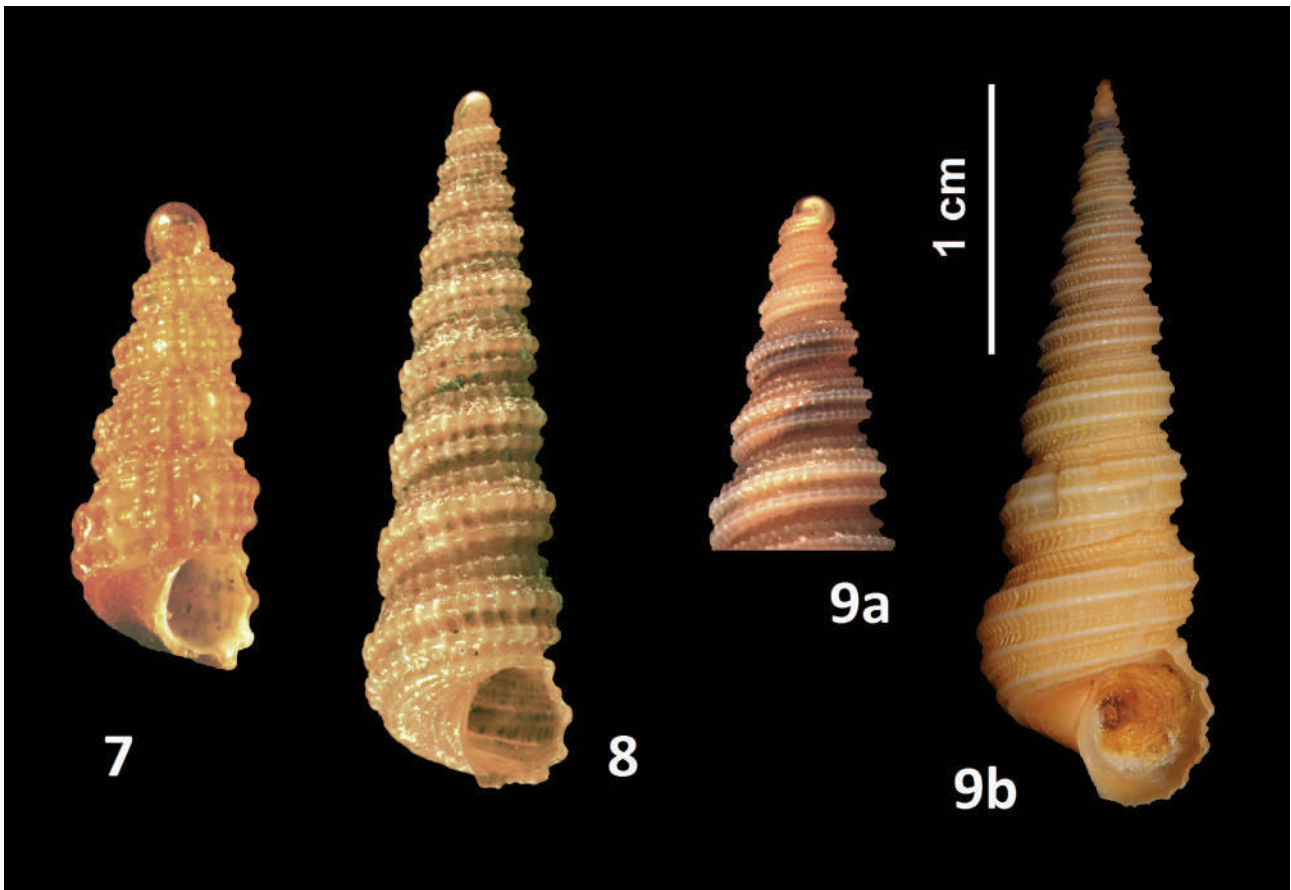
The four specimens of the new taxon were dead collected but very fresh, showing very constant morphological features. *Mathilda brownae* spec. nov. (Figs 1a-2b; 3a-4b; 5a-e) has a specific rib pattern ("1+1+2", Fig. 6) and a peculiar protoconch morphology compared with other species that show a similar spiral



**Figs 1a-2f.** Type material of *Mathilda brownae* spec. nov. **1 a-e**, Holotype, H 3.3 x D 1.5 mm. **1 a-b**, FIB/SEM (uncoated) frontal and dorsal views; **1c-e**, protoconch, early and last teleoconch whorls. **2 a-f**, Paratype A, H 3.0 x D 1.3 mm. **2 a-b**, FIB/SEM (uncoated) frontal and dorsal views; **2c**, basal view; **2 d-f**, protoconch, early and last teleoconch whorls.



**Figs 3a-6.** Shells of *Mathilda brownae* spec. nov. **3 a-b**, Holotype, H 3.3 × D 1.5 mm, optical frontal and dorsal views. **4 a-b**, Paratype A, H 3.0 × D 1.3 mm, optical frontal and dorsal views. **5 a-e**, FIB/SEM (uncoated) details of the protoconch of the post-metamorphic specimen from Ascension Island, English Bay, in Lava Tunnel, 9 m depth. **6**, diagram of spiral sculpture of the holotype and paratype A of *M. brownae*, showing relative position and strength of exposed spiral ribs of teleoconch whorls (TW) according to Bieler (1995). Black and white arrows indicate holotype and paratype positions, respectively.



**Figs 7-8.** Shells of *Mathilda gemmulata* Semper, 1865. **7**, subadult, H 2.5 x D 1.4 mm, Linosa Island, Sicily, optical frontal view; **8**, adult, H 8.4 x D. 2.5 mm, Canary Islands, Spain. Optical frontal view. **9a-b**, shell of *Mathilda quadricarinata* (Brocchi, 1814). **9a**, adult, H 25.1 x D 7.3 mm, Trapani, Sicily, 50 m depth, optical frontal view; **9b**, details of early teleoconch whorls of specimen of fig. 9a.

sculpture, but with different pattern of spiral cords, e.g. several species of the east African *Mathilda amanda*-complex (“2+2”), or the more elaborate rib patterns as in *Mathilda houbricki* Bieler, 1995 (“1+1+1+1”) and in *Mathilda richeri* Bieler, 1995 (“1+1+1+1”) from New Caledonia (Bieler, 1995). The closest species to *M. brownae* spec. nov. is *M. gemmulata* Semper, 1865 (figs 7,8), present in the Mediterranean Sea and also reported for the Macaronesian Archipelago, northern Atlantic Ocean (Hernández et al., 2011; Segers et al., 2009), which however differs morphologically from the new taxon by the larger size (on average twice the shell height of *M. brownae*), the more slender teleoconch outline with less convex whorls, and the completely pale brown colour. Along the western and south-eastern coast of Africa, the genus *Mathilda* Semper, 1865, is represented by six species, among which the western-Atlantic *M. barbadensis* Dall, 1889, that was long considered an amphi-atlantic species (Fernandes & Rolán, 1994, and references therein) based on the erroneous identification of *M. canariensis* (? = *barbadensis*) (Oliverio & Nofroni, 1986, 1988). Its presence in the Northern East

Atlantic (including the Mediterranean Sea) was first dismissed (Oliverio & Nofroni, 1988) and recently reinstated (Rocchini, 2004), but based on an erroneous record from the Tuscan Archipelago and Sicily. The other species are: *M. amanda* Thiele, 1925; *M. salve* Barnard, 1963; *M. sansibarica* Thiele, 1925; *M. mozambicensis* Mariottini & Smriglio, 2009; *M. herberti* Smriglio & Di Giulio, 2009. To date, these taxa have not been reported from St. Helena, and all are morphologically separable from *M. brownae* spec. nov. by their size, morphology and sculpture (Talavera-Casanas, 1982; Mariottini et al., 2009).

	H (mm)	D (mm)	H/D	TW	PD (µm)
Holotype	3.3	1.5	2.2	5.2	420
Paratype A	3	1.3	2.3	4.5	430
Paratype B	3.8	1.6	2.4	5.5	410
Paratype C	2.3	1.3	1.8	3.5	430

**Table 1.** Shell characters of *M. brownae* spec. nov.

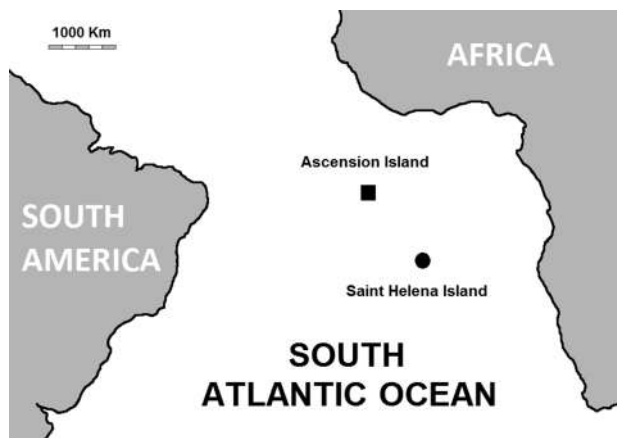


Fig. 10. Map of the records of *Mathilda brownae* spec. nov. Circle (Saint Helena Island) type material; square (Ascension Island) the post-metamorphic specimen.

One of the major diagnostic characters of *M. brownae* spec. nov. is the axial protoconch sculpture, which is not known for any extant *Mathilda* species (Bieler in litt., 2016) and found only in fossil species (Nützel in litt., 2016). In *M. brownae* the protoconch shows a sculpture consisting of axial wrinkles on both sides of the embryonic whorls (Figs 1c,d; 2d,e). A very well preserved post-metamorphic specimen from Ascension Island (Figs 5a-e) has been analysed by SEM (at  $\times 1,000$ -5,000, Figs 5d,e), which revealed some very tiny concentric cordlets crossing the radial wrinkles. Until now this kind of sculptured protoconch has only been observed in some fossil species belonging to different genera of Mathildoidea, as *Schroederilda milierensis* (Zardini, 1978), *Ampezzanilda aialensis* (Zardini, 1985), *Tricarilda toddi* Gründel et al, 2011, *Gymnothilda levata* Schröder, 1995 (Bandel, 1995; Gründel, 2003; Gründel et al., 2011; Gründel & Nützel, 2013; Schulbert & Nützel, 2013). The function of this ancestral character can be hypothesized as an additional hydrodynamic advantage, keeping the shell in an optimal swimming asset, for the larval shell transport and dispersal, occurring either through active (vertically swimming in the water column) or passive (based on physical origins) processes. The presence of this ancestral protoconch sculpture feature, at the moment retained only by *M. brownae* spec. nov. among the extant Mathilidae, remains to be elucidated.

The only mathildid reported from Saint Helena, was *Cingulina* (*Mathilda*) *quadricarinata* Brocchi, 1814, by Smith (1890), who considered *Mathilda* a subgenus of *Cingulina* (sic!). Unfortunately, Smith has not figured the shell, but the description of its morphological characters by this author is undoubtedly sufficient to assign it to Pyramidelloidea Gray, 1840, in the genus *Cingulina* A. Adams, 1860, and not in Mathildoidea

Dall, 1889. According to WoRMS (last access sept-03-2016) the two taxa *Mathilda* and *Cingulina* are not considered subgenera and are attributed to the families Mathilidae and Pyramidellidae, respectively. *Mathilda quadricarinata* (Figs 9a,b) is a well-known species with a distinctive sculpture, a completely pale brown colour, and a large size, also beyond 25 mm, all clearly different from the new taxon. The possibility that the two specimens of *M. brownae* collected in St. Helena Island are subadult shells of *M. quadricarinata*, is ruled out by the comparison of the earlier whorls of this mathildid with the teleoconch of the new species (Fig. 9b).

At the moment *Mathilda brownae* spec. nov. is to be considered a species with a limited distribution since has been only collected at Saint Helena and Ascension Islands (Fig. 10).

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