

A review of the genus *Enatimene* Iredale, 1929 (Gastropoda: Muricidae) from Australia

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Abstract

The three Australian species of *Enatimene* Iredale, 1929 are reviewed and illustrated: *E. simplex* (Hedley, 1903) from New South Wales, eastern Victoria and Tasmania; *E. bassetti* (Houart, 1998) from Queensland and New South Wales; and *E. lanceolatus* n. sp. from Queensland. *Enatimene* is compared with *Trophonopsis* Bucquoy & Dautzenberg, 1882.

Additional keywords: new species, taxonomy.

Introduction

The present paper deals with three Australian muricid species resembling the European *Trophonopsis* Bucquoy & Dautzenberg, 1882. Iredale (1929: 185–186) introduced several new generic and subgeneric names for muricids with little justification. *Enatimene* is considered to be Trophonine by recent authors (Radwin and D'Attilio 1976; Vaught 1989; Wilson 1994). However, since Trophoninae are now considered to be polyphyletic (Kool 1993a, Kool 1993b) (with the type species, *Trophon geversianus* (Pallas, 1774) proven more akin to *Nucella* Röding, 1798 (Ocenebrinae)), all these taxa, and many others, should be classified elsewhere—some possibly in Ocenebrinae. Their final placement, however, can only be determined after a careful study of all the taxa once considered as Trophoninae.

Enatimene Iredale, 1929 was described for *Trophon simplex* Hedley, 1903, a species closely resembling *Trophonopsis muricatus* (Montagu, 1803: fig. 15) from the Mediterranean Sea and the eastern Atlantic Ocean. A second species, *Enatimene bassetti* (Houart, 1998) was originally described in *Trophonopsis*. The discovery of a third species, described herein as new, has led to a thoughtful examination of the whole group and a careful comparison with *T. muricatus*. As a result, *Enatimene* is here retained as a valid taxon for the Australian species and separated from *Trophonopsis* on the basis of minor, although constant, differences.

Material and methods

All material examined is at AMS, and consists of dead shells, unless specified.

Terminology (after Merle 2001; Fig. 6)

The terminology used here is occasionally put between parentheses, meaning that the character was observed in a few cases but not in all specimens.

IP	Infrasutural primary cord (primary cord on shoulder)
P1	Shoulder primary cord
P2–P6	Primary cords of convex part of teleoconch whorl
s1–s6	Secondary cords
ADP	Adapical siphonal primary cord
MP	Median siphonal primary cord
ABP	Abapical siphonal primary cord

Aperture

- ID Infrasutural denticle
- D1–D5 Denticles of the convex part of the teleoconch whorl
- L Length
- W Width
- LA Length of the aperture
- LC Length of the siphonal canal

Other abbreviations

- AMS Australian Museum, Sydney, Australia
- HMAS His/Her Majesty Australian Ship
- MNHN Muséum national d'Histoire naturelle, Paris, France

Systematics

Family **MURICIDAE** Rafinesque, 1815

Genus *Enatimene* Iredale, 1929

Enatimene Iredale, 1929: 185. Type species: *Trophon simplex* Hedley, 1903 (original designation).

Original description

'The little shell Hedley called *Trophon simplex* is a common member of the shelf fauna, and is generically named *Enatimene*, the small apex, medium spire, delicate shape, long recurved canal, and free mouth, making it a striking form, the sculpture being an obsolete clathration.' (Iredale, 1929: 185.)

Revised description

Shell fusiform with a high spire. Aperture ovate. Columellar lip smooth, rim partially erect, adherent adapically. Outer lip smooth or weakly undulate, occasionally with weak denticles within. Siphonal canal open, moderately long. Axial sculpture consisting of narrow ribs. Spiral sculpture of the convex part of teleoconch whorl consisting of narrow cords crossing the axial ribs.

Radula rachiglosse; rachidian with long, broad central cusp, short, narrow lateral denticles and broad, moderately long lateral cusps; lateral teeth sickle shaped, broad. Operculum pyriform with apical nucleus.

Remarks

The description of *Enatimene* is close to *Trophonopsis* Bucquoy & Dautzenberg, 1882, a taxon containing four European species (Houart 2001a): *T. muricatus* (Montagu, 1803) (type species); *T. barvicensis* (Johnston, 1825); *T. breviatus* (Jeffreys, 1882); and *T. droueti* (Dautzenberg, 1889). Other species classified in *Trophonopsis* by Egorov (1993) and by Houart (1994, 1998) have since been transferred to *Pagodula* Monterosato, 1884 (Houart 2001b) or to other genera, while others require further study to clarify their taxonomy. The three Australian *Enatimene* species have been compared with the type species of *Trophonopsis* and with each other. The shell of *Enatimene* resembles *T. muricatus* and the other European species, but differs in having a partially erect rim of the columellar lip in adult specimens (it is completely adherent in *Trophonopsis*), a mammillate protoconch (rounded and broad in *Trophonopsis*), and weak denticles within the outer apertural lip (strong and elongate in *Trophonopsis*).

Table 1. Shell measurements (mm) of *Enatimene simplex*

Specimen	L	W	LA	LC
AMS C.322860	11.5	5.1	2.9	3.1
AMS C.322860	10.5	4.7	2.5	3.0
AMS C.322860	8.4	3.8	2.2	2.3
AMS C.322860	9.7	4.0	2.5	3.0
AMS C.322860	7.9	3.5	2.5	2.2
AMS C.322871	10.4	4.6	2.7	2.9
AMS C.322871	9.9	4.4	2.6	3.2
AMS C.322406	14.0	6.4	3.3	3.9
AMS C.322406	13.4	5.1	3.1	3.5
AMS C.322406	13.3	5.1	3.2	3.7
Mean	10.9	4.7	2.8	3.1

L, Length; LA, length of aperture; LC, length of siphonal canal; W, width.

Enatimene simplex (Hedley, 1903)

(Figs 1, 2, 4–14; Table 1)

Trophon simplex Hedley, 1903: 380, fig. 93

Enatimene simplex Iredale, 1929: 185. – May, 1958: 44, pl. 40, fig. 10; Radwin & D'Attilio, 1976: 180; Wilson, 1994: 51.

Material examined

Holotype. Australia, New South Wales, off Port Kembla, 115–137 m (AMS C.16424).

Other material. **New South Wales:** E of Coogee, Sydney, 33°56'S, 151°33'E, 146 m (1, C.322865); 28 km E of Little Bay, Sydney, 33°58.9'S, 151°33.63'E, alive, 183–192 m (13, C.322857); off Port Hacking, Sydney, 90 m (2, coll. R. Houart); off Botany Bay, Bay & Wattamolla, 34°4'S, 151°15'E, 91 m (8, C.322860); off Crookhaven, 34°55'S, 150°54'E, 64 m (23, C.322871); off Eden, 37°5'S, 150°10'E, 101 m (1, C.322859). **Tasmania:** off Cape Naturaliste, 40°50.6'S, 148°46.5'E, 399 m (11, C.322406); off St Helens Point, 41°20.6'S, 148°30'E, alive, 110 m (1, C.322402).

Other localities

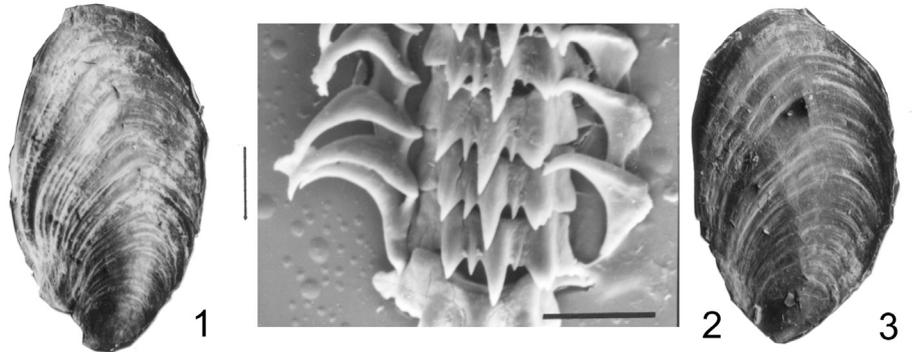
New South Wales (Hedley 1903): off Cape Three Points, 75–91 m; off Botany Bay, 91–95 m; off Wata Mooli, 99–108 m; of Crookhaven River, 20–27 m; off Port Hacking, 40–70 m; 26 km E of Wollongong, 183 m. **Eastern Victoria** (Wilson 1994: 51).

Description

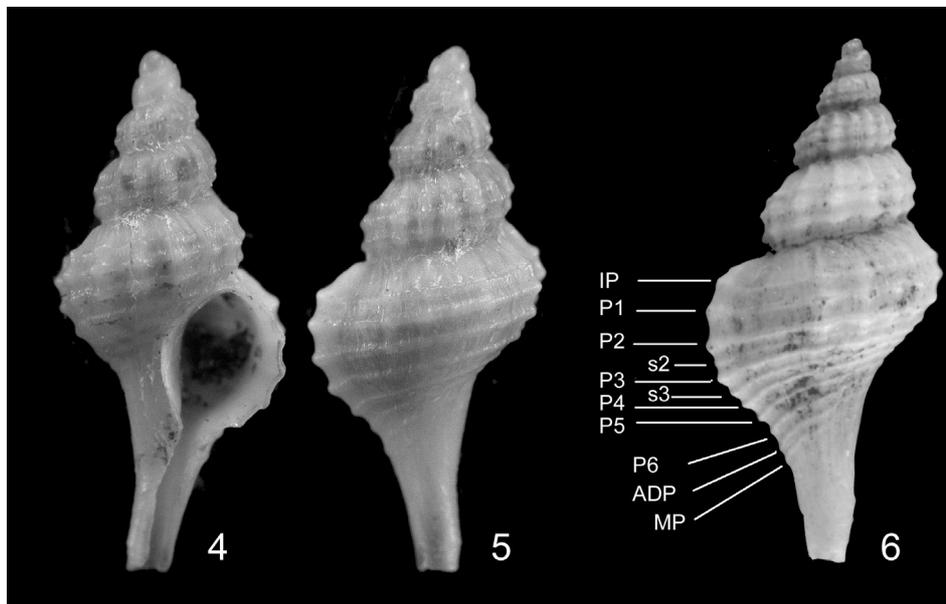
Shell up to 14 mm in length at maturity (Table 1), creamy-white or light tan, lanceolate. Spire high, with 1.5–2 protoconch whorls, and up to 4–4.5 convex or weakly shouldered, teleoconch whorls. Suture impressed. Protoconch small, mammillate; whorls rounded, smooth; terminal varix low, straight.

Axial sculpture of teleoconch whorls consisting of low or moderately high, broad, occasionally weakly nodose ribs, occasionally obsolete on penultimate and last whorls. First teleoconch whorl with 11–13 ribs, second and third with 12–15, last whorl with 10–15 ribs. Apertural varix broadest and strongest. Other axial sculpture consisting of numerous growth striae. Spiral sculpture consisting of narrow, smooth or weakly nodose, primary and secondary cords. Last teleoconch whorl with IP, P1, P2, (s2), P3, s3, P4, (s4), P5, (s5), P6, ADP, (MP).

Aperture small, roundly ovate; columellar lip narrow, smooth; rim partially erect, adherent at adapical extremity; anal notch weak, broad; outer lip weakly erect, with five,



Figs 1–3. 1, Operculum of *Enatimene simplex* (scale bar: 0.5 mm); 2, radula of *Enatimene simplex* (Hedley, 1903) (scale bar: 20 μ m); 3, operculum of *Enatimene lanceolatus* n. sp. (scale bar: 0.5 mm).



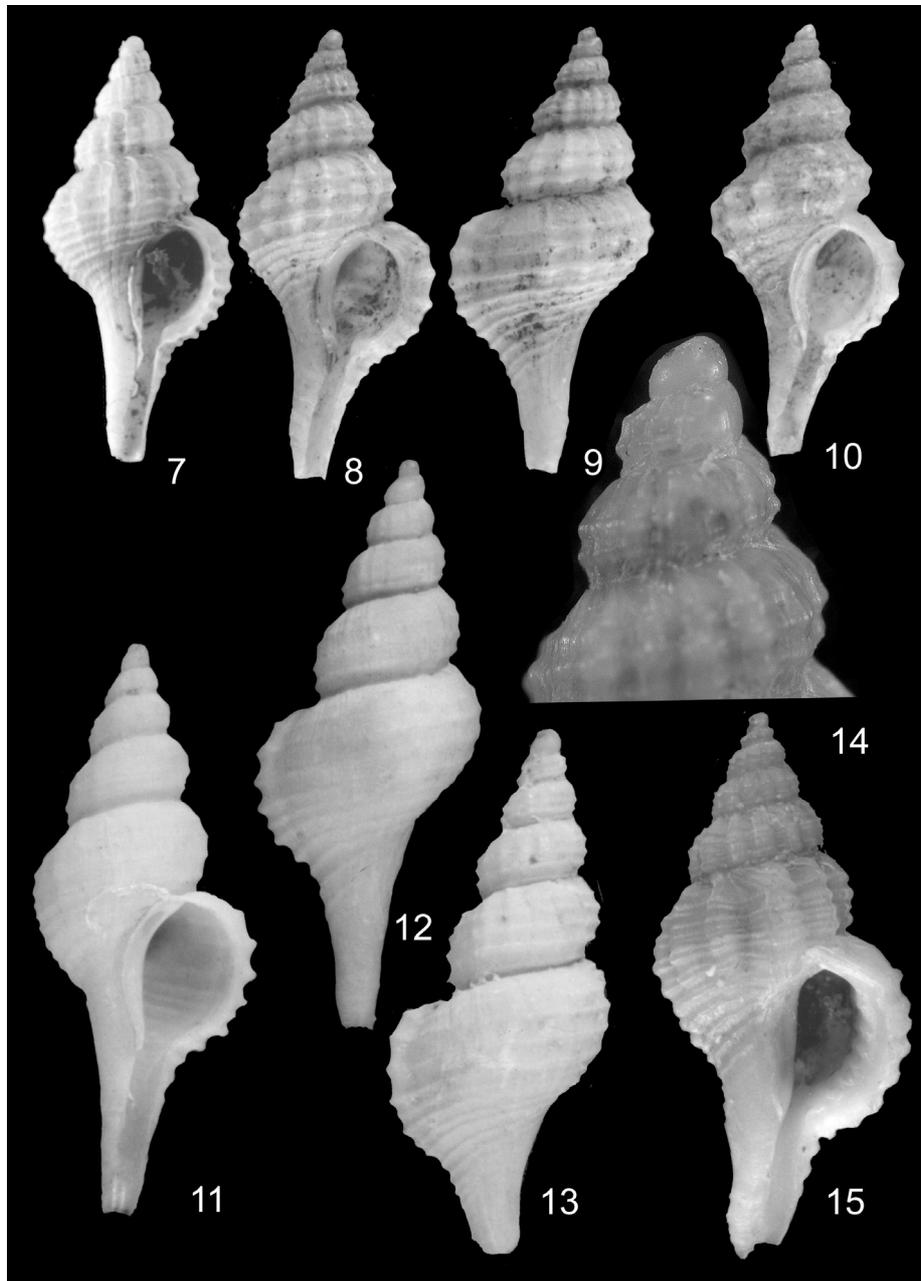
Figs 4–6. 4–5, *Enatimene simplex* (Hedley, 1903), holotype AMS C.16424, 8 mm; 6, *E. simplex* AMS C.322860, New South Wales, (see also Figs 8–9), morphology of spiral sculpture (IP, infrasutural primary cord; P1, shoulder primary cord; P2–P6, primary cords of convex part of teleoconch whorl; s2, s3, secondary cords; ADP, adapical siphonal primary cord; MP, median siphonal primary cord).

usually obsolete, weak denticles within. Siphonal canal long, straight, open. Operculum (Fig. 1) light brown, pyriform, with terminal nucleus.

Radula (Fig. 2): rachidian with long, broad central cusp, short, narrow, lateral denticle, and broad, irregularly shaped, lateral cusp. Lateral teeth sickle shaped, broad.

Distribution

Australia, from central New South Wales to Tasmania and eastern Victoria (33°56'S–41°20.6'S), 20–110 m.



Figs 7–15. 7–14, *Enatimene simplex* (Hedley, 1903). 7, New South Wales, Sydney, off Port Hacking, 1976, 11 mm, coll. R. Houart; 8–9, AMS C.322860, New South Wales, off Botany Bay, Bay and Wattamolla, 34°4'S, 151°15'E, 91 m, 11.5 mm; 10, AMS C.322871, New South Wales, off Crookhaven, 34°55'S, 150°54'E, 64 m, 10.4 mm; 11–13, AMS C.322406, Tasmania, off Cape Naturaliste, 40°50.6'S, 148°46.5'E, 399 m; 11–12, 14 mm; 13, 13.7 mm; 14, Holotype AMS C.16424, first teleoconch whorls. 15, *Trophonopsis muricatus* (Montagu, 1803), AMS C.205289, Italy, Chioggia, 14 mm.

Remarks

The Tasmanian shells (Figs 11–13) are larger and slightly smoother than New South Wales specimens but otherwise no other differences could be detected. Their spiral sculpture, although shallower, is identical to that in the specimens from New South Wales. For differences with *E. bassetti* (Houart, 1998) and *E. lanceolatus* n. sp. see under these species.

Enatimene bassetti (Houart, 1998)

(Figs 16–18; Table 2)

Trophonopsis bassetti Houart, 1998: 100, figs 22–23, 47.*Material examined*

Holotype. Australia, New South Wales, SE of Clarence River, 29°41′–29°32′S, 153°45′–153°47′E, 405–412 m (AMS C.313223).

Paratypes. **Queensland**: E of Lady Musgrave Island, 23°52.5′–23°51.9′S, 152°42.7′–152°41.7′E, alive, 296 m (1, C.31323). **New South Wales**: SE of Clarence River, 29°41′–29°32′S, 153°45′–153°47′E, 405–412 m (1, coll. R. Houart); E of Cape Three Points, 33°28′–33°29′S, 152°4′–152°3′E, 457–476 m (2, C.321596); off Sydney, 34°4.2′S, 151°37.4′E, alive, 393 m (1, C.322783); off Ulladulla, 35°30′–35°33′S, 150°48′–150°47′E, 549 m (1, C.313224).

Description

Shell medium-sized for the genus, up to 13.9 mm in length at maturity (Table 2), uniformly milky-white, slender, weakly spinose, delicate. Spire high, with 1.5 protoconch whorls and up to 4.5 shouldered, spinose teleoconch whorls. Suture impressed. Protoconch large, mammillate, glossy; terminal varix thin, low, weakly curved.

Axial sculpture of teleoconch whorls consisting of low, weak lamellae. Lamellae more strongly developed on shoulder, occasionally producing short, spinelike projections: 7 or 8 lamellae on first whorl, 10–12 on second, 11–13 on third, 11–15 on last whorl. Spiral sculpture consisting of broad, rounded cords: first, second and third whorl with two visible cords (P1 and P2), last whorl with IP, P1, P2, P3, P4, P5, P6, ADP.

Aperture moderately small, angulate; inner lip almost horizontal, forming an angle of ~85–86° with axis of shell; columellar lip smooth, adherent adapically, weakly erect abapically; anal notch shallow; outer lip smooth, with weak, low denticles within; adapical denticle more apparent. Siphonal canal medium-sized or long, narrow, straight, or weakly abaxially recurved, open.

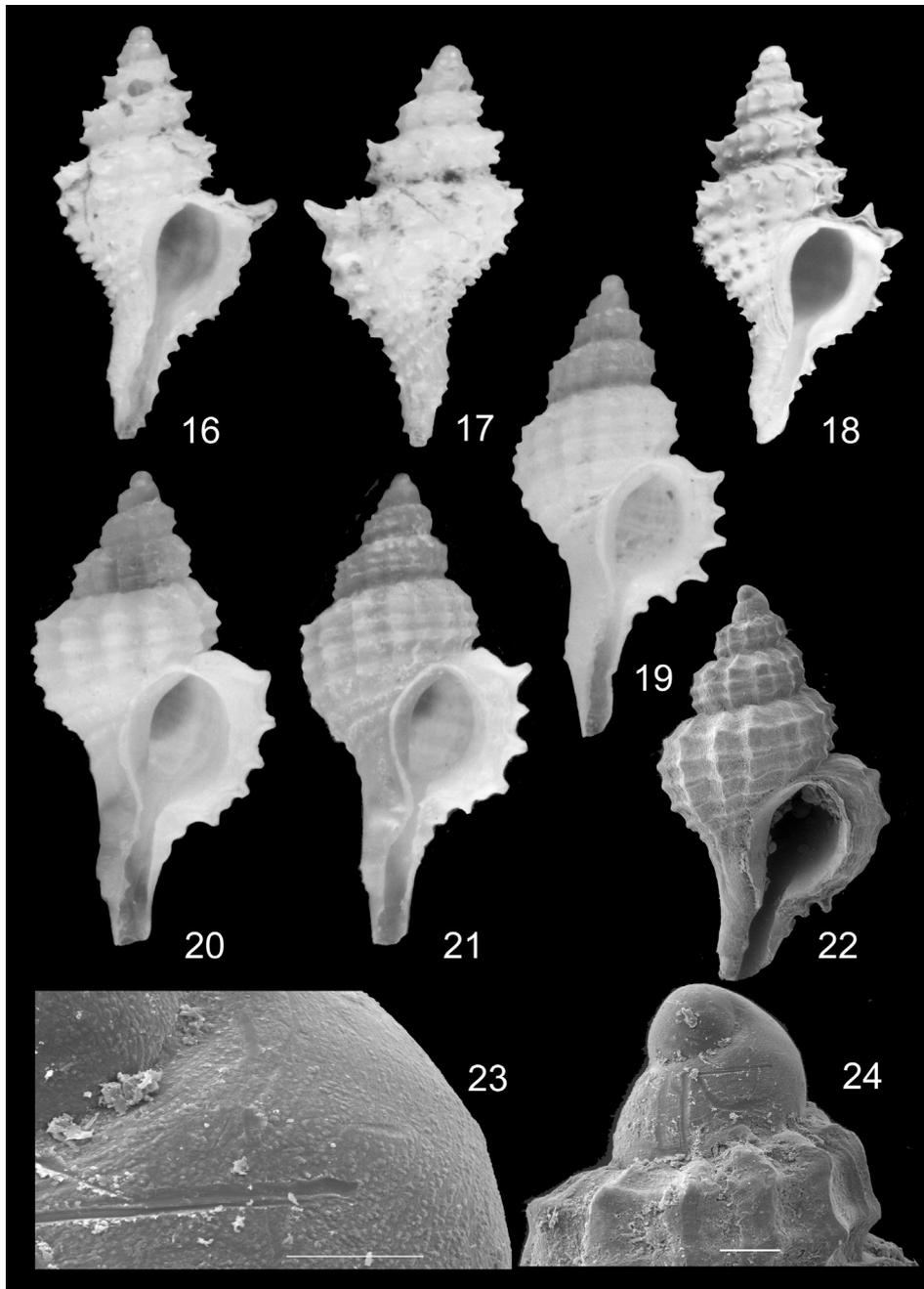
Operculum and radula unknown.

Distribution

Australia, Queensland and New South Wales, 296–549 m, taken alive in 296–393 m.

Remarks

Enatimene simplex has a smoother, more convex shell with a roundly ovate aperture. The spire whorls are rounded or weakly shouldered (more strongly shouldered and spinose in *E. bassetti*), and secondary spiral cords are present (8–10 primary and secondary cords on last whorl, with a higher density on abapical part of the whorl), whereas secondary cords are absent in *E. bassetti*. For comparison with *Enatimene lanceolatus* n. sp. see under that species.



Figs 16–24. 16–18, *Enatimene bassetti* (Houart, 1998). 16–17, Holotype, AMS C.3132238, 8.9 mm; 18, Paratype, coll. R. Houart, 8.6 mm. 19–24, *Enatimene lanceolatus* n. sp. 19, paratype AMS C.321986, 7.6 mm; 20, holotype AMS C.427055, 8.5 mm; 21, paratype AMS C.321986, 8 mm; 22–24, paratype AMS C.321986, 6.6 mm (gold coated for s.e.m.) (scale bars: 23: 100 μ m; 24: 200 μ m).

Table 2. Shell measurements (mm) of *Enatimene bassetti*

Specimen	L	W	LA	LC
Holotype AMS C.313223	8.9	3.8	2.3	3.0
Paratype (R. Houart)	8.7	4.5	2.2	2.8
Mean	8.8	4.2	2.25	2.9

L, Length; LA, length of aperture; LC, length of siphonal canal; W, width.

Enatimene lanceolatus n. sp.

(Figs 3, 19–24; Table 3)

Material examined

Holotype. Australia, Queensland, NE of Cape Moreton, 26°55.5'S, 153°33.5'E, alive, 115–124 m (AMS C.427055) (ex C.321986).

Paratypes. **Queensland:** NE of Cape Moreton, 26°55.5'S, 153°33.5'E, alive, 115–124 m, pre 1968, T. A. Garrard coll. (6, C.321986, 1, MNHN); off Moreton Bay, 27°31'S, 153°40'E, 75–80 m (1, C.321918); off Cape Moreton, dredged alive in 104–121 m (1, coll. R. Houart).

Description

Shell small for the genus, up to 9.5 mm in length (paratypes AMS, Table 3), white or light tan, occasionally with brown band at abapical portion of siphonal canal; slender, lanceolate, nodose.

Spire high, with 1.5 protoconch whorls and up to four broadly convex, weakly shouldered, nodose teleoconch whorls. Suture impressed. Protoconch small, mamillate, with minute, scattered, raised granules (Figs 23, 24); terminal varix narrow, weakly raised and curved.

Axial sculpture of teleoconch whorls consisting of low or moderately high, broad, nodose ribs: 11 on first whorl, 12–14 on second, 12 or 13 on third, last whorl with eight axial ribs, and broad, strong apertural varix. Space between last axial rib of last teleoconch whorl and apertural varix twice (or more) as broad as space between other ribs. Spiral sculpture consisting of moderately high, narrow, nodose cords: first teleoconch whorl with visible P1, P2, (P3), second with visible P1, P2, P3, third whorl with P1–P6, ADP, fourth with P1, P2, P3, s3, P4, s4, P5, P6, ADP, (MP). Cords ending as short, broad, weakly acute, open spines on apertural varix. Spines of P1, P3–P5 almost similar in size, P2 smaller, P6 shortest.

Aperture large, broad, ovate. Columellar lip broad, smooth, rim partially erect, adherent at adapical extremity. Anal notch shallow, narrow. Outer lip erect, crenulate, with five weak denticles within (D1–D5). Siphonal canal, broad, straight, with one or two narrow spiral cords (ADP, occasionally MP). Operculum ovate with terminal nucleus (Fig. 3).

Radula unknown.

Remarks

Enatimene lanceolatus n. sp. differs from *E. simplex* (Figs 1, 2, 4–14) occurring off south-eastern Australia and Tasmania in having a smaller shell although the same number of teleoconch whorls, a broader, expanded apertural varix with short, broad, triangular, open spines (apertural spines absent in *E. simplex*), comparatively stouter and broader teleoconch whorls, and fewer secondary spiral cords; *E. simplex* usually having the following arrangement: IP, P1, P2, (s2), P3, s3, P4, (s4), P5, (s5), P6, ADP, (MP).

Table 3. Shell measurements (mm) of *Enatimene lanceolatus* n. sp.

Specimen	L	W	LA	LC
Holotype AMS C. 427055	8.5	4.4	2.4	2.5
Paratype AMS C.321986	7.6	3.5	2.2	2.3
Paratype AMS C.321986	8.0	3.9	2.1	2.4
Paratype AMS C.321986	6.6	3.6	1.8	1.8
Paratype AMS C.321986	6.2	3.8	2.2	2.5
Paratype AMS C.321986	7.4	3.6	1.9	2.2
Paratype AMS C.321986	8.1	4.3	2.3	Broken
Paratype AMS C.321918	9.1	4.2	2.2	2.7
Paratype MNHN	7.7	3.8	2.1	2.5
Paratype R. Houart	8.8	4.3	2.1	2.9
Mean	7.8	3.9	2.1	2.4

L, Length, LA, length of aperture, LC, length of siphonal canal; W, width.

The new species differs from *E. bassetti* (Figs 16–18) from Queensland and New South Wales in having a more lanceolate and slender shell, compared to the more triangular outline of *E. bassetti*, fewer and more rounded axial ribs (eight on last whorl v. 11–15 in *T. bassetti*), and in the presence of secondary spiral cords, and comparatively narrower primary cords.

Etymology

Lanceolatus (Latin): spearlike.

Discussion

Enatimene is currently known to be endemic to south-eastern Australia, from Queensland (Lady Musgrave Island) to Tasmania (off St Helens Point). As noted above, *Enatimene* resembles *Trophonopsis* Bucquoy & Dautzenberg, 1882 but differs in a few, yet constant, morphological shell characters. However, this assumed separation needs to be tested with additional studies, other than shell characters, such as molecular analyses.

Enatimene is not the only muricid genus named by Iredale (1929), and assigned to Trophoninae by recent authors (Radwin and D'Attilio 1976; Vaught 1989; Wilson 1994; Houart 1995), that is currently considered to be endemic to Australia. Others (all named by Iredale 1929) are: *Anatrophon* (type species: *Trophon sarmentosus* Hedley & May, 1908, south-eastern Australia); *Benthoxystus* (type species: *Trophon columnarius* Hedley & May, 1908, south-eastern Australia), and *Xenotrophon* (type species: *Trophon euschema* Iredale, 1929, New South Wales). Other genera that were considered to be endemic to Australia until recently are: *Enixotrophon* Iredale, 1929 (type species: *Trophon carduelis* Watson, 1883), which is very close to *Pagodula* Monterosato, 1884, and could be a synonym. *Enatimene carduelis* was recently recorded from off the North Island and the west coast of the South Island, New Zealand (Marshall and Houart 1995). *Litozamia* Iredale, 1929 (type species: *Peristernia rudolphi* Brazier, 1894) was considered to be endemic to southern Australia until Houart (1995) described *Litozamia tropis* from north-eastern New Caledonia.

Species included in *Anatrophon*, *Benthoxystus*, and *Litozamia* differ from those in *Enatimene* in having a narrow shell with a very high spire, a short siphonal canal, and shouldered or strongly shouldered teleoconch whorls. *Xenotrophon euschema* is very

different in having a *Haustellum*-like shell with rounded, very broad, last teleoconch whorl, and a very long siphonal canal.

Apixystus Iredale, 1929 (type species: *Trophon stimuleus* Hedley, 1907) was synonymised with *Gemixystus* Iredale, 1929 (type species: *Trophon laminatus* Petterd, 1884) by Houart (2004) and occurs in the Chesterfield Reefs as well as in south-eastern Australia. *Gemixystus* differs from *Enatimene* in having a much smaller shell (7.2 mm as a maximum length in *Gemixystus*), and in having laminate, frilled axial lamellae instead of rounded, broad axial ribs like *Enatimene*, a broad, rounded aperture, and a very short siphonal canal.

Emozamia Iredale, 1929 (type species: *Murex licinus* Hedley & Petterd, 1906) is now known to belong to Coralliophilinae (Kosuge and Suzuki 1985; Wilson 1994), whereas *Ollaphon* Iredale, 1929 (type species: *Trophon molorthus* Hedley & May, 1908), a species originally included in Muricidae, is probably a fasciolariid.

Only two possible endemic Trophonine species, *Trophon segmentatus* Verco, 1908 from southern Australia, and *Trophon aberrans* Houart, 1991 from Queensland, do not fit in any of these genera. *Trophon segmentatus* was assigned to *Apixystus* (= *Gemixystus*) by Wilson (1994), but differs in being larger (shell up to 9.5 mm in length), with a higher spire, a more ovate aperture, a longer siphonal canal and broad, rounded spiral cords. *Trophon segmentatus* differs from the species here assigned to *Enatimene* in having a narrower shell with a shorter siphonal canal, a higher spire, weakly frilled, lamellose varices, a broad, rounded protoconch, and a broad, strongly erect, columellar lip. *Trophon aberrans* differs from *Enatimene* species in being smaller, in having a shorter siphonal canal, strongly shouldered teleoconch whorls, and more numerous axial ribs with short, adapical bent, acute, open spines at the intersection of the spiral cord P1.

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