ROCK BORERS, FLASK SHELLS
Family: GASTROCHAENIDAE

Dufoichaena pexiphora (Sturany, 1899)
Gastrochaena cuneiformis Spengler, 1783
'Gastrochaena' sp. 1
'Gastrochaena' sp. 2
Lamychaena weinkauffi (Sturany, 1899)
Spengleria mytiloides (Lamarck, 1818)

Shells very thin, the valves equal, elongated ovals in shape with a very wide gape ventrally. The umbones very far forward with an external ligament behind. The exterior mostly smooth, some with concentric striae. A periostracum is present but mostly rubbed off, one species with mineralized periostracal spines. The hinge barely discernible with no teeth. Anterior and posterior muscle scars present with a deep pallial sinus.

These animals are known to the author from the empty shells of a number of species recovered from limestone or sandstone rock pieces and coral brought to the surface entangled in bottom-set fishing nets. They are reported to bore into wood, coral or rock. The tunnel/burrow is bottle-shaped, with a short, narrow entrance tunnel that widens sharply into an oval-shaped chamber in which the animal resides, its posterior pointing towards the entrance. In some, the external opening to the siphonal chamber has a figure-of-eight outline. The inspiratory and expiratory siphons are long, passing from the main chamber to the exterior. Much of the animal is outside the confines of the two valves within the chamber.

Bottle shaped boring of
Lamychaena weinkauffi

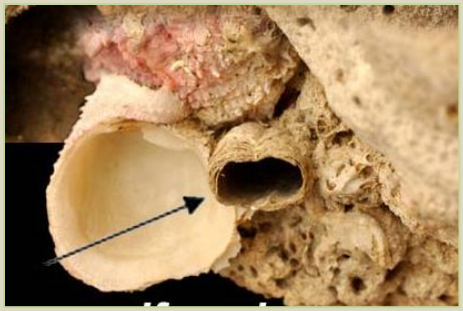


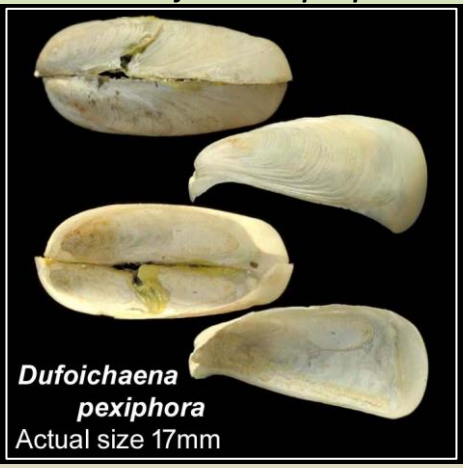
Figure-of-eight opening of
siphonal chamber of
Gastrochaena cuneiformis

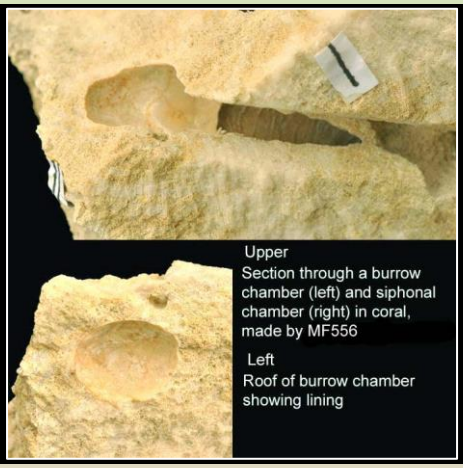
"*Gastrochaena* (Gastrochaenidae) are specialized for boring by having a closed mantle cavity, a large pedal gape, and a truncate foot, allowing them to press the foot and shell against the burrow wall (Ansell & Nair, 1969). When it bores into shells the species forms a sectioned calcareous case to protect itself (Oliver, 1992). In literature they are recorded as boring in limestone, in encrusting corallines, and on old oyster shells, maerl and shell gravel." ['maerl' = type of coralline red algae]

- Zenetos et al, 2010

cf. *Dufoichaena pexiphora*

The name unconfirmed.
Initially determined as *Cucurbitula cymbium* based on images viewed on-line. One image was found that matched this shell. Other images were not such good matches, there being very few of the shell as a number illustrated only the 'igloo' formed by the animal to make up for lack of burrowing space, usually when burrowing in shells. Only one specimen has been found (1.6.2018).
WoRMS (April, 2020) lists three species in the genus *Cucurbitula* Gould, 1861:
aedificator (de Folin in de Folin & Périer, 1879), *cymbium* (Spengler, 1783) and *tasmanica* (Tenison Woods, 1877).





MF556: Maggona, Thudawa SBFH, fishing trash on shore. In bottle-shaped burrow, coral rubble, (right-hand image).
The name has not been confirmed.
The shell bears some resemblance to *G. cymbium* (Fig. 12 in Valentich-Scott & Tonkerd, 2008) but differs in the description. It agrees more with *Dufoichaena pexiphora* in Albano et al, 2019, Figure 14, agreeing with the description.

A fresh search for a better match resulted in the December 2019 paper by Albano et al coming to light with good images of *Gastrochaena pexiphora* Sturany, 1899 that included a description. This species is now accepted as *Dufoichaena pexiphora* (Sturany, 1899) (WoRMS). The description is based on specimens from the Red Sea. *D. pexiphora* is a more likely choice for a name than *Cucurbitula cymbium.*

cf. *Dufoichaena pexiphora* (Sturany, 1899) Boat-shaped flask shell

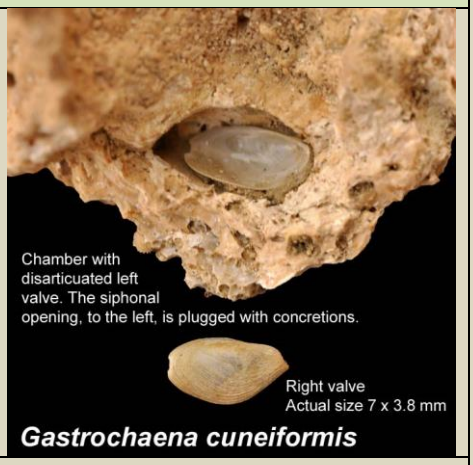
Shell wedge-shaped in lateral profile, gaping widely below. Anterior with a down-turned beak consisting of the ventral margin protruding in front of the dorsally placed umbo. Umbo low, rounded, pointing forwards. Dorsal margin gently convex joining the truncate posterior margin at nearly a right angle. Postero-ventral angle rather beaked joining the ventral margin that is straight at the centre with concave extremities,

Chalky white with strong growth lines. Interior with calcified muscle scars, the anterior below the umbo, the posterior large, oval, below the dorsal margin. A deep V-shaped pallial sinus. Shell fragile, damaged during extraction.

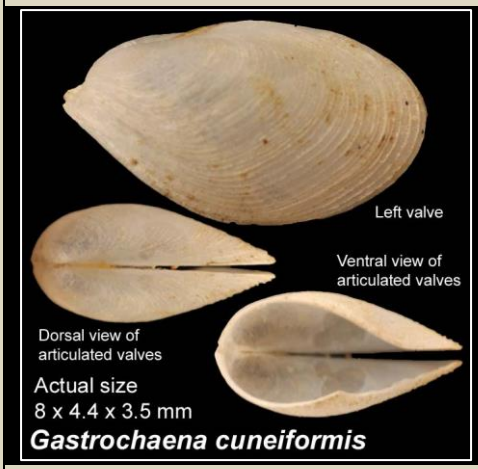
The burrow situated deep within the substrate, branching off other burrows. Nest cavity separated from entrance tunnel by a sill.

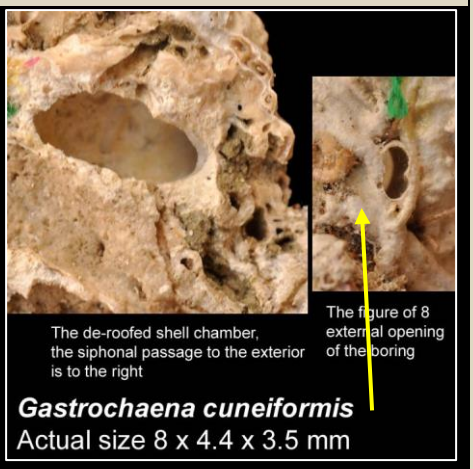
- Albano, 2019.

Gastrochaena cuneiformis



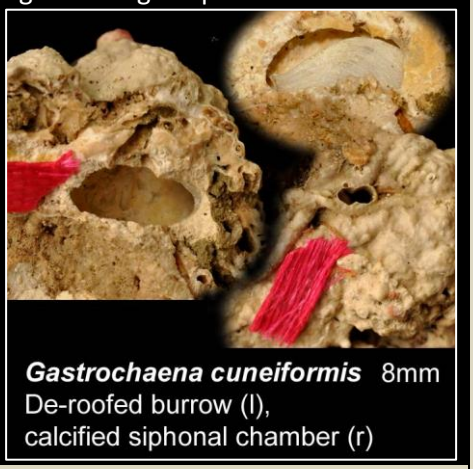
MF682: Maggona, Thudawa Small Boat Fishery Harbour, fishing trash, calcareous rubble. Boring into calcareous mass. Disarticulated valves found inside the boring. Three images of the same specimen.





MF683: Maggona, Thudawa SBFH, fishing trash, rubble. Boring into calcareous mass.

Articulated valves in boring with figure-of-eight siphonal chamber.



MF699: Maggona, Thudawa SBFH, fishing trash rubble. Boring into calcareous encrustation around hard rock.

MF683: Images above and below.

***Gastrochaena cuneiformis* Spengler, 1783** Wedge-shaped flask shell

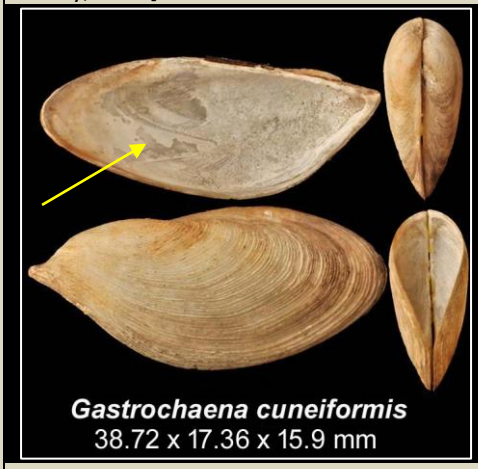
Shell ellipsoid, anterior constricted, posterior broadly rounded, ventrally gaping for almost complete length of shell. Umbones low, rounded. Sculpture of concentric striae crowded anteriorly, wider spaced posteriorly, tending to be lamelliform. (Description based on Valentich-Scott & Tongkerd, 2008)

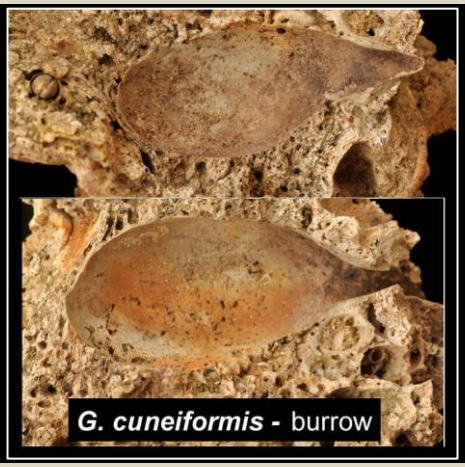
Measurements of three collections: 8 x 4.4 x 3.5 mm - 7 x 3.8 mm - 10.6 x 6.0 mm (contd. next page)

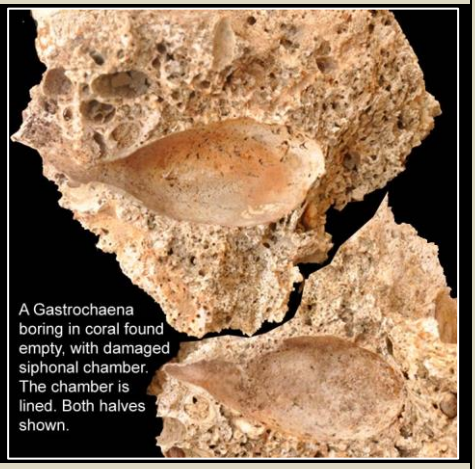
MF718 & MF719 were extracted on 6.7.2016 from fragments broken off a large coral head lying on Kalkudah beach, probably cast ashore by the tsunami of December 26th, 2004. They resemble *G. cuneiformis* but are considerably larger.

MF718 & 719 were at first determined as *Rocellaria dubia* on account of its size. However, *R. dubia* is an European, Mediterranean and Atlantic species. The only Indian ocean record appears to be from Mozambique. In shape also resembles *Lamychaena hians* – with no Indian Ocean occurrence reports seen. Images of *G. difficilis* Deshayes, 1855 are similar. It would be safer to refer this to *Gastrochaena cuneiformis* which it resembles, an undoubtedly Indian Ocean species.

The large size may be because they are much older; or could they be what has been described as *Gastrochaena gigantea*? This name later synonymised with '*cuneiformis*'. [Appukuttan (1974) has recorded *G. gigantea* from the Andaman Islands - Subba Rao & Dey, 2000]

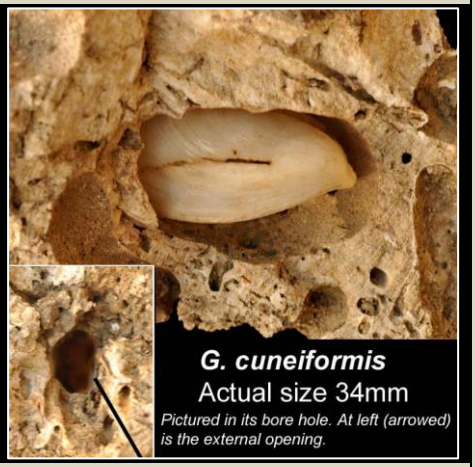




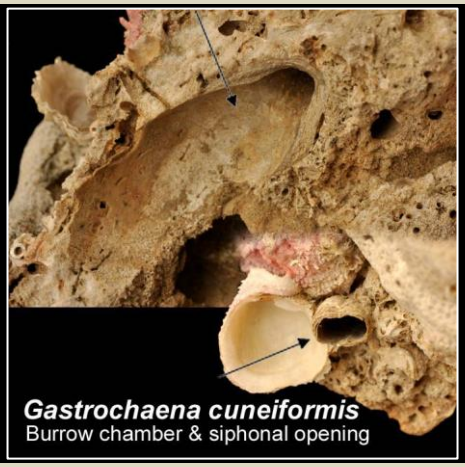


MF718: Kalkudah, boring in coral boulder cast up on beach. Siphonal chamber missing. The boring is lined. The pallial sinus is arrowed.

MF719 and its boring at right with a lined chamber.



MF719 in situ



Left
An empty boring with a thick lining and its siphonal chamber with figure-of-eight opening found in the same piece of rubble from which MF718 & 719 were extracted.

MF719:

Undetermind species of *Gastrochaena*

***Gastrochaena*' sp. 1**
Found on 29.3.2010
Undetermined species with terminal umbones and widely flared shell. Strong antero-ventral growth lines, abraded behind. Anterior myophores? Pallial sinus very wide 'V'-shape.

MF533: 'Gastrochaena' sp. 1. Maggona, Thudawa SBFH, fishing trash, burrowing in sedimentary rock.

'*Gastrochaena*' sp. 1

Shell ovate, narrow anteriorly with umbones low, rounded, terminal, straight hinge line, flaring medially with high convex dorsal margin confluent with broadly rounded posterior. Ventral margin sinuate, gaping widely for about two-thirds of length. Interior glossy, deep V-shaped pallial sinus, not confluent with ventral limb. Anterior myophores present. Fine, close-packed growth striae over entire surface, abraded on medial aspect, stronger antero-ventrally. White.

This specimen has so far not been determined. It differs from *G. cuneiformis,* and from *G. carteri* (Valentich-Scott & Tonkerd, 2008, Fig. 11A-D) in lateral profile and the greater ventral gape. Also differs from *G*. sp.1 in Fig. 11 E-H by being more dorso-ventrally expanded, the ventral gape being similar. Both species referred to above in the publication from Thailand have a truncate anterior similar to the index shell.

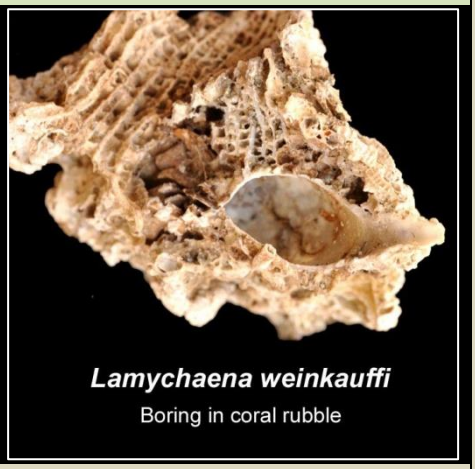
MF674: **Trincomalee**, Erakkandy lagoon mouth, boring into coral rubble cast ashore.

'*Gastrochaena*' sp. 2

Found on 13.9.2015

Shell wedge-shaped with sub-terminal rounded umbones pointing forwards, above the narrowly pointed antero-ventral angle. Inflated, widely gaping ventrally. Anterior narrow, shell flaring to broadly rounded posterior, dorsal margin nearly straight, ventral gently convex. Interior glossy, large rounded posterior muscle scar, deep, 'v'-shaped pallial sinus, its limbs arcuate, the terminal part of the ventral limb confluent with the pallial line. Anterior myophores present. Concentric growth lines, crowded anteriorly, shell somewhat smooth behind with distant striae and patchy chalky deposits.

Lamychaena weinkauffi



MF529: Jaffna, Mandaitivu, fishing trash, boring into coral. The burrow is lined.

***Lamychaena weinkauffi* (Sturany, 1899)**

Synonymised names recorded are: *Gastrochaena inaequistriata* Jousseaume in Lamy, 1923; *Gastrochaena weinkauffi* Sturany, 1899; *Lamychaena inaequistriata* (Jousseaume in Lamy, 1923) and some others.

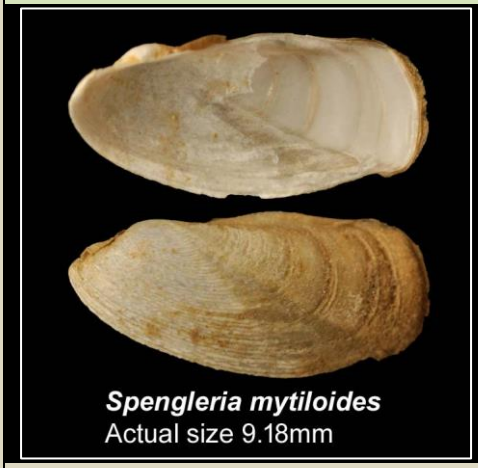
Found on 04/02/2012

Shell thin, light, elliptical, inflated, ventral widely gaping along its entire length. Umbones anterior, rounded, prominent, above and behind the anterior extremity formed by the rounded antero-ventral angle. Antero-dorsal (ligament) margin straight, sloping up, joining the slightly convex postero-dorsal margin at an obtuse angle, the rear tapering to a narrowly rounded posterior. Ventral margin convex. Interior silvery, large posterior muscle scar just behind mid-line, anterior scar small, at anterior extremity. Pallial line with a deep sinus, inferior limb fused. Externally coloured creamy-white, with strong concentric growth lines.

Note: Differs from other species in being slender and elliptical in lateral view with a prominent, narrowly rounded anterior protuberance in front of the umbones.

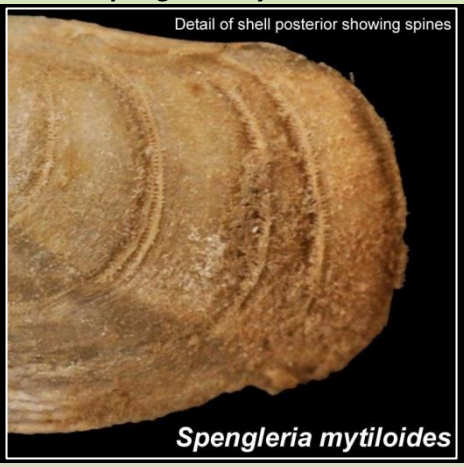
- Albano, 2019.

Spengleria mytiloides

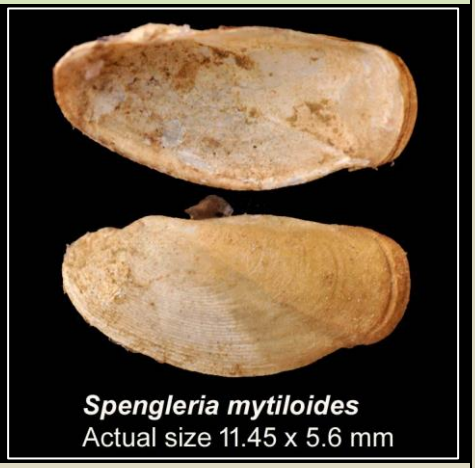


MF677

(Above, at left) MF677: From **Maggona**, Thudawa SBFH, fishing trash. Boring in sedimentary rock (?). (Above, at right) MF796 from the same location found boring into the underside of a shell fragment – probably *Hyotissa numisma* (Gryphaeidae) – with a coral (*Merulina ampliata*) encrusting the upper surface.



MF677



MF796

At left: Paired valves of MF796 photographed in- situ, de-roofed boring.

The middle image above (viewed at 200%) shows the calcified periostracal spines characteristic of this species.

***Spengleria mytiloides* (Lamarck, 1818)** Saya Gai (Japanese common name)

[*Gastrochaena mytiloides* Lamarck, 1818 – original name. Four synonyms]

Shell oblong, narrowly rounded anterior well in front of rounded, prominent umbo, flaring posteriorly to broad, sub-truncate posterior. Moderately inflated, gaping ventrally. Dorsal margin undulating, ventral margin convex. A shallow oblique radial groove from the umbo to the postero-ventral angle, the area behind marked by four, spaced, concentric grooves. The interior divided into an antero-ventral and a postero-dorsal region by a shallow ridge corresponding to the external oblique groove. The antero-ventral region roughened by a series of concentric ridges; the postero-dorsal region smooth, glossy and white, divided into four parts by low ridges corresponding to the external grooves. Muscle scars and pallial line/sinus indistinct. The whole exterior covered by crowded concentric striae that are stronger in front of the oblique groove. Covered by a brownish periostracum with short hairs that protrude behind as a fringe.

The 'hairs' under magnification are seen to be calcified spikes that occur in this genus and some other genera: "Spikes in the posterior area of *Spengleria mytiloides* form only on the outer surface of the periostracum and are therefore, not encased in periostracal material." (Checa & Harper, 2014)

- Bishogai Database

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MF: 31.5.2016; 2.3.2017; 31.5.2018; 4.6.2018; 8.4.2020; 18.12.2020.