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Two new species of Terebridae widespread in the Indo-Pacific

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Abstract: *Strioterebrum illustre* sp. nov. and *Clathroterebra brunneobandata* sp. nov. are here proposed and described as new to science and compared to their closest relatives.

Introduction: A number of **Terebridae** specimens have been retrieved from several localities in the East China Sea (commercial sources), New Caledonia and Vanuatu (SANTO06, an outline of the expedition is given in Bouchet et al., 2011). They are found at depths ranging from 5-180 m and are readily identifiable by their glossy appearance and deep spiral groove structure. In this article, they are named *Strioterebrum illustre* sp. nov. and are compared to several similar species including *Strioterebrum swainsoni* (Deshayes, 1859), *Strioterebrum arabellum* (Thiele, 1925) and *Strioterebrum japonicum* (E. A. Smith, 1873).

For some time, small **Terebridae** shells have been collected from several localities in the Philippines (commercial sources and PMBP04, an outline of the expedition is given in Bouchet et al., 2009), New Guinea and the Solomon Islands. They are found at depths ranging from 30-200 m and have a consistent brown-banded pattern. In this article, they are named *Clathroterebra brunneobandata* sp. nov. and are compared to several similar species including *Clathroterebra dedonderi* (Terry, 2003),

Clathroterebra poppei (Terry, 2003), *Clathroterebra suduirauti* (Terry & Conde, 2004), and to a lesser extent *Terebra trismacaria* Melvill, 1917 which are often found together, certainly in the Philippines.

Material and methods: All species here discussed and described are arranged according to the system proposed in Terry, 2007.

Abbreviations:

ED	Private collection of Ed Dunham, USA
GM	Private collection of Gavin Malcolm, UK
GP	Private collection of Gianluigi Pellifroni, Italy
HM	Private collection of Hugh Morrison, Australia
MB	Private collection of Michel Balleton, French Polynesia
MNHN	Muséum national d'Histoire naturelle, Paris, France
NHMUK	Natural History Museum of the United Kingdom, London, UK – formerly BM(NH)
NMP	National Museum of the Philippines, Manila, Philippines
PMBP	Panglao Marine Biodiversity Project – 2004, often referred to as PANGLAO 04
PS	Private collection of Peter Stahlschmidt, Germany
RBINS	Royal Belgian Institute of Natural Sciences, Brussels, Belgium
SANTO 06	Santo Marine Biodiversity Survey 2006
WF	Private collection Willem Faber, The Netherlands
YT	Private collection Yves Terry, Belgium
ZMB	Zoologisches Museum Berlin, Germany

SYSTEMATICS

Class **GASTROPODA** Cuvier, 1797

Family **TEREBRIDAE** Mörch, 1852

Strioterebrum illustre sp. nov.

Illustrations:

Strioterebrum species A: Terry & Holford, 2008: 50, text fig., pl. 11, figs 15-16.

Terebra arabella Thiele, 1925: Tröndle, 1984: 8, fig. 4.

Terebra arabella Thiele, 1925: Salvat & Rives, 1984: 136.

Type Material: Holotype: MNHN 24507, Santo Marine Biodiversity Survey 2006, Vanuatu Archipelago, Stn FS74, Strait N Tangoa Island, 15°35.7'S - 166°11.59.3'E, 12 m, 21.3 mm. **Paratype 1:** MNHN 24508: Santo Marine Biodiversity Survey 2006, Vanuatu Archipelago, Stn ED07, Segond Channel, Wambu river mouth, 15°33.9/34.2'S-167°08.0/08.4'E, in mixed mineral sand, 20-28 m, 24.4 mm. **Paratypes 2-5:** East China Sea, trawled at 150 m on a gravel/sand bottom by Chinese commercial fishing vessel, YT, 15.5-19.5 mm. **Paratype 6:** East China Sea, trawled at 180 m on a sand bottom by Chinese commercial fishing vessel, PS, 21.7 mm. **Paratypes 7-8:** East China Sea, trawled at 120 m on a sand bottom by Chinese commercial fishing vessel, GM, 18.3-19.8 mm. **Paratype 9:** East China Sea, trawled at 150 m on a sand bottom by Chinese commercial fishing vessel, ED, 16.1 mm. **Paratype 10:** French Polynesia, dived at 30 in a bay of the SE peninsula of Tahiti, MB, 22.0 mm. **Paratypes 11-12:** East China Sea, trawled at 150 m on a gravel/sand bottom by Chinese commercial fishing vessel, GP, 19.2-20.1 mm. **Paratype 13:** East China Sea, trawled at 120 m on a sand bottom by Chinese commercial fishing vessel, WF, 19.3 mm.

Other material: Atelier Lifou Stn 1415, New Caledonia, Loyalty Islands, Lifou, Baie du Santal, in front of Chépénéhé, on a sandy bottom between 3 and 7 m, 1 specimen.

Comparative material: During description and comparison with closely related species, specimens of the following species were studied, both type material and specimens in the authors' collections: *S. swainsoni* (Deshayes, 1859), *S. arabellum* (Thiele, 1925), *S. isabella* (Thiele, 1925) and *S. japonicum* (E. A. Smith, 1873).

Type locality: Vanuatu Archipelago, SANTO 2006 Stn FS74, Strait N Tangoa Island, 15°35.7'S-166°11.59.3'E.

Description: Shells up to 25 mm (estimated size of paratype 1). Plain colour pattern of brown with an intense lustre. Lighter areas around subsutural groove, crests of ribs and lighter hazy band at the periphery, which shows through into the aperture. Overall outline of shell straight, but individual whorls slightly convex and constrained anteriorly. Protoconch of 5 clear conical whorls. Subsutural band formed by a deep groove, which lightly cuts crests of ribs. Axial structure of oblique, curving, widely spaced ribs, 15 ribs on the penultimate whorl of the holotype (21.3 mm). Ribs stretch from suture to suture and continue onto basal area. Spiral structure consists of one or two deep grooves on the anterior half of whorls close to suture and several similar deep grooves on the basal area, at and below, the periphery. Aperture elongate with a callus which develops on the columella of mature specimens.

Note on the holotype: The specimen has been discussed and figured in Terryn & Holford (2008). The largest size given there is 32.3 mm (Terryn & Holford, 2008: 50) and the corresponding shell was figured on plate 11, fig. 16. After a review of these samples, Mrs Virginie Heros (MNHN) noted that this particular specimen measured only 21.3 mm. Upon investigation of the original notes, this was confirmed. A simple typographic mistake in the initial logging of this specimen into the second author's database, was carried into the description and corresponding plate. This mistake is here rectified: the specimen concerned is here logged as holotype measuring 21.3 mm. Largest known specimen is paratype 1 (apex broken) measuring 24.4 mm, maximum size of the species is estimated to be around 25.0 mm

Habitat and bathymetric range: The two specimens of which the origin is assured came from depths between 12 and 28 m (holotype + paratype 1, Vanuatu Archipelago). The specimens originating from Chinese commercial fishing operations in the East China Sea allegedly have a bathymetric range down to 150-180 m and were retrieved from a gravel and/or sand bottom. Terryn & Holford (2008: table 2) demonstrated that members of the genus *Strioterebrum* have a rather narrow and shallow bathymetric range in the Vanuatu Archipelago: somewhat restricted between 0 and 30 m. Also in the Philippines and Japan, *Strioterebrum* are usually found intertidally or in shallow water (0-60 m).

Furthermore, there is a record of a specimen labelled "*Terebra arabella* Thiele, 1925" taken from Tröndle (1984: 8, fig. 4) which has the key features of *S. illustre*. Although the photograph is of poor quality, the characteristic features of the species are evident. The specimen was found in Matavaï Bay, Tahiti, French Polynesia. The locality can be added to the range as its presence was confirmed by a specimen in the collection of Mr Michel Balleton dived alive in a bay at 30 m, peninsula of Tahiti, French Polynesia, here cited as paratype 10. Again both finds indicate a rather shallow habitat of 0-30 m.

Distribution: Known from Vanuatu, New Caledonia, French Polynesia and the East China Sea. The multispiral protoconch suggests a planktonic phase of development and would imply a wide (and possibly scattered) distribution throughout the Central Indo-Pacific.

Comparison and discussion: The most challenging species for comparison with *S. illustre* are *S. japonica*, *S. swainsoni*, *S. arabellum* and *S. isabella*. No larger species of **Terebridae** with juveniles similar to *S. illustre* could be identified and other species within *Strioterebrum* were eliminated based on overall shape, whorl structure or protoconch.

The ribs on *S. japonicum* are cut off at the periphery and are more numerous. The colour pattern is matt with only a minimal shine even on fresh specimens. The subsutural area is white. Spiral grooves are fine or insignificant threads and even missing in some specimens; they are never deep grooves.

The overall shape of *S. swainsoni* has a convex outline compared to an almost straight profile of *S. illustre*. The subsutural groove of *S. swainsoni* cuts sharply into the ribs. There are many weak spiral striae between the ribs of *S. swainsoni*, never deep grooves.

S. illustre is similar to *Strioterebrum arabellum*, also a shiny brown shell but it has a weak white subsutural colour band. *S. arabellum* has a 4 whorl protoconch compared to the protoconch of 5 whorls in *S. illustre*. Specimens of *S. arabellum* examined in the type sets were all less than 12 mm with 9 mature whorls. At the same length, *S. illustre* has consistently developed 10 shorter mature whorls. The whorls of *S. arabellum* are highly convex with strong curving ribs contrasting with the early whorls of *S. illustre*, which have oblique, slightly curved thinner ribs. *S. arabellum* has 3-5 spiral striae between the ribs compared to *S. illustre*, which has one deep groove on its early whorls becoming two grooves only on later whorls.

S. isabella is more elongate in profile with straight ribs with a 3.5 whorl protoconch and 4 faint spiral grooves on the whorls. The apical angle of *S. isabella* is much narrower. It has a shiny light tan background with a white band covering the subsutural band and extending onto the tops of the whorls; its whorls are longer, more convex and have fewer ribs, which are nearly straight.

Additional notes: Bratcher & Cernohorsky define the maximum size of *S. arabellum* as up to 22 mm. This includes the specimens resembling those from Tahiti mentioned by Tröndle (1984) and Salvat & Rives (1975), which are here regarded as *S. illustre*. Adult maximum size of *S. arabellum* is most probably around 12 mm only.

Derivatio nominis: The name *S. illustre* is chosen since the shine of the species causes it to stand out in any group of shells.

Clathrotrebra brunneobandata sp. nov.

Illustrations

Clathrotrebra aff. *dedonderi* Terryn, 2003: Terryn in Poppe, 2008: 812, text fig. (of a live specimen of *C. brunneobandata* sp. nov.)

Type Material: **Holotype:** MNHN 24509, PMBP 2004, Stn T22, Philippines, Bohol Island, 11-20 m, mud, 12.0 mm. **Paratype 1:** NMP, PMBP 2004, Stn D10, Philippines, Bohol Island, 15-22 m, mud, 12.1 mm. **Paratype 2:** MNHN 24510 (ex 30450), PMBP 2004 Stn T26, on mud at 123-135 m, off Cortes, Bohol Island, Philippines, 10.2 mm (estimated total size, largest piece 6.4 mm with intact protoconch). **Paratypes 3-4:** MNHN 24511, PMBP 2004, Stn T33, among sponges on sand bottom at 67-74 m, off Baclayon, Bohol Island, Philippines, 13.7-16.7 mm. **Paratype 5-6:** MNHN 24512, Campagne Salomon 2, stn DW2294, N/O *Alis*, dredged between 105 and 128 m, off South Tetepare Island, Solomon Islands, 11.9-15.8 mm. **Paratype 7:** NHMUK 20110306, by tangle nets on a mud/sand bottom at 200 m, Magellan Bay, Mactan, Cebu, Philippines, leg. GM, 15.0 mm. **Paratypes 8-15:** all from Philippines, Cebu, Mactan, Magellan Bay, by tangle nets on mud/sand bottom at 200 m: paratypes 7-8: GM, 12.8 - 13.0 mm; paratypes 9 - 11: YT, 13.9-16.3 mm; paratypes 12 - 14: HM, 16.0-16.2 mm. **Paratypes 16-42:** Philippines, Bohol, Panglao, by tangle nets on mud/sand bottom at 200 m: paratypes 15-18: GM, 13.5-16.8 mm; paratypes 19-21: YT, 15.1-15.7 mm; paratypes 22-41: HM, 12.7-15.6 mm. **Paratypes 43-61:** Philippines, Mindanao, off Aliguay, trawled at 200 m: paratypes 42-49: GM, 13.2-15.1 mm; paratypes 50-51: YT, 14.0-14.5 mm; paratypes 52-58: HM, 11.3-15.4 mm; paratypes 59-60: ED, 8.7-13.4 mm. **Paratypes 62-65:** Papua New Guinea, Hansa Bay, off Laing Island, dredged at 80 m: YT, 14.0-16.4 mm. **Paratypes 66-67:** Philippines, Mindanao, off Aliguay, trawled at 150 m, ED, 12.1-13.8 mm. **Paratype 68:** Philippines, Cebu, of Mactan Island, trawled at 200 m, ED, 15.7 mm.

Other material: Campagne Salomon2 Stn CP2284, N/O *Alis*, Solomon Island, E Rendova Island, 195-197 m, MNHN 30522 and MNHN 30518, 2 sps (used for tissue extraction); PMBP 2004, Stn T26, Philippines, Bohol Island, Cortes, 123-135 m, mud, MNHN 30531, 1 sp. (used for tissue extraction); PMBP 2004, Stn T26, Philippines, Bohol Island, 123-135 m, mud, 5 sps; PMBP 2004, Stn T11, Philippines, Bohol Island, Maribojoc Bay, 78-95 m, sponges and muddy sand, 3 sps; PMBP 2004, Stn S25, Philippines, Bohol Island, 21 m, mud, 10 sps; PMBP 2004 Stn T11, among sponges on a muddy sand bottom at 78-95 m, Maribojoc Bay, Bohol Island, Philippines, MNHN 30514, 1 sp.

Comparative material: During description and comparison with closely related species, specimens of the following species were studied, both type material and specimens in the author's collection: *C. suduirauti*, *C. dedonderi* and *C. poppei*, from both the Philippines and Papua New Guinea.

Type locality: PANGLAO04 Stn T22, Philippines, Bohol, off Cortes.

Description: A small narrow species which reaches lengths up to 20 mm with the majority of specimens found in the 15-18 mm range. The shell has a matt finish. The colour is brown with a broad white band at the middle of each whorl and a narrow spiral white band just below periphery. The crest of the axial ribs is a lighter colour, which shows against the brown background. There is little variation in the colour pattern between specimens from the different localities. The first two whorls have a straight, turreted outline while the later whorls have a strongly convex profile, which is constricted both anteriorly and posteriorly at the suture. The narrow conical protoconch is 3.5 to 4 transparent whorls, often with a brown spiral ribbon internally. The convex axial ribs are sharply raised, numbering 13-15 on the penultimate whorl and running from suture to suture. The interspaces are much wider than the ribs. The spiral structure comprises 10-11 raised narrow cords, evenly spaced, which reach to the crest of the ribs creating indentations. There is no subsutural groove or punctations. The top of the ribs on each whorl curves sharply inwards to the suture often creating a variation in the spaces between the spiral cords, which can give the impression of a spiral subsutural feature. The body whorl is elongate with ribs stretching onto the base with 22-25 spiral cords. The aperture is elongate, brown within, with a pattern of two white bands. The columella is curved with a strong fold displaying axial striae.

Habitat and bathymetric range: The specimens were retrieved from a mud/sand bottom between 10 and 200 m.

Distribution: Known from Hansa Bay, New Guinea, E Rondova Island, Solomons, and from localities around Bohol and Mindanao in the Philippines. The multispiral protoconch would suggest a planktonic phase of development and imply a wide distribution throughout the Indo-Pacific.

Derivatio nominis: The name *brunneobandata* is a contraction of *brunneo*, here used as an attributive to *bandata*: named for its consistent colour pattern of brown bands.

Comparison: *C. brunneobandata* is similar to several **Terebridae** species with colour patterns of brown and white from the region. Our comparison list includes *Clathroterebra dedonderi* (Terry, 2003), *C. poppei* (Terry, 2003), *C. suduirauti* (Terry & Conde, 2004), *Terebra trismacaria* Melville, 1917 and juveniles of *C. russoi* (Aubry, 1991). *T. picardali* Aubry, 2011 which we would assign to *Clathroterebra* is also included.

C. russoi has a wider apical angle, and even in its juvenile whorls there is a subsutural band defined by a groove cutting the ribs.

C. dedonderi has a significantly wider apical angle, has subsutural punctures of variable depth, lightly cutting the ribs and creating a slightly raised band. It has fewer spiral grooves between the ribs. The colour pattern of *dedonderi* normally has a brown spiral band below the subsutural groove sometimes coalescing into the subsutural band but normally leaving the upper part of the ribs on the band white.

C. picardali (Aubry, 2011) is similar in colour pattern and sculpture to *T. dedonderi* but has an even greater apical angle and at its type length has 11 whorls compared to 14 in specimens of *C. brunneobandata*. Study of the type material of *C. picardali* is necessary to consider its validity or synonymy with *C. dedonderi*.

C. poppei has a similar narrow profile and shares many features with *C. brunneobandata*: the whorl structure, both spiral and axial, is similar, the aperture and the last whorl have the same features. *C. poppei* has a wider protoconch and ribs. The structure of its early whorls is similar to *C. brunneobandata* but by the tenth whorl the whorls of *C. brunneobandata* become longer and wider and more convex than *C. poppei*. *C. poppei* develops lengthwise up to 28 mm but *C. brunneobandata* matures at about 18 mm. The colour pattern of *C. poppei* normally has a single thin brown spiral band adjacent to the suture and sometimes a vague brown band on the lower half of the whorls.

C. suduirauti is a longer shell maturing at 25-30 mm. The aperture and whorl structure, both axial and spiral, are very similar to *C. brunneobandata*. The colour pattern of *C. suduirauti*, however, is white, mottled with some brown splashes and a brown base. Its overall shape is much slimmer although its protoconch is wider. The structure of its early whorls is similar to *C. brunneobandata* but by the ninth whorl, the whorls of *C. brunneobandata* have matured and become longer and wider and more convex than *C. suduirauti*. No specimens of *C. suduirauti* have been found which have the brown-banded pattern of *C. brunneobandata* on their early whorls.

T. trismacaria is a longer shell found in the same distribution but it has a light coloured subsutural band defined by deep grooves between the ribs.

Molecular analysis: Molecular analysis has been undertaken which demonstrated a significant separation of this species from *C. dedonderi*. Unfortunately to this date, we lack tissue samples of *C. poppei* and *C. suduirauti*.

The sequences of specimen MNHN 30450 (renumbered from 24510, here listed as paratype 2, pl. 3 fig. 1) have been published by Holford et al. (2009) as "*Hastulopsis sp.*". The sequences COI, 16S, 12S can be consulted in GenBank (see internet references) with accession numbers: 16S: EU685654.1; COI: EU685517.1; 12S: EU685362.1. The COI sequence is also accessible in BOLD as CONO256-08 (see internet resources).

Summary: *C. brunneobandata* has a consistent colour pattern of a wide brown band next to the suture, a wide whitish band at middle and a wide brown band reaching to the anterior of the whorl. On the last whorl a thin whitish band is found at the periphery. In a large number of samples of specimens from several localities, specimens of *C. brunneobandata* bigger than 20 mm have not yet been found. Equally specimens of *C. suduirauti* and *poppei* are not found with the banded colour pattern on their juvenile whorls. With a multispiral protoconch denoting a planktonic phase, we would expect that the species would be found widely with some variations between the different localities.

S. illustre has a consistent brown colour pattern with a uniquely intense lustre and one or two deep grooves on the anterior half of its whorls and these unique features are not found in other described species. It reproduces in a wide distribution range with little variation in colour, shape or structure found in mature specimens.

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Internet resources:

<http://www.aubryterebridae.com> – the personal website of Dr Umberto Aubry; data retrieved till June 2011. We note here that making all this information available to the public is a valuable contribution to the small community of Terebridae collectors and researchers.

<http://www.ncbi.nlm.nih.gov/nuccore?term=hastulopsis%20sp%20MNHN%3A%2030450> – access to 12S, 16S and COI genes of *C. brunneobandata* (listed originally as “*Hastulopsis* sp.”)

<http://www.boldsystems.org> – access to the Barcode of Life Data systems.

Plate 1

1-5: *Strioterebrum illustre* sp. nov.

1: Holotype, MNHN 24507, SANTO06, 21.3 mm.

2: Paratype 1, MNHN 24508, SANTO06, 24.5 mm.

3-4: Paratype 2, YT, East China Sea, 19.5 mm.

5: Holotype, MNHN 24507, SANTO06, 21.3 mm, detail of apex and protoconch.

6: *Strioterebrum japonicum* (E. A. Smith, 1873) - YT, trawled at 100 m off Wakayama Prefecture, Honshu, Japan, 25.7 mm.

7: *Strioterebrum isabella* (Thiele, 1925) - holotype, ZMB, Padang, Sumatra, 13.5 mm. (x 2)

8: *Strioterebrum illustre* sp. nov. - paratype 5, YT, East China Sea, 15.5 mm. (x 2)

9: *Strioterebrum arabellum* (Thiele, 1925) - holotype, ZMB, Padang, Sumatra, 10.7 mm. (x 2)

10: *Strioterebrum swainsoni* (Deshayes, 1859) - paralectotype 2, NHMUK 1979113/3, Hawaiian Islands, 30.1 mm.

Plate 2

1-8: *Clathrotrebra brunneobandata* sp. nov.

1: Holotype, MNHN 24509, PMBP 2004, Stn T22, Philippines, Bohol Island, 12.0 mm

2: Paratype 4, MNHN 24511, PMBP 2004, Stn T33, Philippines, Bohol Island 16.7 mm.

3: Paratype 21, YT, Philippines, Bohol, Panglao, 15.6 mm.

4: Other material, MNHN 30514, PMBP 2004, Stn T22, Philippines, Bohol Island, used for tissue extraction, 10.3 mm.

5: Paratype 4, MNHN 24511, 16.7 mm, detail of apex and protoconch.

6: Paratype 4, MNHN 24511, 16.7 mm, detail of aperture and body whorl.

7: Paratype 21, YT, PMBP 2004, Stn T11, Philippines, Bohol Island, 15.6 mm, detail of aperture and body whorl.

8: Paratype 65, YT, Papua New Guinea, Hansa Bay, 16.4 mm, detail of aperture and body whorl.

Plate 3

1: *Clathroterebra brunneobandata* sp. nov. - paratype 2, MNHN 24510, used for tissue extraction, estimated total size 10.2 mm.

2: *Clathroterebra brunneobandata* sp. nov. - paratype 65, YT, 16.4 mm.

3: *Clathroterebra poppei* (Terry, 2003) - paratype 5, RBINS IG n°30019, Papua New Guinea, Hansa Bay, dredged at 40 m, 24.5 mm.

4: *Clathroterebra dedonderi* (Terry, 2003) - paratype 14, YT, Papua New Guinea, Hansa Bay, dredged at 36-50 m, 21.2 mm.

5: *Clathroterebra suduirauti* (Terry & Conde, 2004) - paratype 2, YT, Philippines, Aliguay, 28.5 mm.



Plate 2





1



2



3



4



5