New records and three new species of *Thysanodonta* (Gastropoda: Calliostomatidae: Thysanodontinae) from New Caledonia

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ABSTRACT. New records of *Thysanodonta* from New Caledonia area are listed. *Thysanodonta diadema* n. sp., *T. pileum* n. sp. and *T. cassis* n. sp. are described and compared with similar *Thysanodonta* species from New Caledonia that are also illustrated. Seven *Thysanodonta* species are recognized by now in New Caledonia, a eighth species occurring in the neighbouring Chesterfield Islands.

RESUME. De nouvelles récoltes de *Thysanodonta* de Nouvelle-Calédonie sont données. *Thysanodonta diadema* n. sp., *T. pileum* n. sp. et *T. cassis* n. sp. sont décrites et comparées avec les espèces connues de *Thysanodonta* de Nouvelle-Calédonie qui sont également illustrées. Sept espèces de *Thysanodonta* sont donc à présent recensées en Nouvelle-Calédonie, avec une huitième limitée dans la zone voisine des Iles Chesterfield.

INTRODUCTION

The subfamily Thysanodontinae was introduced by Marshall (1988), based mainly on a very distinctive radula (central field lacking, outer teeth very slender with backward-oriented barbs), narrow, expanded at midlength and tapered at tip, snout and first teleoconch whorls carinate on the third primary spiral cord. Marshall considered that Thysanodontinae could have derived from Calliostomatinae, while Hickman and McLean (1990) noted however that the radula of Thysanodontinae is so modified that no characters of the Calliostomatinae radula could be recognized.
The subfamily contains only 3 genera (*Thysanodonta*, *Carinastele* and *Herbertina*, all Marshall, 1988) with a few species within : originally, 9 species were placed in this subfamily of which 8 were new species. A new species from South Africa was added later to the genus *Herbertina* (Herbert, 1995).
Within the molluscan material brought by the French expeditions in New Caledonia area from 80's and 90's (conducted by the IRD (Institut de Recherche pour le Développement, Paris - ex-ORSTOM) and the MNHN (Muséum national d'Histoire naturelle, Paris), 4 new *Thysanodonta* were found and described by Marshall (1995). Consequently, 5 species of this genus were known at this time for the New Caledonia area (*T. boucheti*, *T. festiva*, *T. opima*, *T. eucosmia*, all from New Caledonia, and *T. chesterfieldensis*, from the adjacent Chesterfield Plateau).

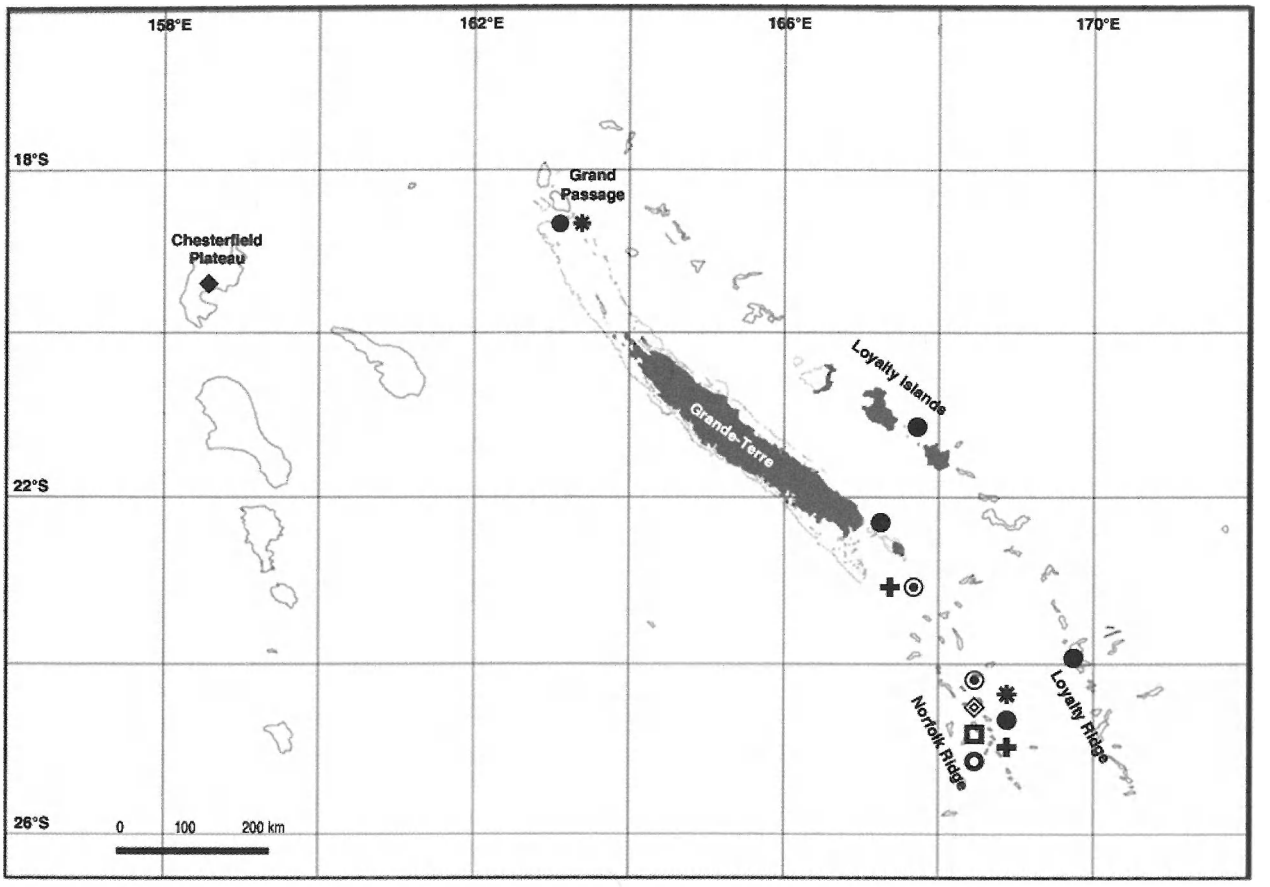
Several recent cruises from the same source have been examined, new records of known species and three new species of *Thysanodonta* were discovered. The present paper reports on these new findings. The material recorded and described by Marshall (1988, 1995) is not listed, but its results were used to investigate possible sympatry and syntopy of the 8 New Caledonian species.

Abbreviations

Repositories
MNHN : Muséum national d'Histoire naturelle, Paris, France.

Other abbreviations
W : width
H : height
HA : height of the aperture
P1, P2, P3, ...: primary cords (P1 is the most adapical)
S1, S2, S3, ...: secondary cords (S1 is the most adapical)
TW : number of teleoconch whorls
stn : station
lv : live-taken specimens present in sample
dd : no live-taken specimens present in sample

For bathymetric distribution, the range is taken from the internal intervals of the two extremes values.



Map. 1. Distribution of *Thysanodonta* in New Caledonia area. *Thysanodonta chesterfieldensis* ◆; *boucheti* ●; *festiva* ✱; *opima* ⊙; *eucosmia* ✚; *cassis* ⊡; *pileum* O; *diadema* ◘.

SYSTEMATICS

We follow here the classification of Bouchet & Rocroi (2005), where Thysanodontinae, earlier treated as a subfamily of Trochidae, are ranked as a subfamily of Calliostomatidae.

Superfamily: **TROCHOIDEA** Rafinesque, 1815
Family: **CALLIOSTOMATIDAE** Thiele, 1924
Subfamily : **THYSANODONTINAE** Marshall, 1988
Genus: ***Thysanodonta*** Marshall, 1988
Type species: *Thysanodonta aucklandica* Marshall, 1988 (by o.d.) – Recent, New Zealand.

Key to species of *Thysanodonta* of New Caledonia area

1. Spiral cords thin, more than 6 in number on adult spire whorls ..... *T. eucosmia*
— No more than 6 spiral cords on spire whorls 2
2. Broadly conical shell, height similar to width ..... *T. opima*
— More narrowly conical shell 3
3. 6 spiral cords on spire whorls 4
— 4 broad spiral cords on spire whorls 7
4. Conical or almost conical shell 5
— Cyrtoconoidal shell, all spiral cords granular 6
5. Abapical spiral cords more or less smooth on last whorl, narrowly conical ..... *T. festiva*
— Spiral cords granular, abapical cord poorly visible, ratio height-width smaller ..... *T. cassis*
6. P3 serrated on intermediate whorls, distance between cords smaller than cords ..... *T. diadema*
— P3 similar to other spiral cords, distance between cords similar in size to cords ..... *T. pileum*
7. Protoconch with a crowded close network of hexagons ..... *T. boucheti*
— Protoconch with a more open network of hexagons ..... *T. chesterfieldensis*

Thysanodonta boucheti Marshall, 1988
Figs 1-2

Thysanodonta boucheti Marshall, 1988: 219-220, figs 3 G-I. Type locality: northern New Caledonia.

Material examined. New Caledonia. BIOCAL: stn DW08, 20°34'S, 166°54'E, 435 m, 1 dd. - BATHUS 3: stn DW790, 23°49'S, 169°48'E, 685-715 m, 2 dd. - Stn DW830, 23°20'S, 168°01'E, 361-365 m, 1 lv. - BATHUS 4: stn DW914, 18°49'S, 163°15'E, 600-616 m, 22 dd. – Stn DW917, 18°47'S, 163°14'E, 397-400 m, 1 dd. – Stn DW919, 18°50'S, 163°17'E, 610-660 m, 5 dd. – Stn DW923, 18°52'S, 163°24'E, 470-502 m, 1 dd. – Stn DW929, 18°52'S, 163°23'E, 502-516 m, 1 lv, 8 dd. - SMIB 8: stn DW146-147, 24°55'S, 168°22'E, 598-532 m, 1 dd.

Distribution. Northern and Southern New Caledonia, living at 365-502 m, empty shells only in 350-685 m (ranges computed using the material examined by the authors and Marshall (1988, 1995)), and Wallis et Futuna 640-730 m (dead).

Thysanodonta eucosmia Marshall, 1995
Figs 3-4

Thysanodonta eucosmia Marshall, 1995:437-439, figs 113-115, 148-149, 158. Type locality: southern New Caledonia.

Material examined. New Caledonia. CHALCAL 2: stn DW 72, 24°55'S, 168°22'E, 527 m, 2 dd. - BERYX 11: stn DW27, 23°37'S, 167°41'E, 460-470 m, 2 dd. – Stn DW35, 23°33'S, 168°16'E, 550-570 m, 13 dd. - Stn CH41, 23°39'S, 168°00'E, 230-360 m, 1 dd. - SMIB 8: stn DW146-147, 24°55'S, 168°22'E, 508-532 m, 3 lv, 12 dd. – Stn DW166, 23°38'S, 167°43'E, 433-450 m, 6 dd. – Stn DW167, 23°38'S, 167°43'E, 430-452 m, 1 lv, 11 dd. – Stn DW168, 23°38'S, 167°43'E, 433-450 m, 4 dd. – Stn DW169, 23°37'S, 167°42'E, 447-450 m, 4 lv, 9 dd. - Stn DW189, 23°18'S-23°19'S, 168°06'E, 400-402 m, 1 dd. – Stn DW193-196, 22°52'S-23°S, 168°21'-168°23'E, 491-558 m, 14 lv, 63 dd. – Stn DW200, 24°00'S, 167°21'E, 514-525 m, 1 dd. – Stn DW201, 23°59'S, 167°21'E, 500-504 m, 2 lv, 8 dd. - BATHUS 2: stn DW720, 22°52'S, 167°16, 530-541 m, 1 dd. - BATHUS 3: stn DW816, 23°41'S, 168°15'E, 380-391 m, 1 dd. – Stn DW830, 23°20'S, 168°01'E, 361-365 m, 2 lv, 13 dd. - HALIPRO 2: stn BT94, 23°33'S, 166°42'E, 448-880 m, 2 dd. - NORFOLK 1: stn DW 1666, 23°42'S, 167°44'E, 469-860 m, 3 dd. – Stn DW 1688, 24°56'S, 168°22'E, 533-545 m, 1 dd. NORFOLK 2: stn DW2025, 23°27'S, 167°51'E, 410-443 m, 1 dd. – Stn DW2033, 23°39'S 167°43'E, 430-450 m, 1 lv & 1 dd.

Distribution. Southern New Caledonia, Northern Norfolk Ridge, living at 360-775 m, empty shells only in 360-775 m (ranges computed using the material examined by the authors and Marshall (1995)).

Thysanodonta festiva Marshall, 1995
Figs 5-6

Thysanodonta festiva Marshall, 1995: 435, figs 104-106, 158. Type locality: southern New Caledonia.

Material examined. New Caledonia. BERYX 11: stn DW18, 24°48'S, 168°09'E, 250-270 m, 2 dd. - SMIB 8: stn DW154, 24°46'S, 168°08'E, 235-252 m, 1dd. – Stn DW166, 23°38'S, 167°43'E, 433-450 m, 5 lv, 4 dd. - Stn DW167, 23°38'S, 167°43'E, 430-452 m, 7 lv, 1 dd. – Stn DW169, 23°37'S, 167°42'E, 447-450 m, 1 dd. – Stn DW170-172, 23°41'S, 168°00'E-168°01'E, 230-290 m, 1 dd. – Stn DW190, 23°18'S, 168°05'E, 305-310 m, 4 lv, 8 dd. - BATHUS 3: stn DW818, 23°44'S, 168°16'E, 394-401 m, 1dd. – Stn DW824, 23°19'S, 168°00'E, 601-608 m, 1 dd. - BATHUS 4: stn DW925, 18°55'S, 163°24'E, 370-405 m, 1 dd. - Stn DW927, 18°56'S, 163°22'E, 444-452 m, 1 lv, 1 dd. – Stn DW942, 19°04'S, 163°27'E, 264-270 m, 1 dd.

Distribution. New Caledonia, Northern Norfolk Ridge, living at 310-444 m, empty shells only in 230-601 m (ranges computed using the material examined by the authors and Marshall (1995)).

Thysanodonta cassis n. sp.
Figs 7-8; 13

Type material. Holotype MNHN (Moll 5872). 2 paratypes MNHN (Moll 5873).

Type locality. New Caledonia, Norfolk Ridge, NORFOLK 2, stn DW2069, 25°20'S 168°58'E, 795-852 m.

Material examined. New Caledonia. NORFOLK 2 : stn DW2066, 25°17'S 168°55'E, 834-870 m, 1 dd (paratype). – Stn DW2069, 25°20'S 168°58'E, 795-852 m, 1 lv & 1 dd (holotype and paratype).

Distribution. South-eastern New Caledonia, Norfolk Ridge, living at 795-852 m, empty shell only in 834-870 m.

Diagnosis. A *Thysanodonta* species of rather medium size, higher than wide, conical in shape, with a angular periphery, 6 granular spiral cords on last whorl, all similar in size except the most adapical that is broader and the peripheral cord that is thinner; the base is weakly convex, bearing 8 or 9 smooth spiral cords and no umbilicus.

Description. *Shell* of medium size for the genus (height up to 11.4 mm, width up to 8.5 mm), conical or very weakly cyrtoconoidal in shape; spire high,

height about 1.3x width, about 3.6x to 3.9x higher than aperture, anomphalous.
Protoconch ca 180 to 200 µm in diameter, of 1,25 whorl, covered by reticulate network of fine ridges producing hexagonal spaces; apical fold almost straight with a rounded thin terminal varix.
Teleoconch of up to 6.8 whorls, bearing spiral granular cords, more or less flat. Suture poorly visible, not channelled. First whorl of teleoconch convex, sculptured by spiral weakly granular primary cords; P3 appearing immediately, P1 and P2 appearing more or less simultaneously after a quarter of whorl; P3 flange-like, much stronger than P1 and P2; prosocline axial ribs in intervals between cords, connecting granules of cords; distance between axial ribs as broad as width of ribs. At begin of second whorl, P3 stronger than other primary cords; S2 appearing, quickly as large as P1 and P2; at end of whorl, P4 almost completely covered by next whorl. On third whorl, S3 appearing; P1, P2, S2 and P3 of the same size while S3 becoming quickly as broad as other cords; angulation at P3 weakening and disappearing; distance between cords smaller than width of cords; axial sculpture still visible, distance between ribs 2 times larger than width of ribs. On fourth whorl, axial sculpture becoming obsolete; beads of cords becoming stronger and closer; P1, P2, S2 and P3 similar in size, S3 stronger, becoming peripheral; distance between cords similar in size to cords, except distance between P3 and S3 that is 1.5 times larger than width of cords; P4 emerging but almost completely covered by next whorl. On last whorls, P1 the strongest, S3 a little weaker but stronger than P2, S2 and P3 similar in size, P4 much weaker; distance between cords similar in size to cords, except distance between P3 and S3 still larger and distance between S3 and P4 smaller than size of cords; beads of abapical cords becoming obsolete.
Aperture subcircular; outer lip rather thin at rim; basal part curved, meeting outer lip without angle and inner lip with a obtuse angle.
Columella slightly concave, vertical, smooth, ending abruptly; callus completely closing umbilicus.
Base weakly convex, with up to 9 smooth rounded spiral cords similar in size; distance between cords of about same size as cords; no distinct axial threads in space between cords.
Colour of teleoconch and protoconch uniformly pinkish white.
Operculum horny, circular, multispiral.

	TW	H	W	HA	H / W	H / HA
holotype	6.3	9.4	7.3	2.4	1.29	3.92
paratype 1 DW2069	6.2	9.0	6.7	2.5	1.34	3.60
paratype 2 DW2066	6.8	11.4	8.5	2.9	1.34	3.93

Table 1. - *Thysanodonta cassis* : Shells measurements in mm for available specimens.

Discussion. *Thysanodonta cassis* n.sp. is close to *T. aucklandica* Marshall, 1988 from New Zealand, regarding their both conical shape and number of primary spiral cords on penultimate whorl, but *T. cassis* n.sp. has a smaller protoconch, a greater height-width ratio, primary cords P1 and P2 appearing much earlier, spiral cords broader with a distance between cords similar to the cords, and lacks any tertiary spiral cords on whorls.
T. cassis n.sp. is also different from *T. wairua* Marshall, 1988 from New Zealand for similar reasons, but also because this species has more numerous spiral cords on the whorls and on the base.
The new species can't be confused with *T. pileum* n. sp. (Figs 11-12) because this species is smaller for a similar number of whorls, has a cyrtoconoidal shape and spiral cords similar in size except P3 that is broader.
T. cassis n.sp. may also remember *T. festiva* Marshall, 1995 (Figs 5-6), but this species has only adapical cords clearly granular on the last whorl, a S3 cord separating into 2 spiral cords and is more narrowly conical (greater height-width ratio) with a weakly tumid last whorl.

Etymology. Helmet (Latin) - with reference to the conical shape of the shell that remembers the helmets of the ancient Near East.

Thysanodonta diadema n. sp.
Figs 9-10; 14-15

Type material. Holotype MNHN (Moll 5874). 4 paratypes MNHN (Moll 5956).

Type locality. New Caledonia, SMIB 8, stn DW152-154, 23°18'S-23°19'S, 168°05'E, 305-367 m.

Material examined. New Caledonia. SMIB 8: stn DW152-154, 23°18'S-23°19'S, 168°05'E, 305-367 m, 2 lv (holotype and paratype). – Stn DW190, 23°18'S, 168°05'E, 305-310 m, 1 lv, 1 dd (paratypes). - BATHUS 3: stn DW830, 23°20'S, 168°01'E, 361-365 m, 1 dd (paratype).

Distribution. South-eastern New Caledonia, living at 305-310 m, empty shell only at 361-365 m.

Diagnosis. A *Thysanodonta* species of small size, very higher than wide, cyrtoconoidal in shape, with a subangular periphery, a serrated peripheral spiral cord

on the median whorls, 6 granular spiral cords on last whorl; the base is weakly convex, bearing about 7 granular spiral cords and no umbilicus.

Description. *Shell* of small size for the genus (height up to 5.0 mm, width up 3.3 to mm), cyrtoconoidal in shape; spire high, height 1.4x to 1.5x width, 3x to 5x higher than aperture, anomphalous.
Protoconch ca 200 µm in diameter, of 1 whorl, covered by reticulate network of fine ridges producing large hexagonal spaces; apical fold straight with a rather strong rounded terminal varix.
Teleoconch of up to 6 whorls, bearing spiral granular cords; whorls weakly convex. Suture poorly visible, not channelled. First whorl of teleoconch convex, sculptured by crisp fine spiral threads and granular primary cords P3 and P4; P3 appearing immediately, P4 commencing on mid whorl; P3 much stronger, flange-like and whorl angulated at P3; P1 and P2 resolving almost simultaneously at end of whorl or at beginning of next whorl, both granular and similar in size; distance between P1, P2 and P3 lesser than cords, distance between P3 and P4 greater; prosocline axial ribs in intervals between cords, connecting granules of cords; distance between axial ribs 1.5 to 2 times larger than width of ribs. On second whorl, beads of P3 becoming weakly sharp; S2 and S1 appearing, quickly as large as P1 and P2; S3 absent. On third whorl, P1 becoming stronger than S1, P2 and S2; beads of P3 sharper; angulation at P3 weakening and disappearing; P4 clearly weaker, partly covered by next whorl; distance between cords becoming similar in size to cords. On fourth whorl, one for three beads of P3 becoming stronger and sharper than other beads; P1 stronger; axial ribs becoming obsolete. On fifth whorl, acute beads of P3 tends to be horizontally broader; beads of P1 becoming prosocline elongated; all other beads rounded. At the beginning of sixth whorl, all beads of P3 becoming similar rounded; all cords more or less similar in size, possibly P1 weakly stronger; distance between cords smaller than cords.
Aperture subcircular; outer lip rather thin at rim, thickened within; basal part curved, meeting outer lip without angle and inner lip with a distinct angle.
Columella fairly straight, slightly twisted on some specimens, vertical, smooth; callus completely closing umbilicus.
Base moderately convex, with about 7 granular rounded spiral cords; cords similar in size, distance between cords smaller than cords; fine axial threads in space between cords.
Colour of protoconch and first whorl brown; next teleoconch whorls pink with large pistachio, occasionally brown, blotches; base of same colour as whorls, but paler.
Operculum unknown.

	TW	H	W	HA	H/W	H/HA
holotype	6	5.0	3.3	1.0	1.52	5.00
paratype 1 DW190	6	4.2	3.1	1.3	1.35	3.23
paratype 2 DW830	6	4.0	2.9	1.3	1.38	3.08

Table 2. - *Thysanodonta diadema* : Shells measurements in mm for mature specimens.

Discussion. *Thysanodonta diadema* n.sp. is distinctive among *Thysanodonta* species with a unique combination of cyrtoconoid shell, rather thick spiral cords and P3 coronate on the intermediate whorls.
The new species may be compared to *T. boucheti* Marshall, 1988 (Figs 1-2), but this slightly greater species has a conical spire, less cords on whorls, no S2 while S3 is present.
T. diadema n.sp. may weakly remember *T. festiva* Marshall, 1995 (Figs 5-6), but this species has a conical spire, a S3 cord separating into 2 spiral cords and a P3 cord never showing a coronate shape.
The new species is very different from *T. eucosmia* Marshall, 1995 (Figs 3-4) because this larger species has more numerous and finer spiral cords on the whorls and on the base.

Etymology. Diadem, thin crown (Latin) - with reference to the specific serrated spiral cord on the median whorls.

Thysanodonta pileum n. sp.
Figs 11-12; 16-17

Type material. Holotype MNHN (Moll 5957). 4 paratypes MNHN (Moll 5958).

Type locality. New Caledonia, SMIB 8, stn DW152-154, 23°18'S-23°19'S, 168°05'E, 305-367 m.

Material examined. New Caledonia. SMIB 8: stn DW152-154, 23°18'S-23°19'S, 168°05'E, 305-367 m, 5 dd. (holotype and paratypes). – BATHUS 3: stn CP804, 23°41'S, 168°00'E, 244-278 m, 1 dd.

Distribution. South-eastern New Caledonia, Norfolk Ridge, empty shells at 278-305 m.

Diagnosis. A *Thysanodonta* species of small size, very higher than wide, cyrtoconoidal in shape, with a subangular periphery, 6 granular spiral cords on last whorl, all similar in size except the most abapical that

is thinner; the base is weakly convex, bearing about 7 granular spiral cords and no umbilicus.

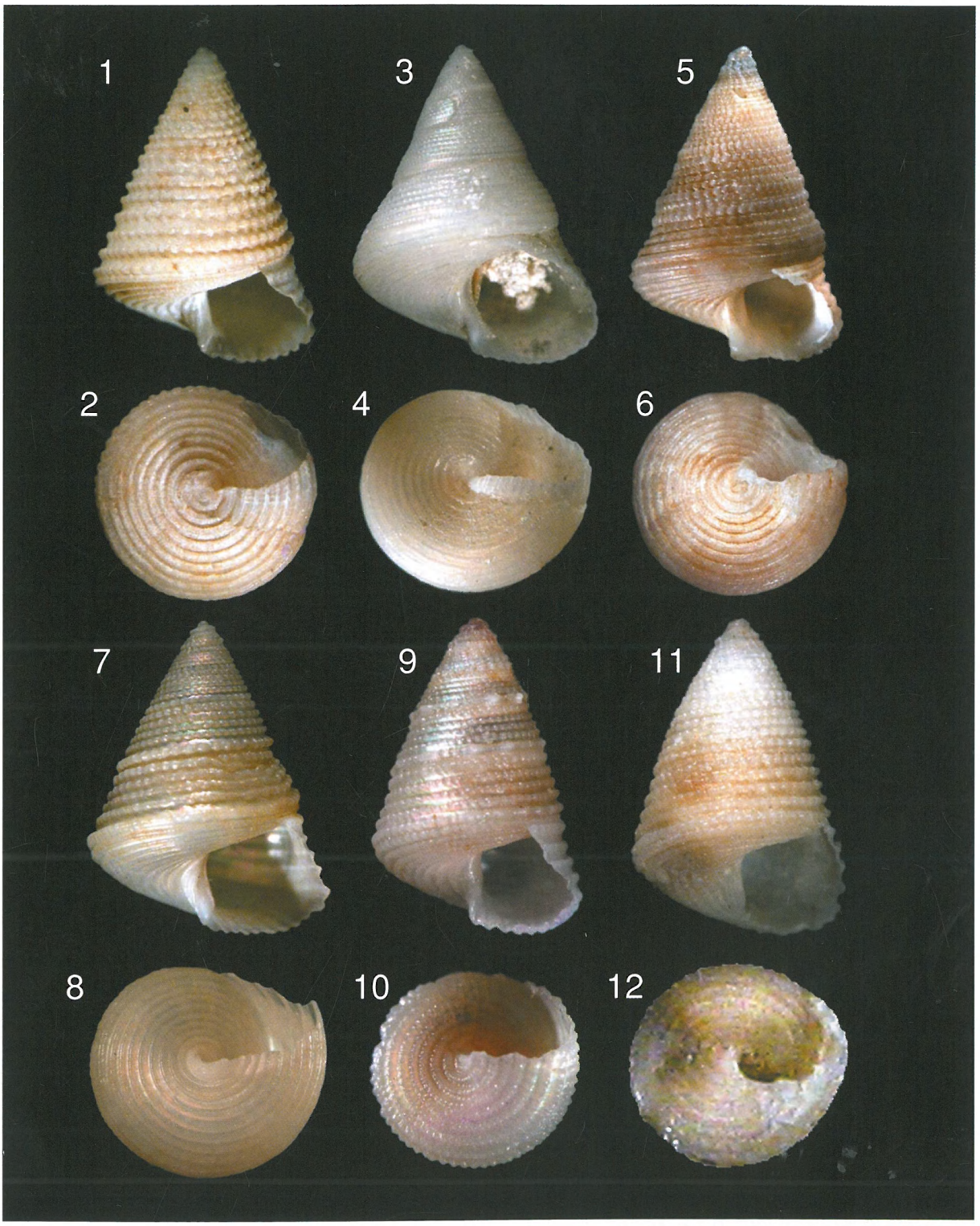
Description. *Shell* of small size for the genus (height up to 5.0 mm, width up to 3.4 mm), cyrtoconoidal in shape; spire high, height 1.3x to 1.5x width, about 3.8x to 4.8x higher than aperture, anomphalous.
Protoconch ca 200 µm in diameter, of 1 whorl, covered by reticulate network of fine ridges producing rather large hexagonal spaces; apical fold straight with a rounded terminal varix.
Teleoconch of up to 6 whorls, bearing spiral granular cords; whorls very weakly convex. Suture poorly visible, not channelled. First whorl of teleoconch convex, sculptured by crisp fine spiral threads and granular primary cords P3 and P4; P3 and P4 appearing immediately; P3 slightly stronger, flange-like; prosocline axial ribs in intervals between cords, connecting granules of cords; distance between axial ribs 1 to 1.5 times larger than width of ribs. P1 and P2 resolving more or less simultaneously at mid whorl, granular and similar in size; distance between P1 and P2 and between P3 and P4 of about same size as cords, greater than cords between P2 and P3. At begin of second whorl, P3 stronger than other primary cords; S2 and S1 appearing, quickly as large as P1 and P2; S3 absent; at end of whorl, P4 almost completely covered by next whorl. On third whorl, S2 becoming stronger than P1, S1 and P2; angulation at P3 weakening and disappearing; distance between cords becoming similar in size to cords; axial sculpture still visible, axial ribs thicker between S2 and P3, distance between ribs 2 times larger than width of ribs. On fourth whorl, axial sculpture becoming obsolete; beads of cords becoming stronger and closer; P1, S1, P2 and S2 similar in size, P3 stronger. On last whorls, all cords similar in size except P4 weaker; distance between cords similar in size to cords.
Aperture subcircular; outer lip rather thin at rim, thickened within; basal part curved, meeting outer lip without angle and inner lip with a obtuse angle.
Columella fairly straight, slightly twisted, vertical, smooth; callus completely closing umbilicus.
Base moderately convex, with up to 8 granular rounded spiral cords similar in size; distance between cords smaller than cords, much smaller in the inner part; fine axial threads in space between cords.
Colour of teleoconch whorls and base uniformly pinkish white; protoconch of same colour, but slightly darker.
Operculum unknown.

	TW	H	W	HA	H / W	H / HA
holotype	5.6	5.0	3.3	1.3	1.52	3.85
paratype 1 DW152-154	5.1	4.7	3.4	1.2	1.38	3.92
paratype 2 DW152-154	5.2	4.6	3.2	1.0	1.44	4.60
paratype 3 DW152-154	5.3	3.9	2.7	0.9	1.44	4.33
paratype 4 DW152-154	5.0	3.6	2.7	0.9	1.33	4.00
specimen CP804	6.0	4.8	3.2	1.0	1.50	4.80

Table 3. - *Thysanodonta pileum* : Shells measurements in mm for available specimens.

Figures 1-12.

1-2. *Thysanodonta boucheti* Marshall, 1988, northern New Caledonia, 610-660 m [BATHUS 4, stn DW919], 7.0 x 4.9 mm; **3-4.** *T. eucosmia* Marshall, 1995, MNHN, southern New Caledonia, Ile des Pins, 491-558 m [SMIB 8, stn 193-196], 10.7 x 8.1 mm; **5-6.** *T. festiva* Marshall, 1995, MNHN, southern New Caledonia, 250-270 m [BERYX 11, stn DW18], 6.5 x 4.4 mm; **7-8.** *T. cassis* n. sp., holotype MNHN (Moll 5872), southern New Caledonia, 795-852 m [NORFOLK 2, stn DW2069], 9.4 x 7.3 mm; **9-10.** *T. diadema* n. sp., holotype MNHN (Moll 5874), south-eastern New Caledonia, 305-367 m [SMIB 8, stn DW152-154], 5.0 x 3.3 mm; **11-12.** *T. pileum* n. sp., holotype MNHN (Moll 5957), south-eastern New Caledonia, 305-367 m [SMIB 8, stn DW152-154], 5.0 x 3.3 mm.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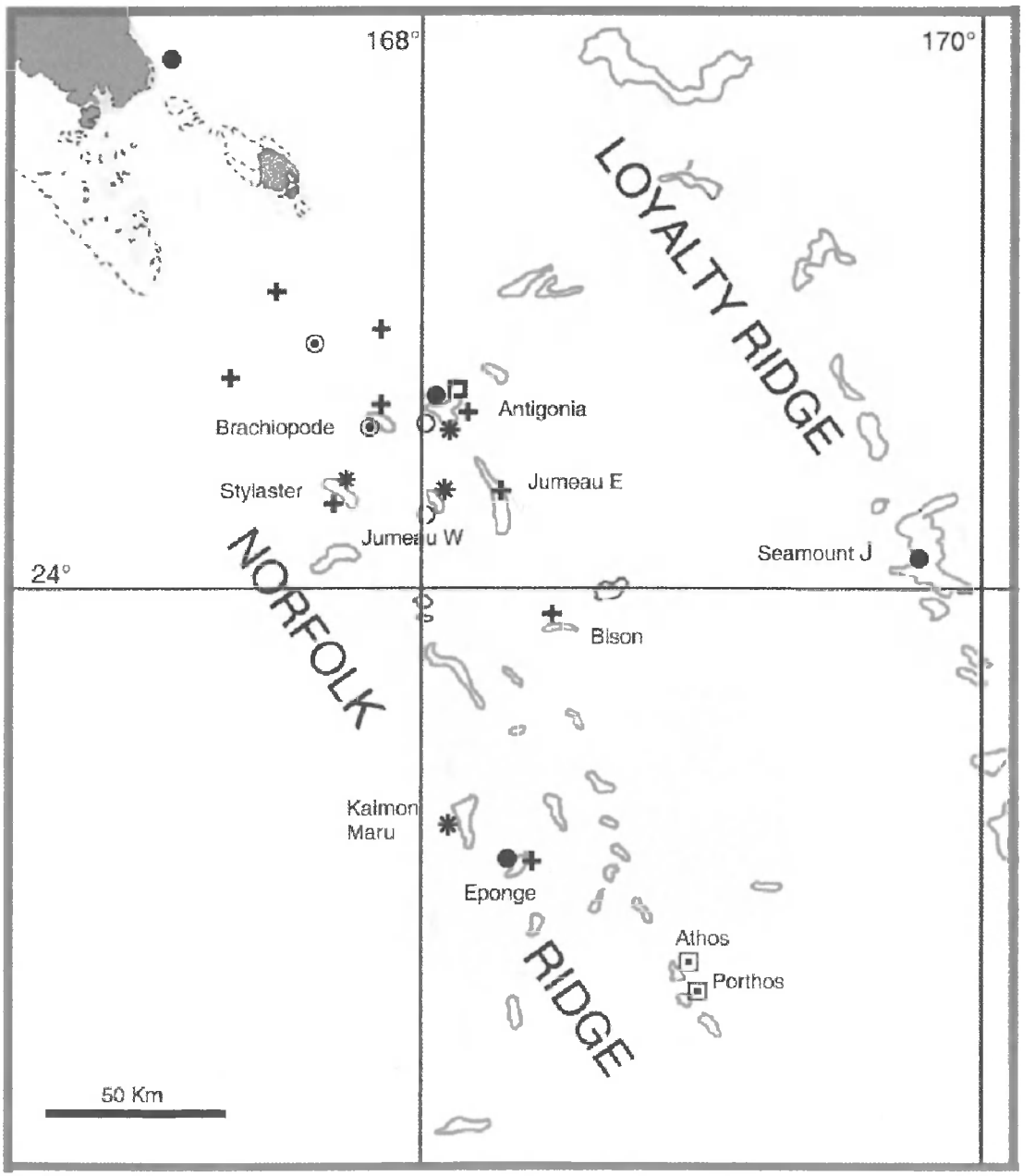
Discussion. *Thysanodonta pileum* n.sp. seems to be close to *T. diadema* n.sp. (Figs 9-10; 14-15) regarding their both cyrtoconoid shape, but *T. pileum* n.sp. lacks the serrated peripheral spiral cord on the first teleoconch whorls and has a distance between cords clearly similar to the cords.
The new species can't be confused with *T. eucosmia* Marshall, 1995 (Figs 3-4) because this larger species has a conical, sometimes weakly coeloconoid, shape and much more numerous and finer spiral cords on the whorls and on the base.
T. pileum n.sp. is also very different from *T. boucheti* Marshall, 1988 (Figs 1-2), because this slightly larger species has a conical spire, less and much separated cords on whorls, no S2 while S3 is present.
The new species may only weakly remember *T. festiva* Marshall, 1995 (Figs 5-6), because this species has a conical spire, sometimes with a weakly tumid last whorl while the other ones are flat, only adapical cords clearly granular on the last whorl and a S3 cord separating into 2 spiral cords.

Etymology. Cap (Latin) - with reference to the general shape of the shell.



Map 2. Distribution of *Thysanodonta* species on the Norfolk Ridge banks. *Thysanodonta chesterfieldensis* ◆; *boucheti* ●; *festiva* ✱; *opima* ⊙; *eucosmia* ✚; *cassis* ⊡; *pileum* ○; *diadema* □.

Notes on sympatry and syntopy of the New Caledonian *Thysanodonta* species.

The genus *Thysanodonta* is present in almost the whole New Caledonia area, except Lord Howe seamounts, Landsdowne Fairway, Hunter and Matthews volcanoes and the Lagoon area. It is clear that the *Thysanodonta* species live at such a depth that they can't live in the Lagoon. And the three other areas were only poorly prospected, explaining the lack of material. In the same way, Chesterfield Plateau was scarcely explored, giving only one species with only few specimens.

Norfolk Ridge, south of New Caledonia, is a seamounts chain SSE oriented, culminating between 300 and 500 m depth. The dredging campaigns considered in this paper were led not only at the summits, but also on the slopes of these mounts. But geographically very close dredging stations can be separated by tens even maybe by hundreds of meters. So, some species can be sympatric, because they live on the same isolated mount, but are not syntopic because they live at incompatible depths. Under such circumstances, one may also discuss syntopy for species live-taken in the same dredge.

The table 4 gives the distribution of New Caledonian *Thysanodonta* species and also toponyms of the seamounts of Norfolk Ridge, with the bathymetric range of the live-taken specimens.

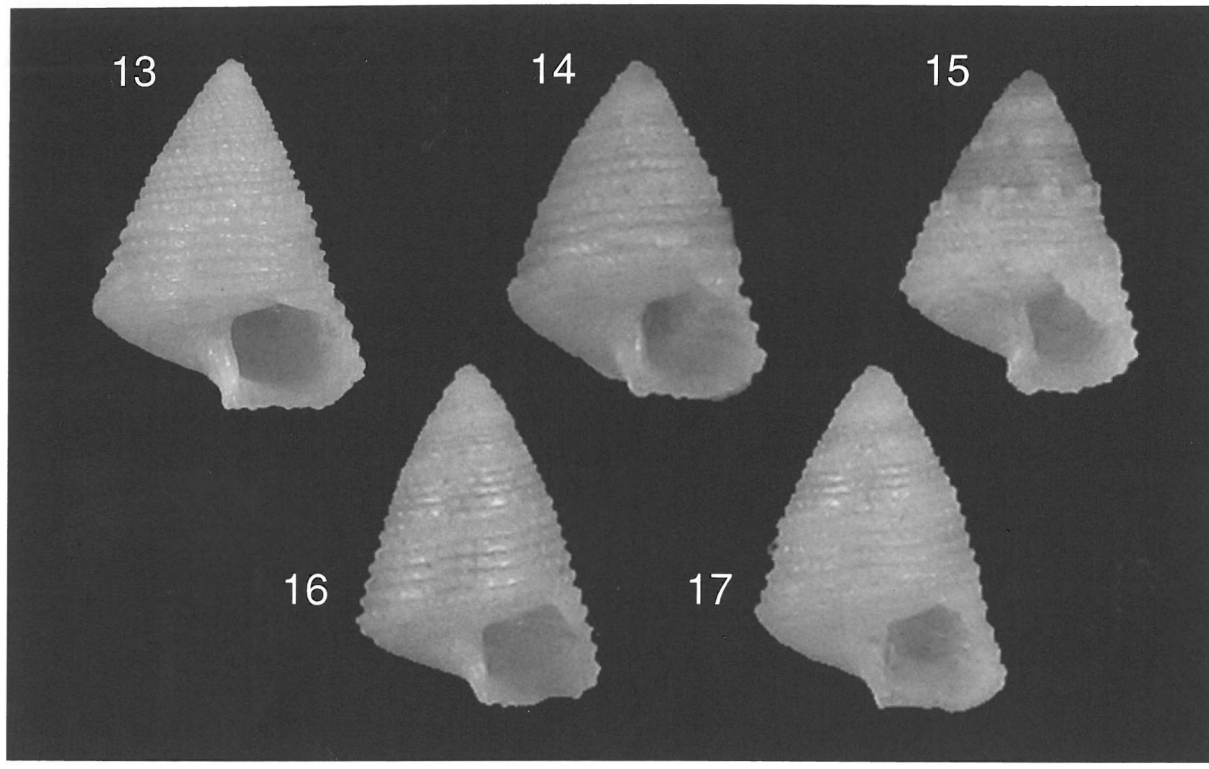
	Off Chesterfield Islands	Atoll de Surprise	Grand Passage	East of Ile Nou	South of Ile des Pins	Antigonia Bank	Brachiopode Bank	Stylaster Bank	Jumeau W Bank	Jumeau East Bank	Bison Bank	Kaimon Maru Bank	Eponge Bank	Athos bank	Porthos Bank	East Lifu	J Seamount "Loyalty R."
T. festiva			450			305 310		430 450	o			o					
T. boucheti		o	500 515	o		360							o			o	o
T. eucosmia					560 680	360 365	o	430 470		o	500 505		510 530				
T. diadema						o											
T. pileum						o			o								
T. chesterfieldensis	o																
T. cassis														o	o		
T. opima					o		o										

Table 4. Occurrences of the eight *Thysanodonta* species in New Caledonia area. Living records are mentioned.

Except *T. chesterfieldensis*, all the species were recorded in the Norfolk Ridge. Most of them found alive have a relatively narrow bathymetrical amplitude between 350 and 500 m (Table 5). The exception comes from *T. eucosmia* which has been dredged alive between 360 and 775 m. The seven species can be found on 10 different banks, from the northern Antigonia Bank to the southern Athos and Porthos Banks. But sympatric and syntopic species were only found on two of these banks : Antigonia and Stylaster. Antigonia Bank is the only one where more than two species were recorded (5 living, 1 dead). Regarding these records, we can state that :

- *T. boucheti*, *T. diadema*, *T. eucosmia* and *T. festiva* are clearly sympatric on these banks; they were found there living at similar depths;
- *T. boucheti* and *T. eucosmia* on the one hand, *T. diadema* and *T. festiva* on the other hand, are syntopic because they occurs living in the same dredge;
- *T. eucosmia* and *T. festiva* are sympatric and syntopic on Stylaster Bank;
- *T. boucheti* and *T. festiva* were found living together in the Grand Passage; they were dredged at close stations at rather similar depths (the bathymetrical difference is about 50 m); so, one can suspect that these two species are sympatric in this area.

The most southern banks (Athos, Porthos and Aramis) have been explored recently during the cruise Norfolk 2 in 2003. One first new species, *T. cassis*, extends this genus to the South. No conclusion regarding sympatry can be drawn from these records.



Figures 13-17.

13. *T. cassis* n. sp., paratype MNHN (Moll 5873), southern New Caledonia, 795-852 m [NORFOLK 2, stn DW2069], 9.0 x 6.7 mm; **14.** *T. diadema* n. sp., paratype MNHN (Moll 5956/1), south-eastern New Caledonia, 305-310 m [SMIB 8, stn DW190], 4.2 x 3.1 mm; **15.** *T. diadema* n. sp., paratype MNHN (Moll 5956/2), south-eastern New Caledonia, 361-365 m [BATHUS 3, stn DW830], 4.0 x 2.9 mm; **16.** *T. pileum* n. sp., paratype MNHN (Moll 5958/1), south-eastern New Caledonia, 305-367 m [SMIB 8, stn DW152-154], 4.6 x 3.2 mm; **17.** *T. pileum* n. sp., paratype MNHN (Moll 5958/2), south-eastern New Caledonia, 305-367 m [SMIB 8, stn DW152-154], 4.7 x 3.4 mm.

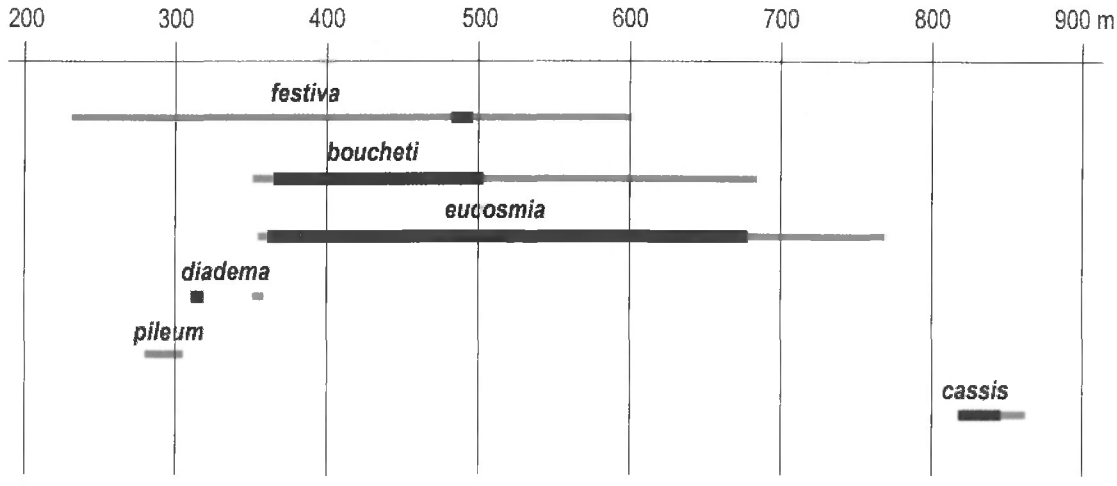


Table 5. Bathymetric data of the 6 New Caledonian *Thysanodonta* species occurring in the same area – heavy line: confirmed living depth range; light line: depth range indicated by empty shells only.

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