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Catalogue of the Gastropoda (snails, phylum Mollusca) collected by the IN2021_V04 and IN2022_V08 expeditions to the Australian Christmas Island and Cocos (Keeling) Islands Territories

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Abstract In this catalogue, 46 species of gastropods collected by the IN2021_V04 and IN2022_V08 expeditions to the Australian Christmas Island and Cocos (Keeling) Islands Territories are described and illustrated.

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Keywords gastropods, Indian Ocean Territories, illustrated catalogue, biodiversity, species discovery, deep-sea

Figure 1. Shell of *Calliotropis infundibulum*. Scalebar = 10 mm

Contents

Introduction

This taxonomic catalogue has been generated based on the examination of the gastropod material (over 300 specimens) collected from Australia's Indian Ocean Territories (IOT) during the 'Investigating the IOT' campaign (voyages IN2021_V04 and IN2022_V08). Based on the examination of shell and external body morphology, samples were assigned to 130 morpho-species (in 42 families). A literature search was then conducted for all names available and potentially applicable to the taxonomic units isolated. While 55 of them could be readily assigned to named species, the remaining 75 were of problematic species (or sometimes genus) attribution. It is not unlikely that several of these, yet unidentified, units will eventually be assigned to an available species name pending further consultation with experts for various gastropod groups. Nonetheless, a significant proportion of the sampled gastropod fauna is considered herein to be new to science. For example, the vast majority of the 39 morpho-species in the superfamily Conoidea (nearly a third of the total morpho-species isolated) are considered as undescribed herein. For each of the species identified, the shell of (up to 3) specimens was photographed and its length (SL) measured. Based on literature data, a brief conchological diagnosis for the species as well as remarks on its taxonomy, geographic and bathymetric distribution and ecology were generated. This species-specific information, however, was not available for the unidentified morpho-species, which were not included in this study. It should also be noted that, as sampling was conducted primarily by beam trawl (O'Hara, 2021, 2022), the smaller-sized (<10 mm) gastropod fauna, which normally slip through the mesh of this type of collecting gear, is likely to be under-sampled. Some ecological observations, however, can be made based on the taxonomic composition of the material. Sharing a feature of deep-sea gastropod faunas worldwide (Allen, 1983), the IOT material predominantly included families of scavengers, deposit-feeders, predators and parasites, with no true herbivores (absent due to the lack of photosynthetic life at the sampled depths). Most scavengers were represented by Pseudococculinidae (Hickman, 1983) and Cocculinidae (Haszprunar, 1987; Marshall, 1985) that feed on sunken plant remains and by Nassariidae (e.g. Dekker & Dekkers, 2009; Fraussen, 2003; Kool, 2004), that feed on animal remains. Deposit-feeders were also present in the material, such as species of the families Seguenziidae, Solariellidae and Calliotropidae (Kano, 2008; Kano *et al.*, 2009). Most of the predator gastropods collected were Conoidea (Bouchet *et al.*, 2011), that paralyse their polychaete prey by injecting venom through modified arrow-like radular teeth. Other predators were in the families Muricidae (Marshall & Houart, 2011; Oliverio *et al.*, 2009), Fasciolariidae (Fraussen *et al.*, 2007; Hadorn & Fraussen, 2003), Naticidae (Bouchet & A., 1993; Burch & Campbell, 1963; Simone, 2014) and Cassidae (Beu, 2008). Both the latter two bore a hole through the shell of their (respectively) molluscan or echinoid prey, using their radula and an acid secretion. Finally a small amount of parasite gastropods were found, in the family Eulimidae (Bouchet & Warén, 1986) (which extract body fluids from echinoderm hosts through a muscular proboscis) and in the Epitoniidae (Bouchet & Warén, 1986) (having cnidarian hosts). While, quite predictably, most of the species identified have a typical Indo-Pacific distribution, four of these species exhibit a trans-oceanic Atlantic-Pacific distribution: *Calliotropis infundibulum* (Watson, 1879) (Vilvens & Swinnen, 2008), *Lampasopsis rhodostoma* (Sowerby, 1835) (Beu *et al.*, 2012), *Oocorys sulcata* Fischer, 1884 (Beu, 2008; Bouchet & A., 1993), *Cryptogemma phymatias* (Watson, 1886) (Zaharias *et al.*, 2020). While the first three cases are exclusively supported by (however robust) morphological evidence, the latter only one has been molecularly tested. Our ongoing genetic work on Raphitomidae (Criscione & Hallan, subm.) indicate that the phenomenon of trans-oceanic distribution in deep-sea gastropods is far more common than previously thought.

Methods

Station details and collection methods are described in O'Hara (2024).

Systematic account

Order Seguenziida

Superfamily Seguenzioidea

Family Calliotropidae

***Bathybembix abyssorum* (Smith, 1891)**

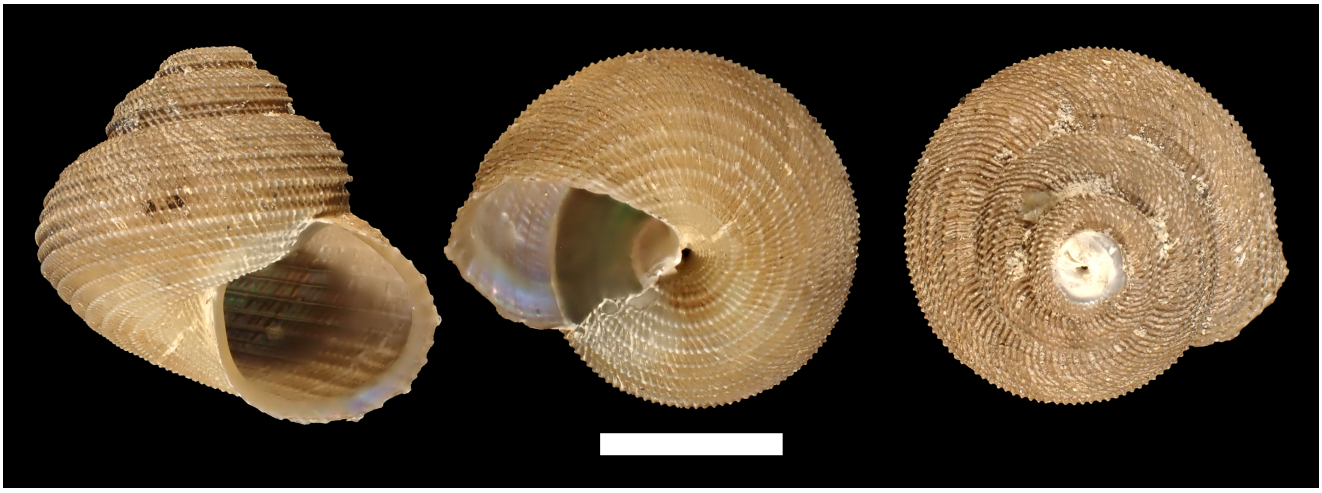

Figure 2. Shell of *Bathybembix abyssorum*. AMS C.593501 [IN2021_V04_033]. Scalebar = 10 mm.

Diagnosis Shell turbinate, thin, whorls convex, spiral sculpture of inequal lirae, axial sculpture of strong oblique growth lines forming nodules at the intersection with lirae. Last whorl large, subglobose, aperture large, slightly oblique, nearly half of shell height, thinly furrowed inside, nacreous; lip thin, narrowly spread; columella slightly curved, oblique.
Taxonomic remarks Given the distance with the known species range and some minor differences in shell features with the type, the IOT samples may represent an undescribed species.
Distribution Known for (off) E Japan, 2300 m (IOT record 3007–3100 m).
Ecology and life history Selective deposit-feeding has been documented in the genus, and the animals have greatly enlarged hindguts that are packed with fine sediment (Hickman, 1981).

***Calliotropis hondoensis* (Dall, 1919)**

Figure 3. Shell of *Calliotropis hondoensis*. AMS C.548137 [IN2021_V08_103]. Scalebar = 10 mm.

Diagnosis Shell turbinate, thin, with moderately inflated whorls, colour olivaceous, suture distinct; spiral sculpture of sharp threads raised into rather sharp nodules at the intersections with the axial threads, and with wide interspaces between the suture, each other and the following threads, the first of which on which the suture is laid and three similar threads on the base are minutely beaded, while the last, at the verge of the funnel shaped axially striated deep umbilicus is more coarsely beaded; axial sculpture of fine sharp threads more or less obsolete in the interspaces but forming nodules at the intersections and between them finer sharp close threadlets; not nodulating the posterior spirals; base convex, aperture rounded, the pillar and outer lip continuous thin and sharp, the inner lip erased, nacreous.

Taxonomic remarks Given the distance with the known species range and some minor differences in shell features with the type, the IOT samples may represent an undescribed species.

Distribution Off SW Japan, 1655 m (IOT records, 2974–3780 m)

Ecology and life history Calliotropids like this species possess a radula with unusually fine and numerous marginal teeth. The primary feeding action of this radula is inferred to be sweeping up of detrital particles (Beesley *et al.*, 1998).

***Calliotropis infundibulum* (R. B. Watson, 1879)**

Figure 4. Shell of *Calliotropis infundibulum*. AMS C.594114 [IN2021_V04_028]. Scalebar = 10 mm.

Diagnosis Shell turbinate, thin, translucent and nacreous. Spiral sculpture of thin beaded threads; axial sculpture of delicate folds of decreasing prominence towards last whorl. Shell colour yellowish white, with brilliant nacreous sheen. Whorls rapidly increasing in size, rounded, but angulated by spirals projections, very inflated on the base. Suture linear, strongly defined. Aperture round, slightly oblique, nacreous within. Outer lip thin, not descending; columellar lip slightly expanded, bending flatly over umbilicus. Umbilicus funnel-shaped, rather open, but contracted within, sharply scored with the lines of growth.
Taxonomic remarks Given the distance with the known species range and some minor differences in shell features with the type, the IOT samples may represent an undescribed species.
Distribution N. Atlantic, Gulf of Mexico, off New Caledonia, (IOT record 2760–2850 m).
Ecology and life history Like the previous species, it feeds selectively on detrital particles.

Order Trochida

Superfamily Trochoidea

Family Margaritidae

Gaza daedala Watson, 1879

Figure 5. Shells of *Gaza daedala*. AMS C.593551 [IN2021_V04_002]. Scalebar = 10 mm.

Diagnosis Large, spire height about same as body whorl, spire profile almost straight; suture shallow, very weakly convex. Sculpture of numerous spiral and axial fine lines. First whorls unsculptured with axial lines gradually appearing closer to upper suture; then spiral and axial lines becoming equally developed, with spiral lines stronger near aperture.
Distribution South and Central Pacific about 1000 m (IOT records 1225–1626 m).
Ecology and life history While filmed by a NOAA ROV off Hawaii, a specimen of *G. daedala* revealed a curious escape behaviour. The snail tumbled on the volcanic-rock bottom, with its long foot extended, in a jerky, quick motion, most likely in response to the presence of the ROV (Wicksten, 2016).

Family Solariellidae

***Bathymophila aages* Vilvens, 2009**

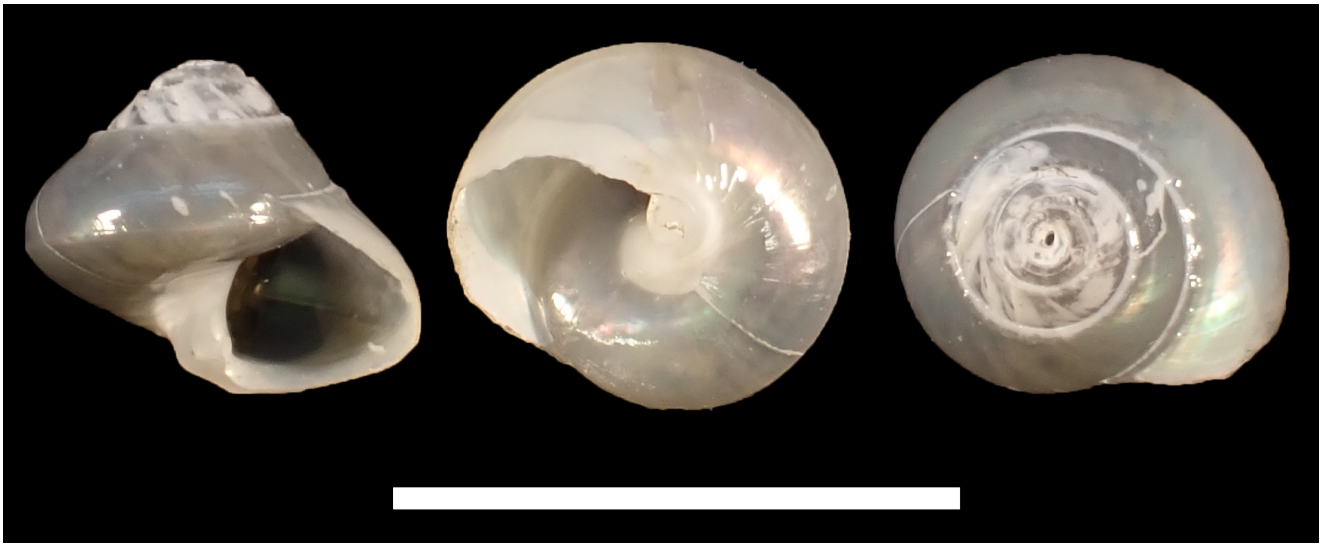

Figure 6. Shell of *Bathymophila aages*. AMS C.548153 [IN2021_V08_153]. Scalebar = 10 mm.

Diagnosis Shell large for the genus, white polished, with a moderately elevated spire, a nodular subsutural cord on last whorl and a moderately wide umbilicus partly covered by a thick callus with three swellings on its columellar part.

Distribution Eastern lndonesia, 221–283 m; Taiwan, 246 m (dead) (IOT record 1736–1747 m)

Ecology and life history Solariellids like this species have modified oral disc and foot which gives them the ability to live on and burrow into sandy substrata and to extract food particles selectively from sediments. They also have a posterior elaboration of extensible metapodial tissue that is used in swimming, a foot-thrashing escape response (Beesley *et al.*, 1998). They brood their young in the mantle cavity (Herbert, 1987).

Order Littorinimorpha

Superfamily Capuloidea

Family Capulidae

***Hyalorisia tosaensis* (Otsuka, 1939)**

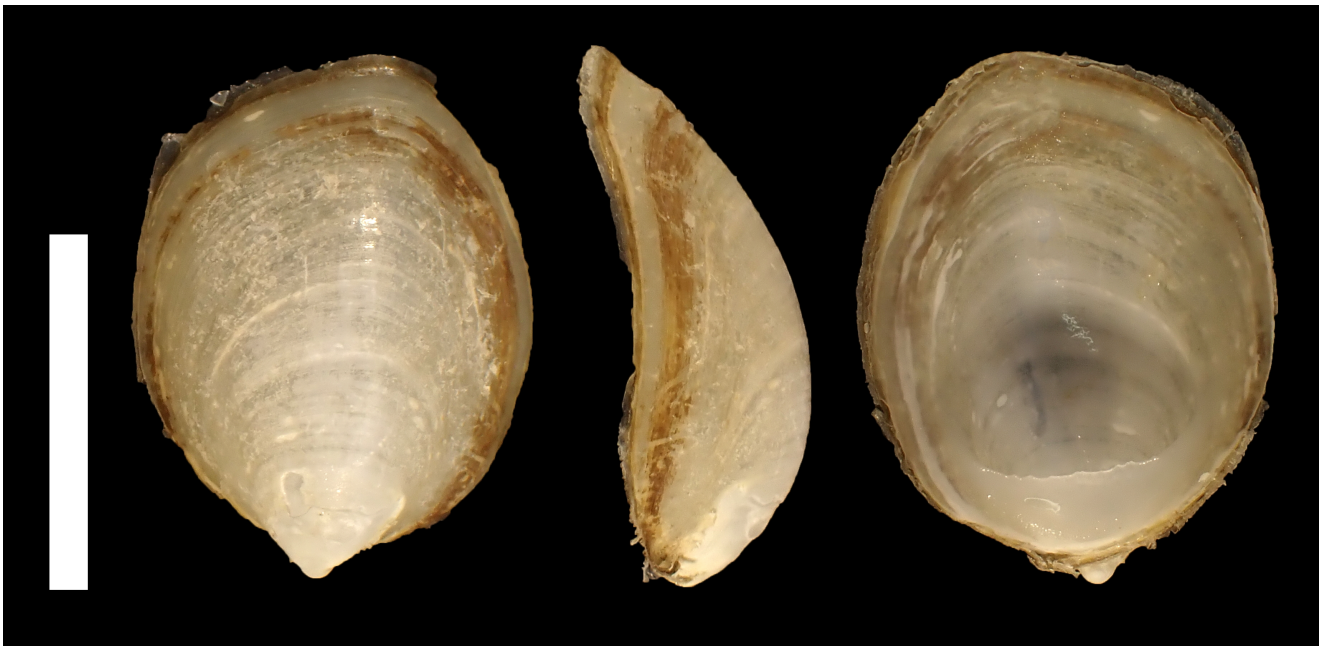

Figure 7. Shell of *Hyalorisia tosaensis*. AMS C.593515 [IN2021_V04_031]. Scalebar = 10 mm.

Diagnosis Shell thin, white, semi-translucent, oval, covered with delicate thin olive green epidermis extending to shell margin; apex situated at the posterior end on the median line of shell, slightly produced posteriorly; outer surface smooth, glossy; aperture ovate, margin thin; inner surface white, glossy, with horse-shoe shape muscular impression; a thin narrow lamella produced arcuately from posterior inner apertural wall to anterior; sometimes very fine radiating sculptures visible with magnifying lens.

Taxonomic remarks In the IOT, this species has been recorded much deeper than the known maximum depth for the genus (1000m; Fassio *et al.*, 2020). The availability of molecular data may clarify whether the IOT specimen represents a new species with a deeper bathymetric distribution.

Distribution Central West Pacific, NW Indo-Pacific (278–1045 m). (IOT record 2189–2264 m).

Ecology and life history Species of *Hyalorisia* are most probably kleptoparasitic filter feeders (Bouchet & A., 1993). They are found (alone or in pairs) on scallops of *Propeamussium* spp. (García, 2012; Matsukuma, 1978; Otuka, 1939). *Hyalorisia* attaches onto the antero-dorsal part of the left valve and close to its edge where it generally produces a small semilunar notch and a scar on the shell on the site of attachment (Fassio *et al.*, 2020).

Superfamily Cypraeoidea

Family Cypraeidae

***Naria labrolineata* (Gaskoin, 1849)**

Figure 8. Shell of *Naria labrolineata*. AMS C.594988 [IN2021_V08_172]. Scalebar = 10 mm.

Diagnosis Teeth moderately small, extending about halfway to the margin on the outer lip. Ends drawn out; sides thickened. Base white, sides spotted with irregularly spaced dark brown spots of varying size. Dorsal surface olive green to light brown, with few round white spots of varying size. Mantle line distinct. Brown spire blotch, and two brown blotches on the anterior end.

Taxonomic remarks This species was originally described as a variety of *Cypraea flaveola* from which it differs by its paler colour, smaller and more numerous teeth (with the anterior teeth of the columellar side being bifurcated) and more numerous blotches extending onto the base.

Distribution Off southern Japan, Guam, Philippines, northern Australia, Fiji, New Caledonia, New Guinea (15–200 m) (IOT record 169–176 m.)

Ecology and life history Cypraeids like this species are unusual among gastropods in that the female remains on the egg mass, covering it with her expanded foot until the embryos hatch (Beesley *et al.*, 1998). Most of them are probably herbivorous or omnivorous, although some are specialised browsers on sedentary colonial animals such as sponges and possibly bryozoans (Beesley *et al.*, 1998).

Superfamily Stromboidea

Family Xenophoridae

***Xenophora pallidula* (Reeve, 1842)**

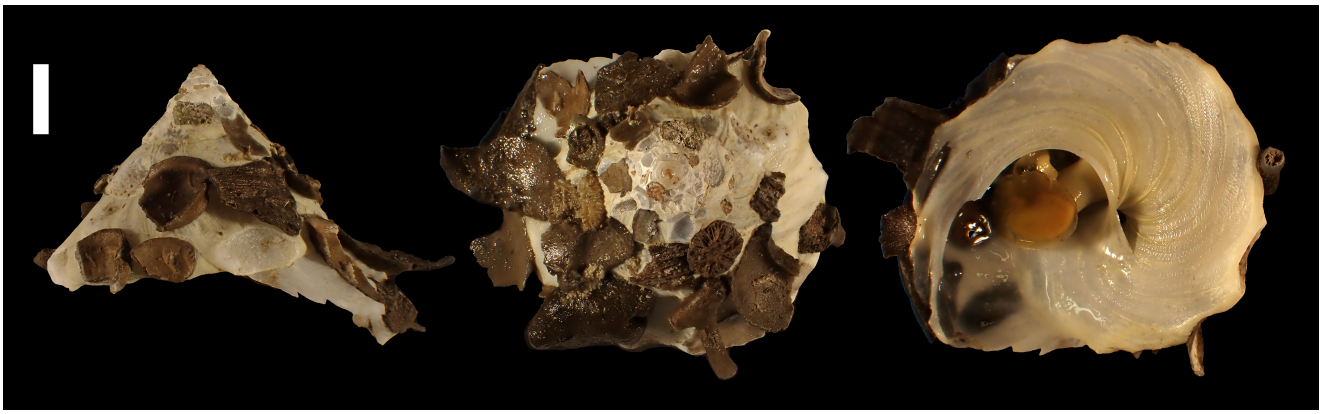

Figure 9. Shell of *Xenophora pallidula*. AMS C.593557 [IN2021_V04_005]. Scalebar = 10 mm.

Diagnosis Shell of large size and moderate elevation for the family; whorls convex. Whorl surface very rough, with coarse shells and rock fragments attached to all whorls, covering more than half of surface. Base nearly flat, with narrow flange on periphery of last whorl. Umbilicus open, small but deep. Colour fawn, columella and lip callus white.

Distribution Indo-West Pacific, 50–1050 m (IOT record 643–997 m)

Ecology and life history In order to camouflage, this species attaches large shell fragments (often of bivalves) on early whorls and elongate shells in a radial fashion on the last whorl.

Superfamily Tonnoidea

Family Bursidae

***Lampasopsis rhodostoma* (G. B. Sowerby II, 1835)**

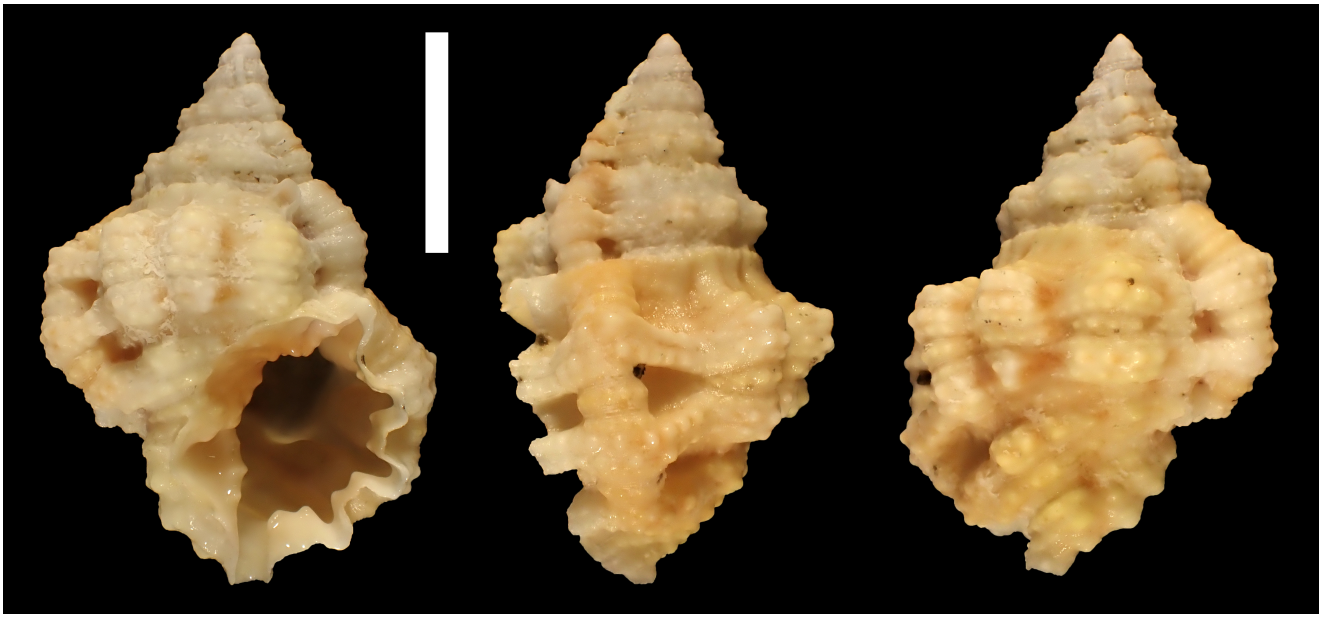

Figure 10. Shell of *Lampasopsis rhodostoma*. AMS C.548097 [IN2021_V08_179]. Scalebar = 10 mm.

Diagnosis Shell small for the genus, spire low (or, more rarely, high), with almost subspherical shape, with three predominant spiral cord bearing on their crests a median groove, deep and relatively wide on the peripheral cord. Aperture of very variable colour (pale cream to deep purple) bearing a row of paler nodules on each lip. When not encrusted with calcareous algae, shell colour variable, pale yellow or grey to pale golden tan, with scattered darker flecks.
Taxonomic remarks This species exhibits distinct morphs or colour forms throughout its wide range that have been, in the past, recognised as distinct species (see remarks to species in Beu, 1998).

Distribution Off European coasts, Atlantic Ocean (off the Canary Islands, Madeira and the Cape Verdes, in the Caribbean Sea, the Gulf of Mexico and the Lesser Antilles) Red Sea, Indian Ocean (off Aldabra, Chagos, and the Mascarene Basin) off Australia (New South Wales, Northern Territory, Queensland, Western Australia), 0–250 m. (IOT records 111–121 m.)
Ecology and life history Bursa species are intertidal to subtidal epifaunal carnivores. They are common on coral reefs and also on rocks. Little is known of the details of their feeding or reproduction (Beesley *et al.*, 1998).

Family Cassidae

***Oocorys sulcata* P. Fischer, 1884**

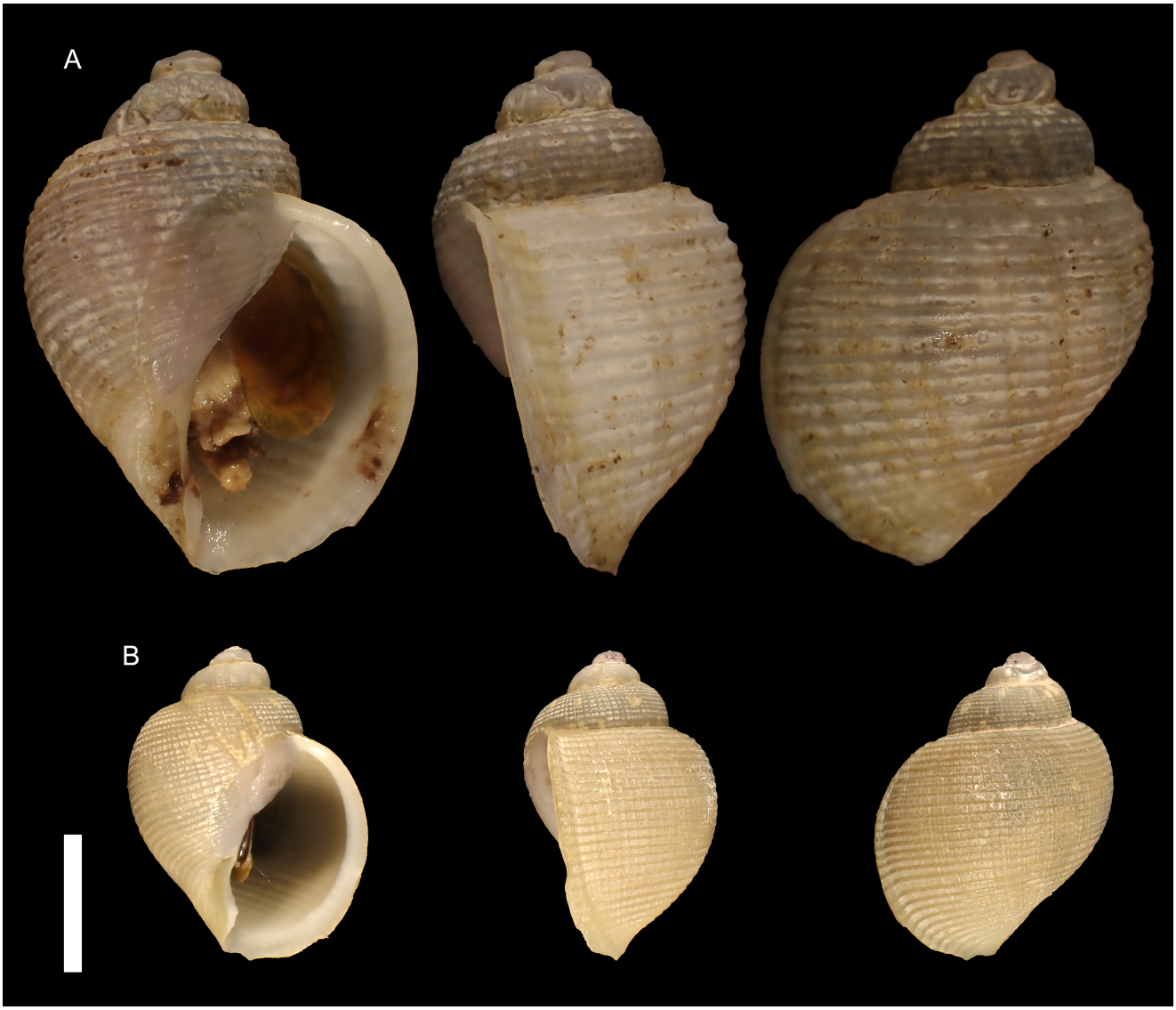

Figure 11. Shells of *Oocorys sulcata*. Shells of Oocorys sulcata. (A) typical morph, AMS C.548135 [IN2021_V08_103]. (B) 'abyssorum' morph, AMS C.594110 [IN2021_V04_027]. Scalebar = 10 mm.

Diagnosis Shell thick to thin, stout, with inflated whorls, and a short, obtuse spire. Whorls rapidly increasing, evenly rounded, strongly convex, the last whorl occupying more than one half the length of the shell. Suture deep, well impressed, the whorls rising abruptly from the suture produce a well-rounded shoulder. Aperture broadly ovate; outer lip thin, sharp, with a nearly evenly rounded outline and slightly to moderately everted near its junction with the whorl; inner lip continued as a thin lustrous coat of white enamel on the previous whorl, becoming raised, sharp, and- slightly sinuous in the umbilical region, and turning outward to nearly conceal a narrow umbilical chink. Canal very short, and wide, scarcely projecting beyond the margin of the outer lip. Sculpture consists of numerous small, but very distinct, elevated, spiral cords, evenly spaced and separated by much wider to narrower concave interspaces, crossed by weak to rather conspicuous and regular ridgelets. Colour white beneath the yellowish periostracum. The operculum is horn-colour, translucent.
Taxonomic remarks The name *Benthodolium abyssorum* was provided for very thin-shelled specimens with a thin, narrow inner lip and a thin, only weakly flared outer lip, and with sculpture of very narrow, widely spaced spiral cords (Verrill, 1884). The typical *O. sulcata* exhibits a thick shell with wider spiral cords, a thicker and wider inner lip, and a more thickened, more strongly flared outer lip forming a true varix. Both forms have been collected in the IOT (see this species figure A-B). Examination of more material showed that these two morphs intergrade completely and *B. abyssorum* is a junior synonym of *O. sulcata* (Beu, 2008; Bouchet & A., 1993).
Distribution This species appears to have a continuous distribution in about 350-5000 m throughout the Atlantic, Indian and Pacific Oceans, i.e., apparently throughout the world's temperate and tropical oceans (other than the Mediterranean). (IOT records 683–3839 m)
Ecology and life history The strong jaws and radula of this species suggest that it is a predator, probably of polychaetes (Quinn, 1980). Its protoconch morphology clearly indicates planktotrophic larval development (Bouchet & A., 1993).

Order Caenogastropoda *incertae sedis*

Superfamily Epitonoidea

Family Epitoniidae

Amaea cf *thielei* (de Boury, 1913)

Diagnosis Shell very fragile, thin, elongated conical, axial sculpture of numerous ribs, filiform, thin, leaf-shaped, very slightly projecting, spiral sculpture of fine and numerous cords which give the shell a decussate appearance. Suture deep, whorls very convex, gradually increasing in size.
Taxonomic remarks Given the distance with the known species range and some minor differences in shell features with the type, the IOT samples may represent an undescribed species. Two very similar specimens were collected in the GAB (IN2015_C02_141_122).

Distribution Offshore West Pacific (IOT record 2889–2923 m)
Ecology and life history Epitoniids like this species feed primarily actinarian anemones and some corals. Feeding relationships of various species have been described as ranging from predacious to commensal or ectoparasitic. They are typically found burrowing in the substratum, often adjacent to an anemone or coral. Some are host specific and others are more generalists. The host of *A. thielei* is unknown. When feeding they evert their proboscis and use their radula and jaws to bite pieces off the prey (Beesley *et al.*, 1998).

Figure 12. Shell of *Amaea* cf *thielei*. AMS C.548102 [IN2021_V08_181]. Scalebar = 10 mm.

Order Neogastropoda

Superfamily Buccinoidea

Family Belomitridae

***Belomitra brachytoma* (Schepman, 1913)**

Diagnosis Shell turriform, with high, elevated spire, whorls convex and angulated at shoulder. Last whorl medium high. Suture narrow, shallowly impressed. Subsutural ramp well pronounced, narrow, concave, delimitated on shoulder by row of defined rounded knobs, formed by thickened axial ribs. Another row of knobs just below suture. Axial sculpture of inconspicuous growth lines and sharp, narrow, rather widely spaced, nearly straight orthocline ribs. Ribs usually less pronounced to complete absent on ramp, becoming obsolete on shell base. Spiral sculpture very variable, of low, broad, closely spaced cords, covering entire shell surface, sometimes indistinct. Cords varying in size and irregularly spaced, better pronounced on canal, more convex and broader spaced. When intersecting axial ribs, cords forming rounded knobs, from very small to large and rounded. Often fine spiral striation seen at least on some parts of shell. Aper-

ture medium high, narrow, elongate. Outer lip thin, concave adapically and convex and evenly rounded abapically. Columella nearly straight, smooth. Callus narrow, of thin transparent glaze overlying parietal region. Siphonal notch absent. Canal short, from broad to constricted, curved to left, usually poorly differentiated from aperture. Shell colour off white to light creamy, periostracum yellowish.

Taxonomic remarks The IOT records extend the depth at which is found this very variable and broadly distributed species, both geographically and bathymetrically. Because of its extensive variation in shell characters, it can be easily confused with several other congeners.

Distribution From Taiwan to Indonesia, the Philippines and Solomon Islands, 430–-1010 m (IOT records 1363-1850 m).

Figure 13. Shell of *Belomitra brachytoma*. AMS C.593513 [IN2021_V04_013]. Scalebar = 10 mm.

***Belomitra decapitata* Kantor, Puillandre, Rivasseau & Bouchet, 2012**

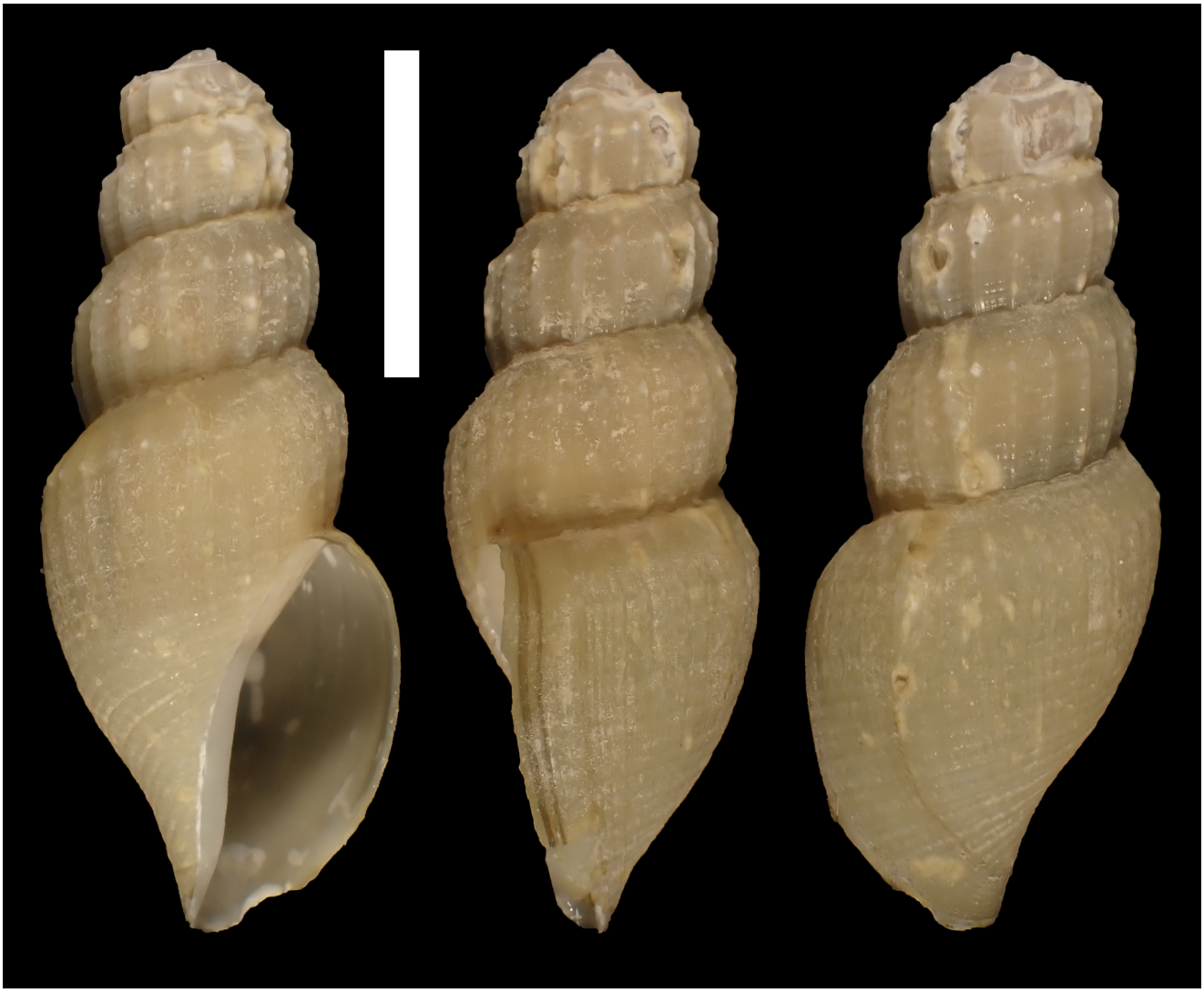

Figure 14. Shell of *Belomitra decapitata*. AMS C.548339 [IN2021_V08_133]. Scalebar = 10 mm.

Diagnosis Shell thin but solid, turriform, with high elevated spire, whorls convex. Apical whorls decollated. Suture impressed. Subsutural ramp well pronounced, narrow, concave, delimitated by a beaded subsutural cord and a row of rounded oval beads formed by intersection of axial ribs and shoulder cord. Beside inconspicuous growth lines, axial sculpture consisting of sharp, narrow, closely spaced, and very weakly recurved, prosocline ribs extending over whole height of spire whorls and becoming obsolete on shell base at onset of siphonal canal. Spiral sculpture of distinct, low, narrow cords, poorly pronounced or absent on subsutural ramp, closely spaced (interspaces less than half of cords width) on periphery of spire whorls and adapical part of last whorl and becoming more broadly spaced on shell base and canal. Aperture medium high, elongate oval. Outer lip thin, concave adapically, convex and evenly rounded abapically. Columella nearly straight, smooth, without plaits, with strong siphonal fold. Callus narrow, of thin transparent glaze overlying parietal region. Siphonal notch absent. Canal short, broad, strongly curved to left. Shell colour off-white, periostracum greenish.
Taxonomic remarks This species differs from B. admete by its larger shell, more numerous and stronger axial ribs and more pronounced spiral cords.
Distribution W Indian Ocean to New Caledonia, 3680–4400 m (IOT records 3948–4047 m).

Family Fasciolariidae

***Amiantofusus maestratii* Fraussen, Kantor & Hadorn, 2007**

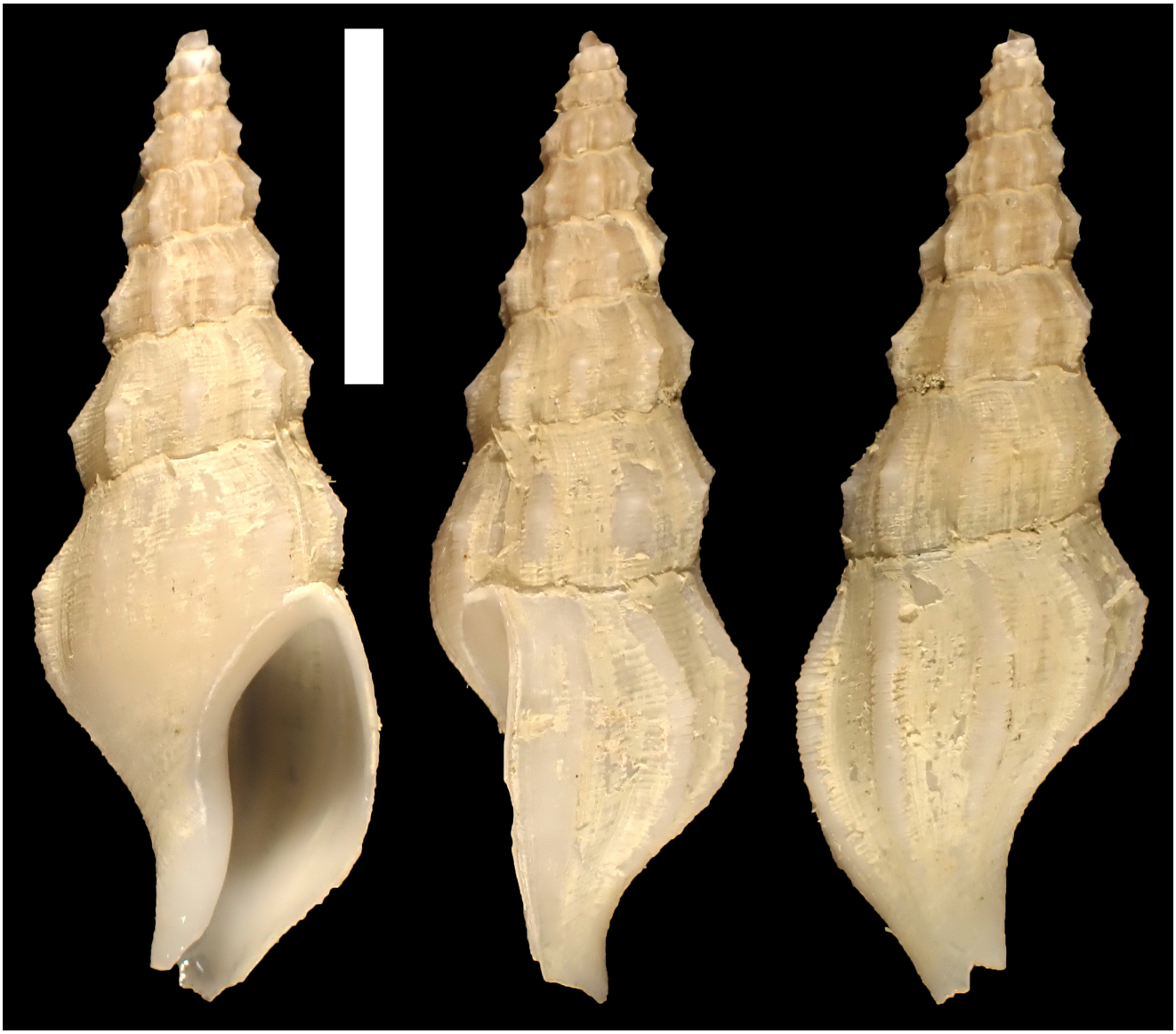

Figure 15. Shell of *Amiantofusus maestratii*. AMS C.593533 [IN2021_V04_009]. Scalebar = 10 mm.

Diagnosis Shell white to pale yellow-brown, fusiform, rather smooth and glossy, slender with high spire and short siphonal canal, subsutural slope straight and broad. Suture wavy, slightly shouldered, incision rather deep. Axial sculpture of 8-10 strong ribs, running from suture to suture, interspaces broad. Spiral sculpture of two weak primary cords, increasing to 7 on last whorl, numerous secondary cords appearing. Aperture semi-ovate. Outer lip slightly thickened.
Distribution Off New Caledonia, (IOT record 975–1174 m).

Amiantofusus pacificus **Fraussen, Kantor & Hadorn, 2007**

Figure 16. Shell of *Amiantofusus pacificus*. AMS C.548042 [IN2021_V08_159]. Scalebar = 10 mm.

Diagnosis Shell white to orange, fusiform, slender with high spire and short siphonal canal. Suture rather deep, whorls convex. First whorl with two sharp primary spiral cords and one additional, fine, subsutural cord. Last whorl with 9 or 10 primary spiral cords, with up to 6 secondary cords between each abapical pair of primary cords or 4 between each adapical pair. Siphonal canal with some broad spiral cords, occasionally alternating strong and fine. All whorls with 8 or 9 sharp axial ribs, running from suture to suture, interspaces twice as abroad. Aperture semi-ovate. Outer lip with 8 internal lirae and thick labral varix. Columella with about 9 knobs, callus thin. Siphonal canal short, broad, open.

Distribution Off N Taiwan, N Fiji Basin, Coral Sea, off New Caledonia, off Vanuatu and off Tonga, 420–795 m (IOT record, 603–675 m).

***Fusinus alcyoneum* Hadorn & Fraussen, 2006**

Figure 17. Shell of *Fusinus alcyoneum*. AMS C.548026 [IN2021_V08_136]. Scalebar = 10 mm.

Diagnosis Shell rather small for genus, fusiform, stout, heavy, whorls convex. Spire angle broad. Suture constricted, wavy. White. Axial ribs prominent, interspaces broad, deeply impressed, as broad as ribs. Axial growth lines well visible in axial interspaces. Teleoconch beginning with 3 primary spiral cords, additional cord appearing on second whorl together with one fine intercalated secondary cord between primary cords. From third or fourth post-nuclear whorl on, fine, sharp intercalated tertiary cords appear; their number increasing to up to 7 on body whorl. Spiral cords stronger when crossing axial ribs. Aperture white, ovate, narrowing at both ends. Outer lip crenulate, with some short close-set lirae within, stronger near siphonal canal. Inner lip curved, callus thin, appressed to parietal wall. Surface smooth, without columellar folds, with small callused tooth near posterior canal. Siphonal canal short, strongly curved, broad; outer side ornamented with some spiral cords and intercalated threads becoming weaker towards tip or siphonal canal. Periostracum thin, greenish.
Distribution SW Pacific, 397-797 m (IOT record 754–890 m).
Ecology and life history Fasciolariids like this species are active predators of polychaetes, bivalves and gastropods: even cannibalism has been reported in some species (Beesley *et al.*, 1998).

Family Nassariidae

***Nassarius papillosus* (Linnaeus, 1758)**

Diagnosis Shell thick, ovate and conical with convex and subcarinated whorls. Surface ornamented with small tubercles formed like rounded papillae, eight transverse rows of which appearing upon the body whorl, four upon the second, and three only upon those of the spire. Tubercles diminishing in size towards the summit. Aperture ovate, rounded, terminated at its upper part by an angle of the outer lip, and a thick ridge of the left lip, forming a canal. Base emargination oblique. Outer lip thick, with six or seven spinose teeth at its edge, interiorly with numerous transverse striae, very fine, and slightly apparent. The left lip smooth and obliterated above, forming a convex varix at the base and terminates near this point by a straight and somewhat pointed projection. Shell colour whitish or reddish, marked upon the convexity of the lowest whorl, with a large red or fawn-coloured spot, the rest of the spire sometimes sprinkled with other smaller spots of the same colour.
Distribution Indian Ocean off Aldabra, Chagos, Madagascar, the Mascarene Basin, Mauritius and Réunion, Pacific (New Caledonia, Marquesas Islands); off Australia (Northern Territory, Queensland, Western Australia), intertidal to 92 m. (IOT record 111–121 m.)
Ecology and life history Nassariids like this species are carnivores feeding on carrion, but some species can become facultative herbivores. They are rapid burrowers and some species are capable of being transported for short distances by exposing their expanded foot to the surf (Beesley *et al.*, 1998).

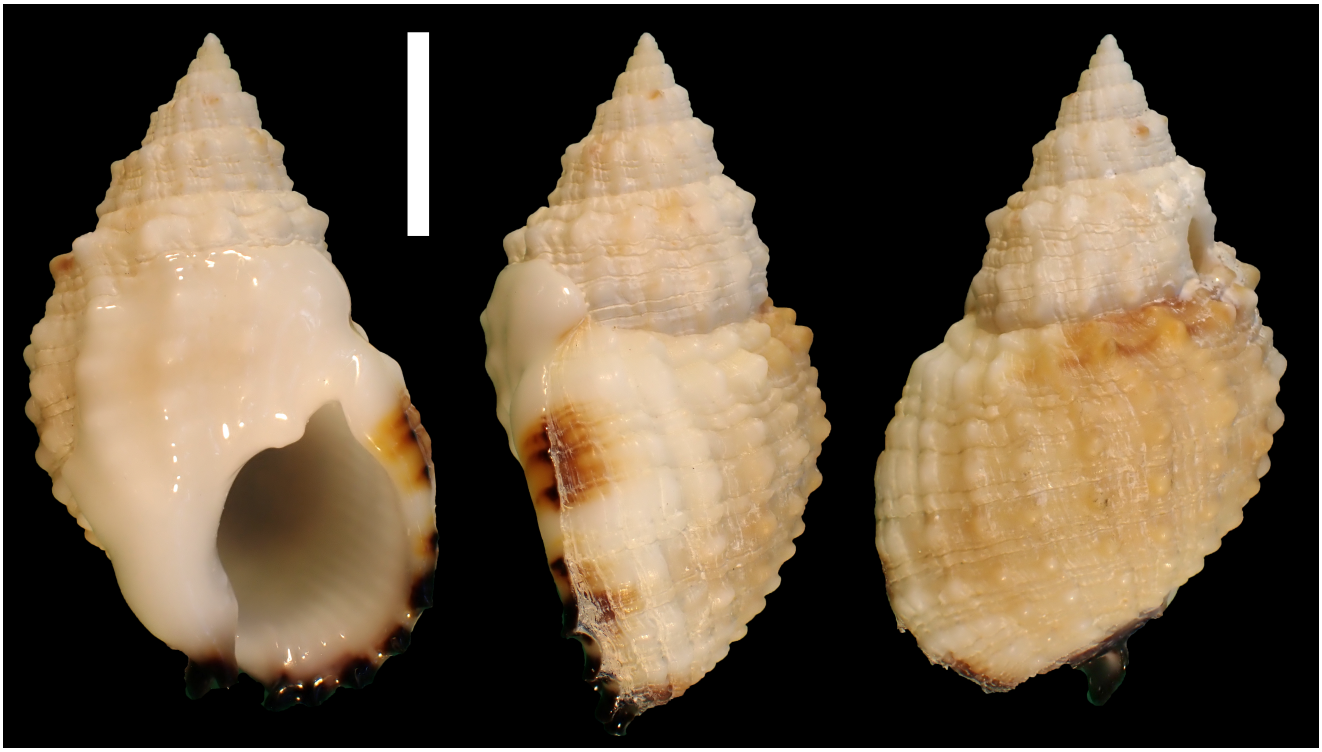

Figure 18. Shell of *Nassarius papillosus*. AMS C.547994 [IN2022_V08_179]. Scalebar = 10 mm.

***Nassarius* cf *roissyi* (Deshayes, 1832)**

Diagnosis Shell elongated and subturreted, spire long and pointed formed of eight or nine convex whorls, chequered by longitudinal folds and numerous and very regular transverse striae. Body whorl short and subglobular. Aperture small, ovate, oblong, white. Outer lip is finely striated internally. Columella cylindrical, obliquely truncated, terminated at the base by deep emargination, curving towards the back of the shell. Colour uniform, pale fawn, interrupted on body whorl by obscure and transverse whitish zone.
Taxonomic remarks This species is known for the holotype only, which appears to be an immature specimen. This renders the identification of the IOT specimen tentative.
Distribution Known from its type locality only (Indian Ocean, no depth provided). (IOT record 463 m).

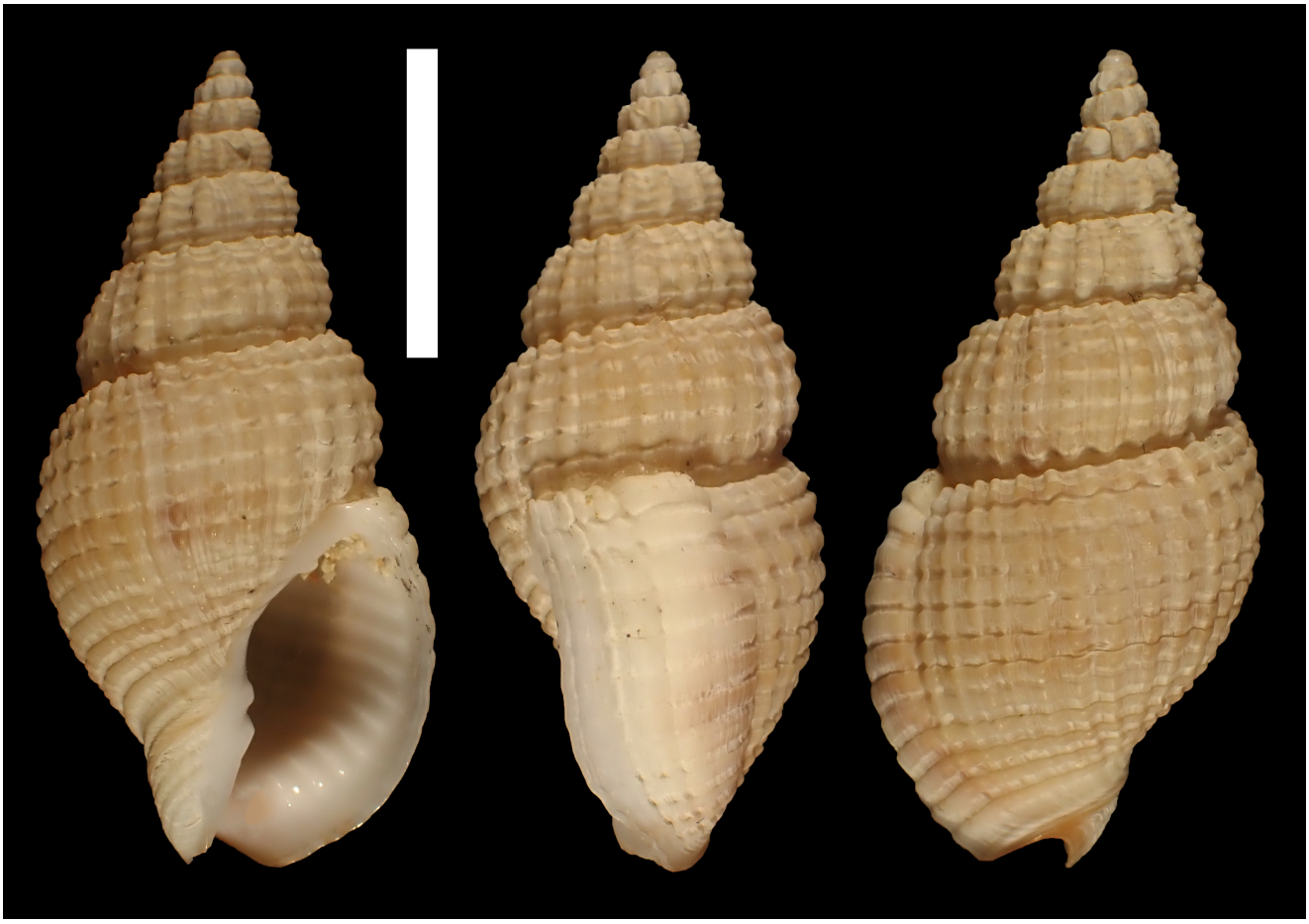

Figure 19. Shell of *Nassarius* cf *roissyi*. AMS C.593537 [IN2021_V04_018]. Scalebar = 10 mm.

***Tritia ephamilla* (R. B. Watson, 1882)**

Diagnosis Whorls weakly or distinctly angled. Sculptured with axial ribs and overriding spiral ribs which produce nodules at the intersections; penultimate whorl with 15-26 axial and 3-5 spirals, body whorl with 17-30 axials and 8-12 spiral ribs. Outer lip moderately thin, smooth, without varix. Columella concave, with a thin elevated ridge at lower end, weakly calloused only in very mature specimens. Anterior canal short and wide. Colour white or cream, with a thin, straw-yellow to light brown periostracum.
Distribution Australia and New Zealand; in Australia, Newcastle, NSW, to south-western WA, and Tas. Common on the continental shelf and slope, 146–3100 m. (IOT records 1113–1943m.)

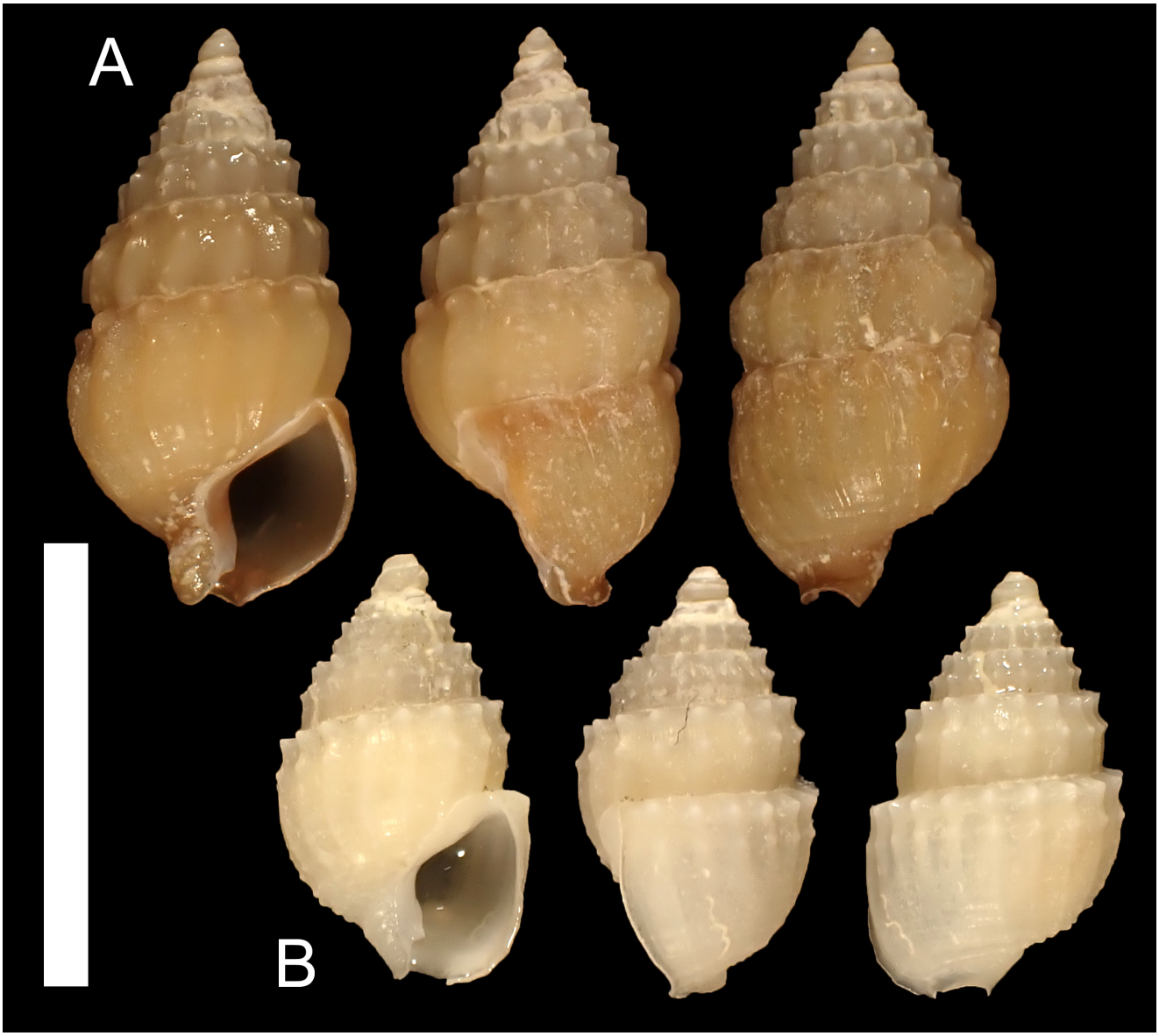

Figure 20. Shells of *Tritia ephamilla*. (A) AMS C.548129 [IN2022_V08_143]. (B) C.594969 [IN2022_V08_153]. Scalebar = 10 mm.

Superfamily Muricoidea

Family Muricidae

***Chicomurex globus* Houart, Moe & C. Chen, 2015**

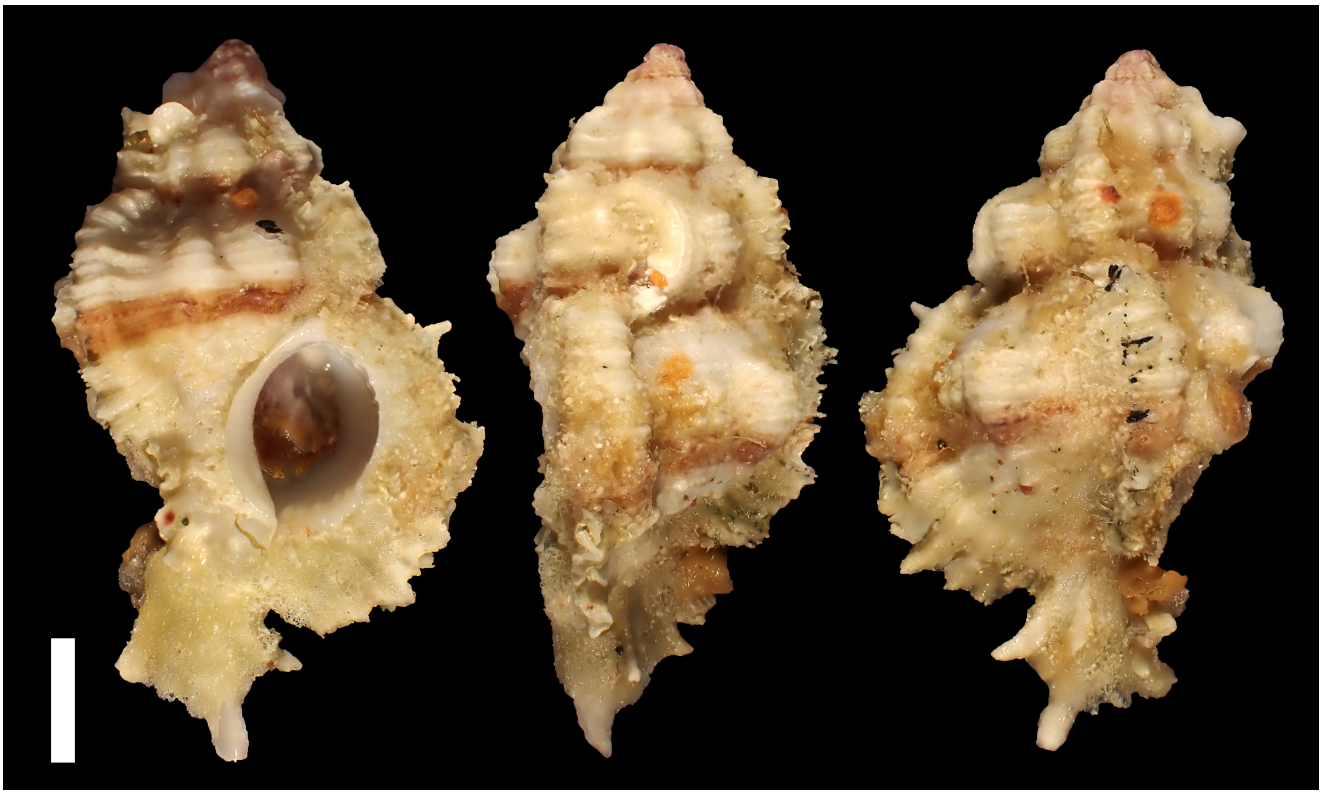

Figure 21. Shell of *Chicomurex globus*. AMS C.547982 [IN2022_V08_179]. Scalebar = 10 mm.

Diagnosis Shell globose, spinose and nodose. Axial sculpture of nodose ribs on earlier whorls and varices on later whorls, each with primary and secondary spines; axial intervarical ribs or nodes. Spiral sculpture of narrow nodose cords and numerous narrow threads. Aperture moderately small, roundly ovate. Columellar lip narrow, smooth or covered with small folds or wrinkles, anal notch shallow, broad. Outer lip erect, crenulated, with weak denticles. Siphonal canal short, moderately narrow, strongly dorsally recurved, narrowly open. Colour cream, light tan, tan or chestnut brown, darker below suture; tan or brown blotches; occasionally with darker spiral sometimes visible on varices only.

Distribution Okinawa, South China Sea, Southern Philippines, Guam, Papua New Guinea, Vanuatu and New Caledonia (18–200 m) (IOT record, 111–121 m).

***Chicomurex gloriosus* (Shikama, 1977)**

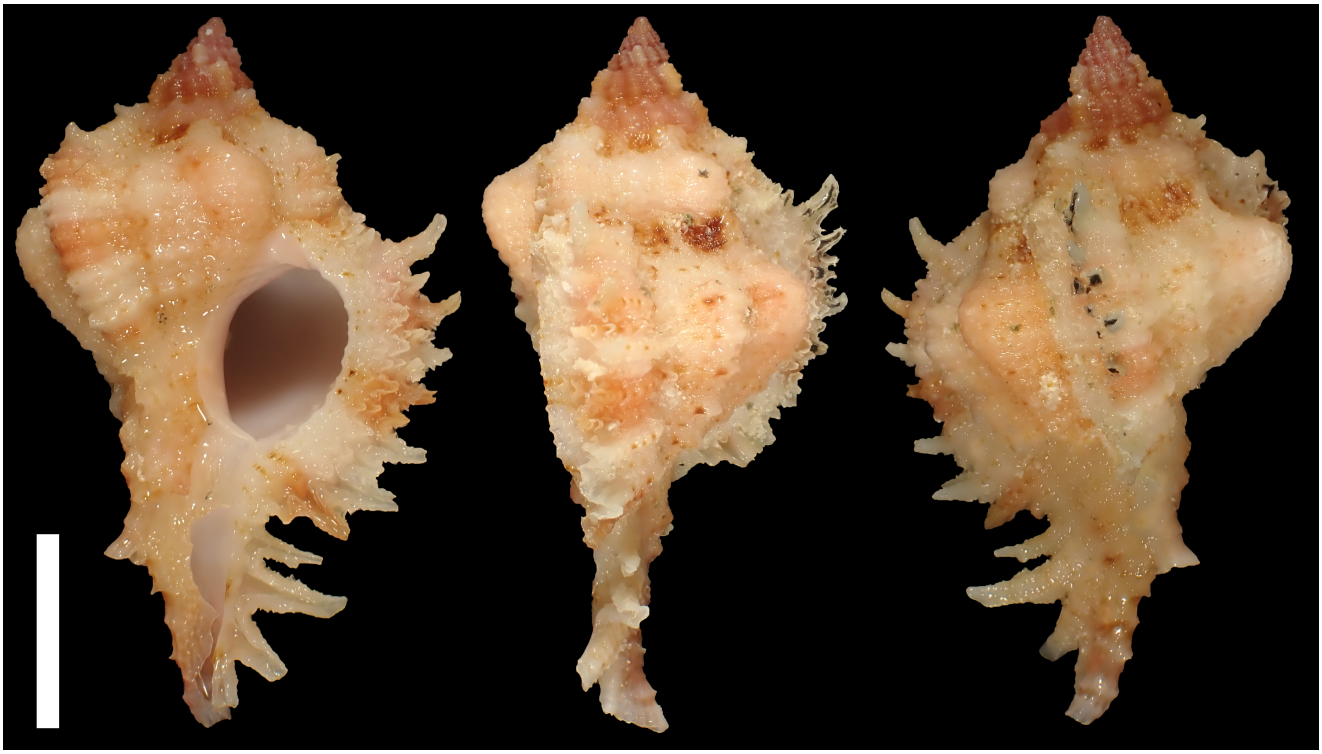

Figure 22. Shell of *Chicomurex gloriosus*. AMS C.547984 [IN2022_V08_179]. Scalebar = 10 mm.

Diagnosis Shell medium sized, thick, pinkish white. Spire moderately high, with deep suture and angulated shoulder. Axial sculpture of narrow, regular ribs on earlier whorls and varices and intervarical nodulose ribs on later whorls. Short spines present on last varix only. Spiral sculpture of numerous spiral cords. Aperture suboval with thin inner and outer lips. Siphonal canal very narrow, slit-like and siphonal tube gently curved. Columella narrow and white.
Distribution Off Cebu Island, Philippines, depth unknown (IOT record, 111–121 m).

***Chicoreus aculeatus* (Lamarck, 1822)**

Figure 23. Shell of *Chicoreus aculeatus*. AMS C.547986 [IN2021_V08_179]. Scalebar = 10 mm.

Diagnosis Shell solid, high-spired. Suture appressed. Last whorl with three rounded varices, each with three or four straight, slightly frondose spines, abapical spine shortest. A short to medium sized intermediate spine between shoulder and second spine rarely present; short intermediate spinelets present. Intervaricial axial sculpture consisting of one prominent node, rarely with an additional ridge. Spiral sculpture of eight or nine strong cords, one or two finer cords and three or four scabrous threads in each interspace. Aperture roundly-ovate. Columellar lip smooth, rim partially erect abapically. Anal notch broad, moderately deep, delineated by shallow callus. Outer lip crenulate, lirate for short distance within. Siphonal canal moderately long, narrowly open and bent abaperturally at tip, with two or three abapically curved spines. Light brown, orange or pink, with darker coloured cords.
Distribution Tropical Indo-Pacific and Offshore W Pacific (IOT record, 111–121 m).

***Chicoreus loebbeckei* (Kobelt, 1879)**

Diagnosis Shell typical colour pastel to bright orange, with not uncommon white, pastel pink and yellow forms. Whorls bearing three prominently protruding varices ('wings') and six evenly spaced knobs (two knobs between each varix). Shell microsculpture scaley with prominent spiral cords. Siphonal canal sharply bent, with prominent wing similar to those on varices. Aperture subovate, operculum reddish brown.
Distribution Indo-Pacific, 100–250 m (IOT record, 111–121 m)

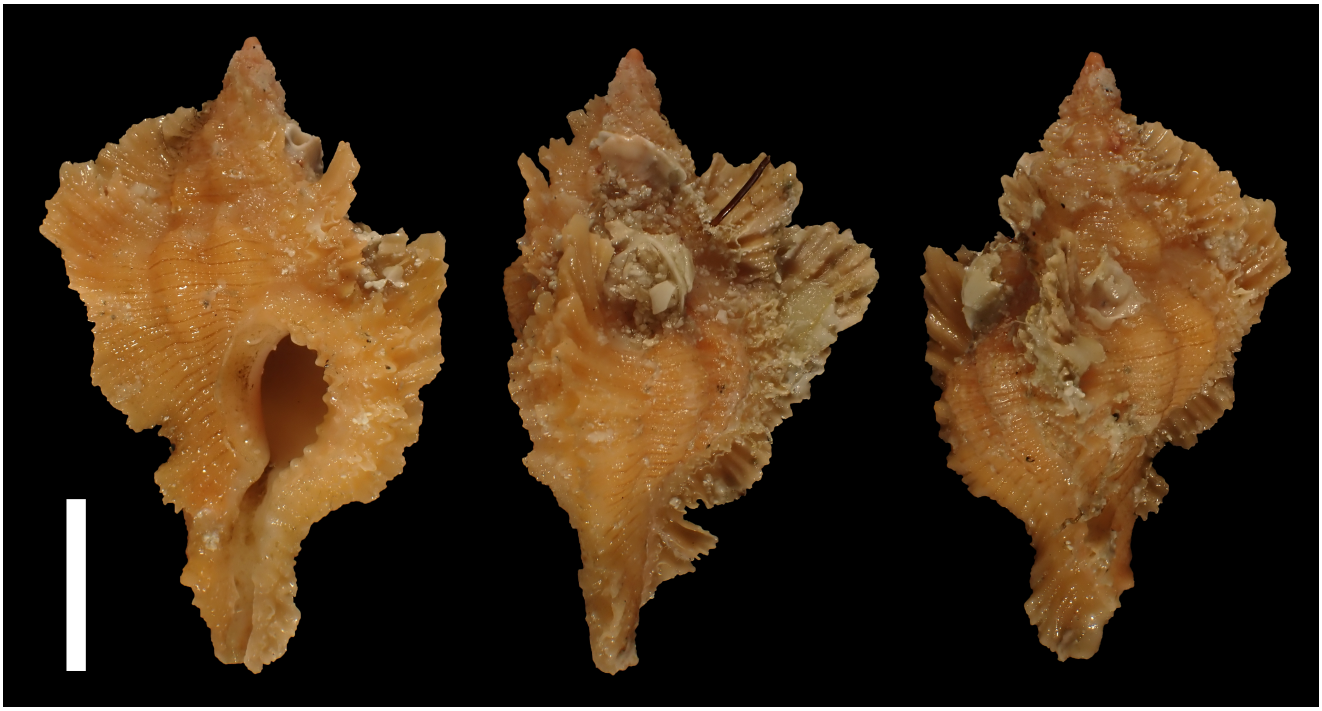

Figure 24. Shell of *Chicoreus loebbeckei*. AMS C.547975 [IN2021_V08_179]. Scalebar = 10 mm.

***Coralliophila inflata* (Dunker, 1847)**

Figure 25. Shell of *Coralliophila inflata*. AMS C.548111 [IN2021_V08_163]. Scalebar = 10 mm.

Diagnosis Shell with rounded whorls with about ten axial folds on the body whorl, with whole shell ornamented with densely scabrous spiral ribs. Body whorl with four large ribs above the periphery, and below the periphery, 12 major ribs with one small rib between each. Columella smooth, outer lip crenulated by external sculpture. Umbilicus barely open. Colour white.

Distribution Off Japan to Indonesia and Australia, 450–500 m. (IOT record 527–528m)
Ecology and life history Gastropods of the subfamily Coralliophilinae are parasites of corals (Scleractinia and Alcyonaria) and have no radula. They insert their proboscis inside the polyps and predigest their tissues by salivary enzymes before ingesting them (Garrigues *et al.*, 2022). A study on Caribbean species of Coralliophila revealed a low host-parasite specie specificity (Potkamp *et al.*, 2017). Coralliphilinae have successfully radiated in deep waters, which is an unusual and interesting pattern (Oliverio, 2008). In the Indo-West Pacific the lower limit for their scleractinian hosts is 100-150 m, deeper than which they are outcompeted by Alcyonaria.

***Cytharomorula vexillum* Kuroda, 1953**

Diagnosis Shell small, fusiform, spire pyramidal. Axial sculpture of roundish, nearly vertical ribs, about as wide as interspaces, last one being a varix and much larger. Microsculpture of regular threads and fine growth lines. Whorls roundly angular; suture deep, slightly margined below. Aperture narrowly lanceolate with a slightly notch; extreme margin of the outer lip thin, and slightly serrated, but strengthened by a heavy varix behind, and 6 tooth-like short lirae inside; suture at the junction of varix ascending; interior of aperture heavily callused with a white enamel; columellar margin smooth, slightly laminated at the callus margin; canal opened and recurved, umbilicus chinked. Shell is white or horn, ribs with transverse reddish-brown lines which are pale or wanting in the intercostal spaces.
Distribution Indian Ocean, Central and western Pacific (IOT record, 169–176 m)

Figure 26. Shell of *Cytharomorula vexillum*. caption_text.

***Emozamia licina* (Hedley & Petterd, 1906)**

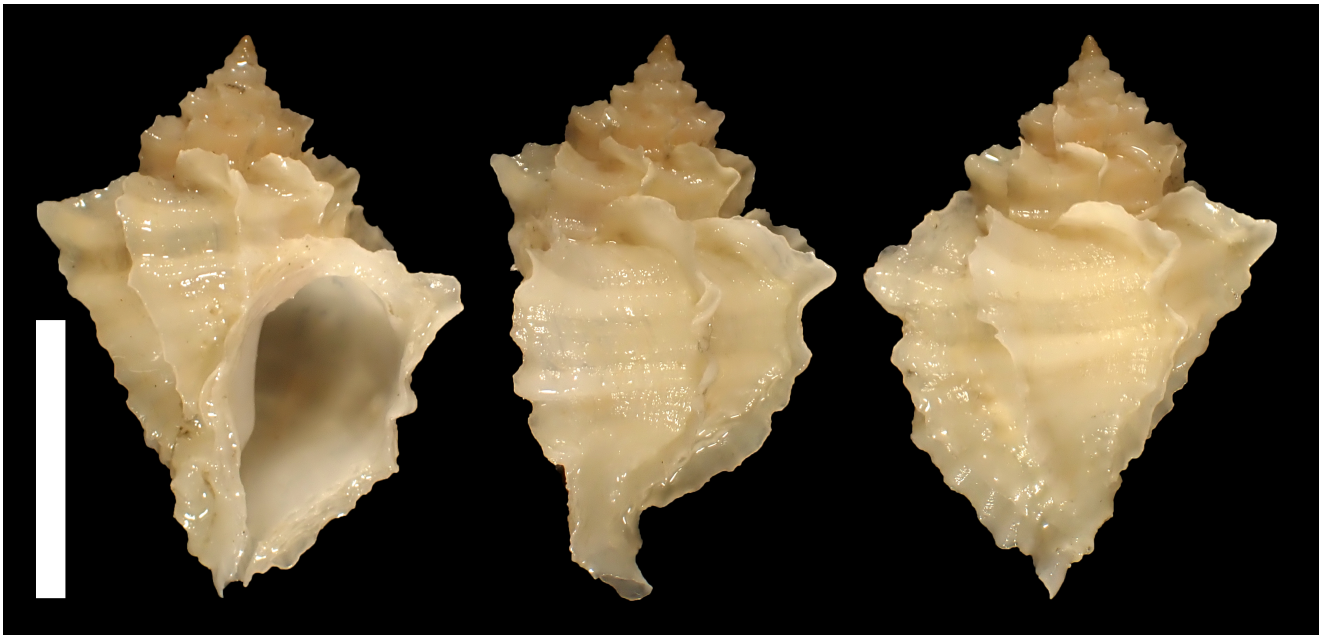

Figure 27. Shell of *Emozamia licina*. AMS C.548017 [IN2021_V08_193]. Scalebar = 10 mm.

Diagnosis Shell rather small, short, broad, angled at the shoulder, obliquely biconical. Canal short, open. Apex acute, bent away from shell axis. Colour pale brown, inner lip light purple. Whorls rapidly increasing. Sculpture of numerous varices, eight to the last whorl, beset the shell. They are low, but erect, feebly denticulate, descend obliquely from the shoulder to the base, above the shoulder converge very obliquely to the suture across an excavate smooth space. On the upper whorls they fade rapidly, becoming extinct on the penultimate. The intervarical spaces are traversed by stout spiral ribs divided by broad deep grooves, about a dozen appearing behind the aperture, no scales occur on ribs or in grooves. Outer lip expanded, smooth, within, denticulate externally, edged with concentric frills. Inner lip straight below, arched medially, its margin expanded, free.

Distribution Off SE Australia, New Zealand and Japan, 70–400 m. The IOT records (467–477 m) are the first for the Indo-Pacific.

Ecology and life history Very little is known on the ecology of this species, which is also likely to feed on corals, such as the other members of the subfamily Coralliophilinae.

***Morula coronata* (H. Adams, 1869)**

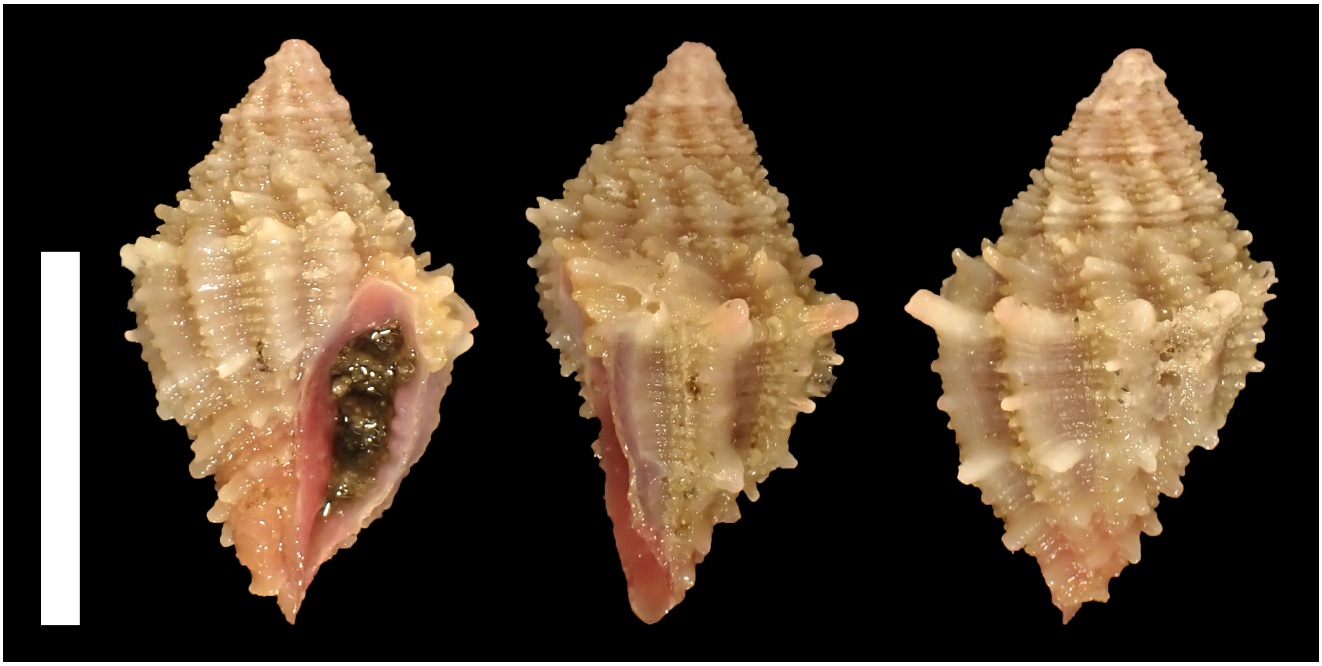

Figure 28. Shell of *Morula coronata*. AMS C.548108 [IN2021_V08_172]. Scalebar = 10 mm.

Diagnosis Shell ovate-fusiform, with spaced longitudinal folds and transverse undulating ribs, in the middle of the bend of the last two stronger ribs, armed with curved spines at the back; purplish-yellow, with paler transverse ribs, with convex curves, the latter exceeding half the length of the shell; aperture acuminate-ovate, inside violet; columella smooth, channel moderately short, anteriorly pink; inner lip lightly callused.
Distribution Indo-Pacific, subtidal (IOT record, 169–176 m)
Ecology and life history *Morula spp.* feed on mussels, barnacles and other sessile animals.

Superfamily Mitroidea

Family Mitridae

Imbricaria amoena **(A. Adams, 1853)**

Figure 29. Shell of *Imbricaria amoena*. AMS C.548022 [IN2021_V04_179]. Scalebar = 10 mm.

Diagnosis Shell oblong-fusiform-pointed, white, variegated with brown spots; spiral sculpture of prominent cords dashed white and reddish-brown. Cords interstices finely cancellated due to fine spiral cordlets intersecting axial riblets; aperture narrow; columellar folds five; lip thin, sharp.
Taxonomic remarks The genus Imbricaria is rather heterogeneous morphologically, with shell varying from conical to narrowly fusiform and remarkable disparity in radular morphology (Fedosov *et al.*, 2018).
Distribution Indo-Pacific, subtidal (IOT record 111–121 m)
Ecology and life history Mitrids, like this species, are predators that feed exclusively on Sipuncula although they do not seem to follow a strict species-specific prey specialization (Fedosov *et al.*, 2018).

Superfamily Turbinelloidea

Family Ptychatractidae

Exilia claydoni **(Harasewych, 1987)**

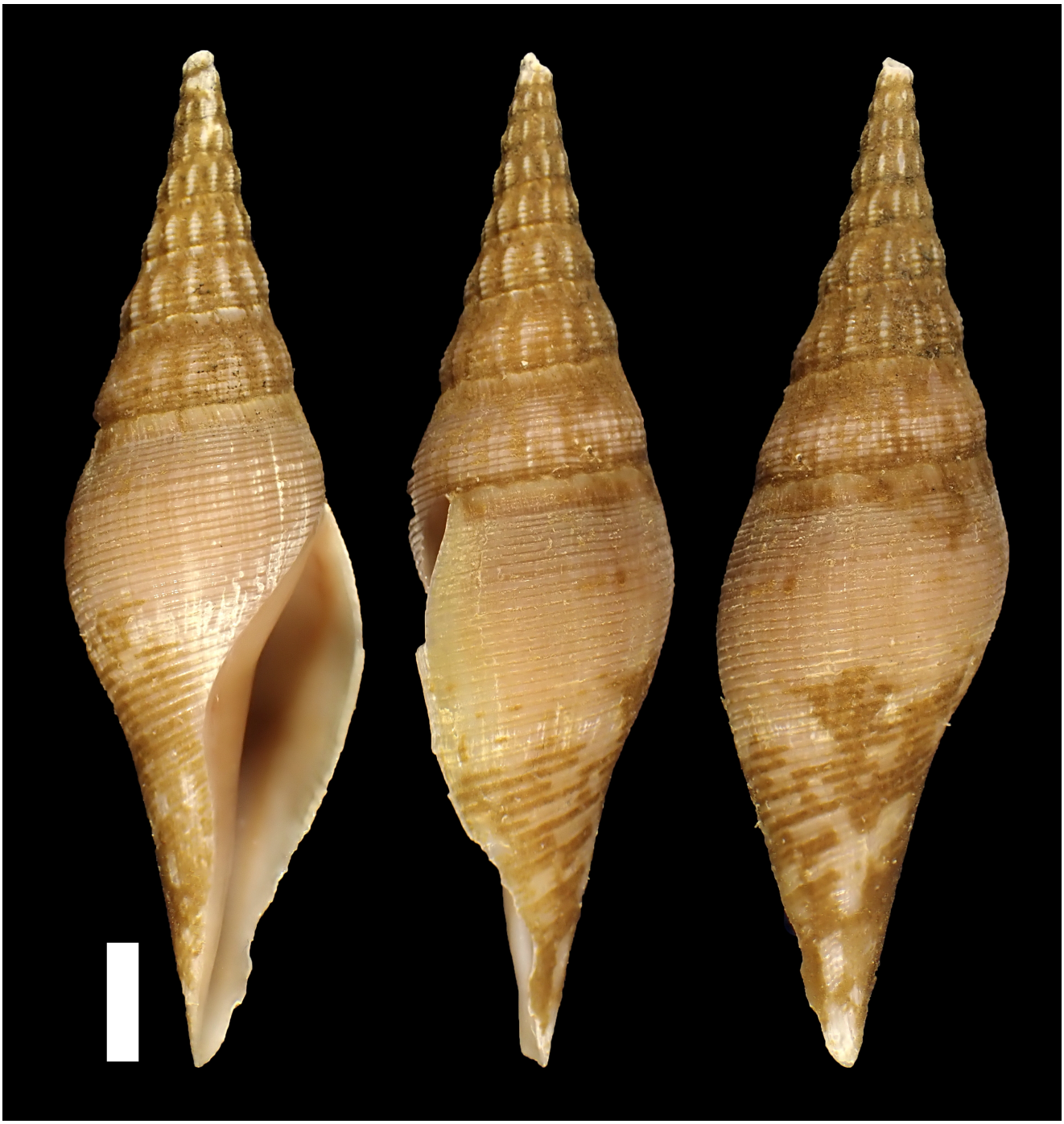

Figure 30. Shell of *Exilia claydoni*. AMS C.548099 [IN2022_V08_159]. Scalebar = 10 mm.

Diagnosis Shell solid, elongate, fusiform. Whorls convex, suture adpressed. Shoulder somewhat pronounced on early whorls, becoming more rounded with increasing size. Spiral sculpture of weak, simple cords. Cords strongest between shoulder and siphonal canal, weakest at suture and distal portion of siphonal canal. Axial sculpture of ribs, most pronounced on earlier whorls, becoming reduced and usually on later whorls. Aperture elongate, elliptical. Outer lip smooth, thin, porcelaneous. Inner lip smooth, characterized by

dissolution of portion of outermost shell layer from parietal region. Columella solid, with 3 simple folds, central fold most prominent, posterior fold weakest and sometimes absent. Siphonal canal broad, long, crosses coiling axis. Interior shell surfaces uniformly smooth, unmodified except by columellar folds.

Taxonomic remarks This and other four nominal species were synonymised with one, previously considered widely distributed species (*E. hilgendorfi* (E. von Martens, 1897) by Kantor *et al.* (2001). Recent molecular data (Kantor *et al.*, 2020) have demonstrated the validity of this western Australian species.

Distribution Off western Australia, 350—596 m (IOT record 1640–3002 m).

Ecology and life history The lack of epizoans on its shells suggests that this species lives buried under mud and other soft sediments where they probably feed on amphipods. Numerous repaired breaks on its shell indicate frequent, unsuccessful predation by crabs and/or fish (Harasewych, 1987).

Superfamily Conoidea

Family Cochlespiridae

Aforia moskalevi **Sysoev & Kantor, 1987**

Figure 31. Shells of *Aforia moskalevi*. AMS C.548013 [IN2021_V08_120]. Scalebar = 10 mm.

Diagnosis Shell fusiform, thin, whorls slightly convex and angulate at the periphery, shoulder flattened and sloping. Axial sculpture of numerous thin growth lines. Spiral sculpture of the upper part of the whorl of threadlike, weak, flattened ribs irregularly displaced and separated by interspaces twice as wide; on whorl lower part spiral ribs larger, narrow, rounded, irregularly disposed and separated by interspaces that are 2-4 times wider than rib widths. Spiral ribs forming reticulate sculpture by crossing strongest growth lines. Outer lip is thin, inner lip smoothly curved, coated with thin callus; siphonal canal long, slightly curved. Sinus deep, wide and rounded with apex situated some distance above middle shoulder. Shell colour

grey.
Distribution Only a few records exist for this species. Described for the Hyort trench (SW Pacific, Sysoev & Kantor, 1987), it has also been reported from (off) Australia, in the Great Australian Bight and off Tasmania (Kantor *et al.*, 2022), 2700–3350 m. (IOT record 3780–3839 m.)
Ecology and life history *Aforia* species are predators of polychaetes with a modified radula whose teeth are used to stab and envenomate the prey and then damaging their tissues once inside the buccal cavity (Sysoev & Kantor, 1987). The paucispiral protoconch of all species in this genus clearly indicates a lecithotrophic (probably entirely intracapsular) development, which would preclude long-distance pelagic dispersal in the larval stage (Gofas *et al.*, 2014). The mechanisms explaining the surprisingly wide distributions exhibited by this and other *Aforia* species is unclear.

***Sibogasyrinx elbakyanae* Kantor, Puillandre & Bouchet, 2021**

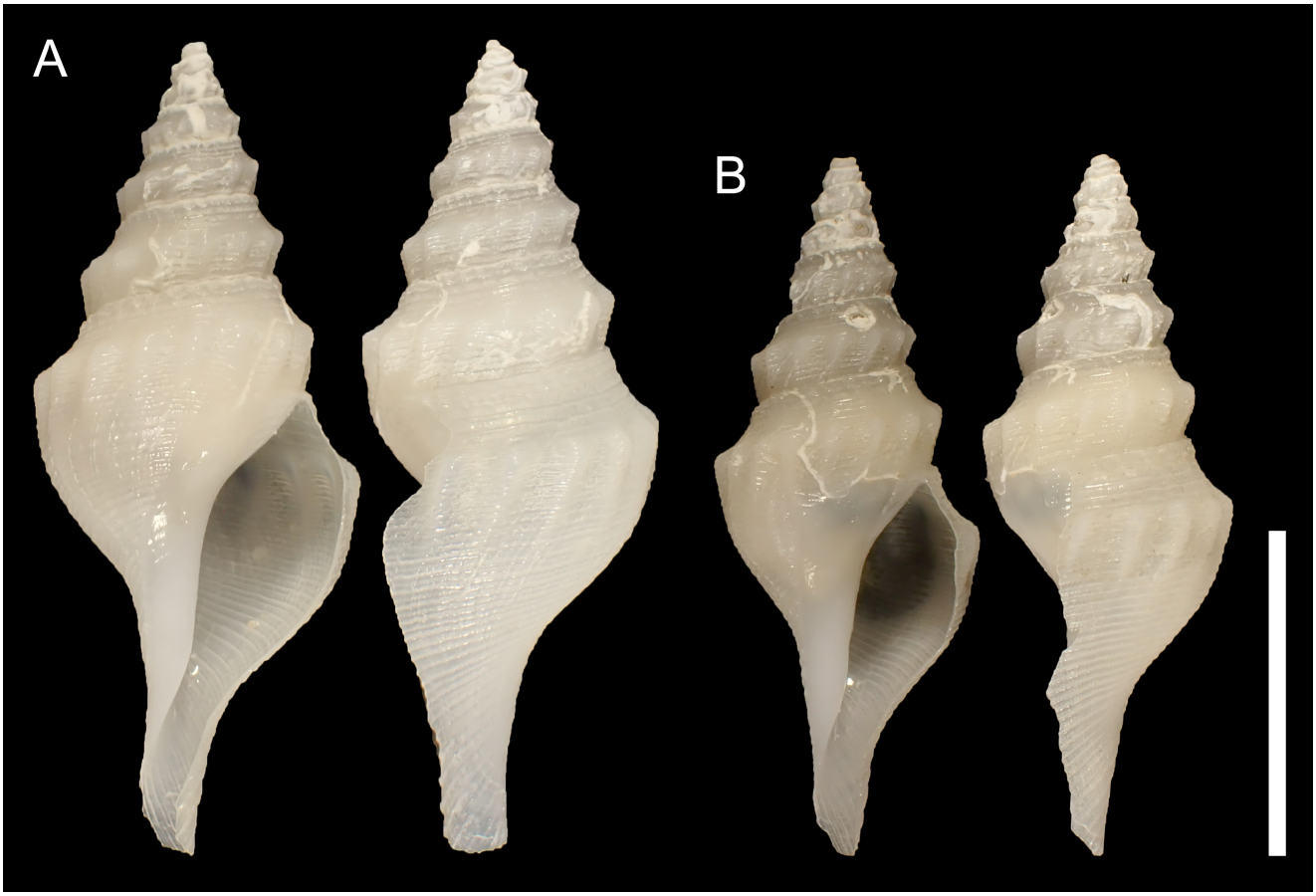

Figure 32. Shells of *Sibogasyrinx elbakyanae*. Shells of Sibogasyrinx elbakyanae (A) AMS C.548131 [IN2022_V08_187]. (B) C.599474 [IN2022_V08_189]. Scalebar = 10 mm.

Diagnosis Shell small for the genus, fusiform, subsutural ramp strongly concave with distinct, broadly-spaced spiral cords and dense subsutural nodules. Axial sculpture of distinct opisthocline ribs extending to shell periphery. Spiral sculpture of distinct cords on and below shoulder.
Taxonomic remarks The shell outline of the new species resembles some species of *Leucosyrinx* (Pseudomelatomidae), particularly *Leucosyrinx verrillii*, but it differs from that species in its smaller size, less numerous shoulder nodules and radular morphology (Kantor & Puillandre, 2021).
Distribution Previously known only for the Solomon Islands, 1136—1750 m. (IOT records 1872–2418.)

Family Marshallenidae

***Marshallena nierstraszi* (Schepman, 1913)**

Figure 33. Shell of *Marshallena nierstraszi*. AMS C.594123 [IN2021_V04_012]. Scalebar = 10 mm.

Diagnosis Shell broadly fusiform, with rather short spire, thin, light greyish white. Sculpture consisting of slightly oblique, narrow ribs, arcuated in the excavation, 15 in number in penultimate whorl, with blunt tubercles about the median part of upper whorls and on shoulder of last whorl, with beads at their upper extremities; just below the suture, the shell is covered with fine growth-striae and spiral lirae, these lirations

being faint in the excavation, stronger and crowded in lower part of whorls, more remote on canal; last whorl attenuated below, passing without marked limit in the rather short canal. Aperture oval, slightly angular above, with a rather narrow canal below: peristome broken, according to growth-striae with a very shallow sinus below the suture; columellar margin concave above, directed to the left along the canal, with a thin layer of enamel.
Distribution Indo-Pacific and Coral Sea, 999–1788 m. (IOT record 2000–2051 m.)

Family Raphitomidae

***Gymnobela yoshidai* (Kuroda & Habe, 1961)**

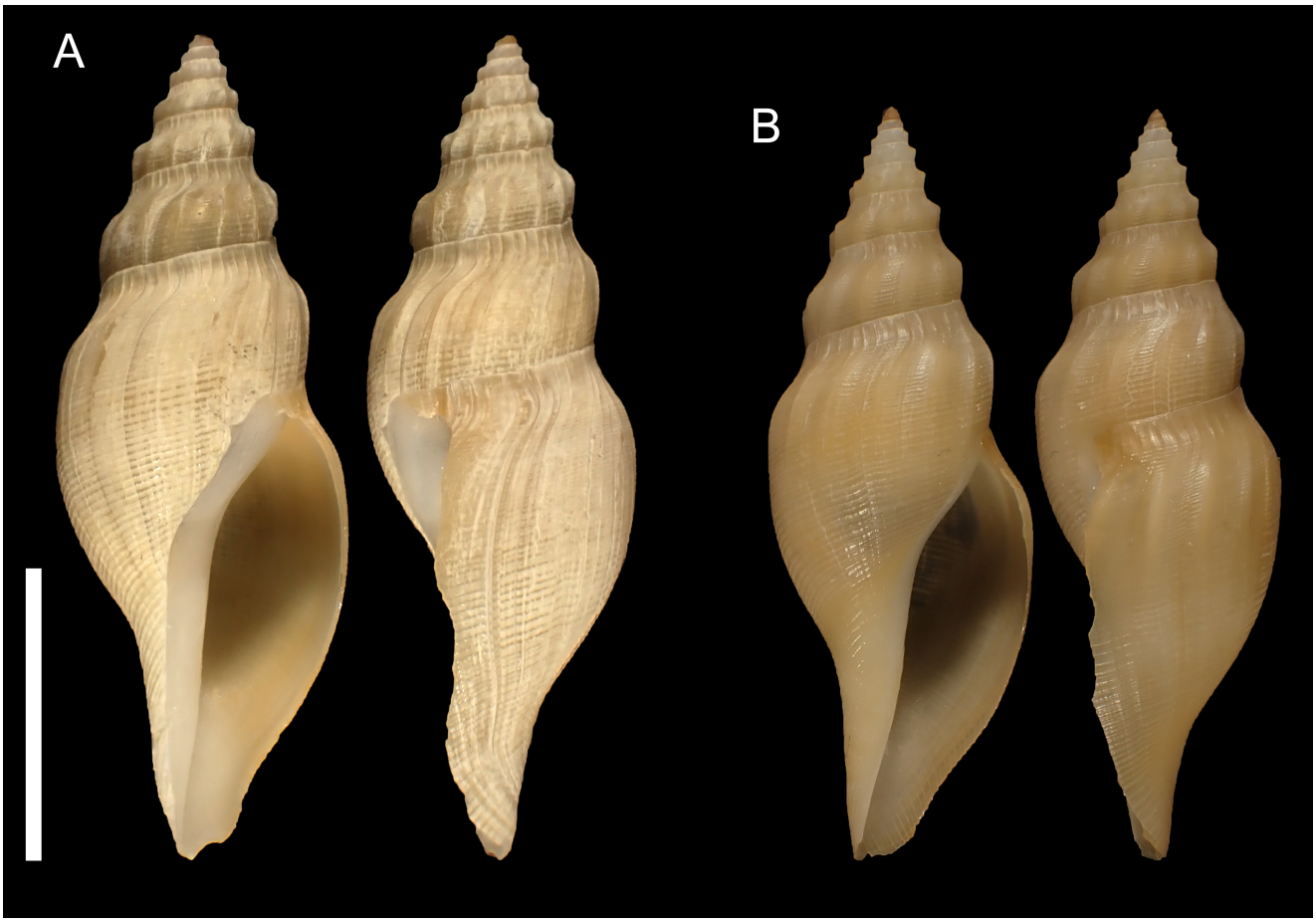

Figure 34. Shells of *Gymnobela yoshidai*. (A) AMS C.548081 [IN2022_V08_163]. (B) C.548141 [IN2022_V08_193]. Scalebar = 10 mm.

Diagnosis Shell turreted-fusiform. Protoconch small, dark-brown, with typical raphitomine diagonally cancellate sculpture. Axial ribs short, orthocline to slightly opisthocline, commencing on abapical part of subsutural ramp and, on last whorls, weakened or often obsolete abapically near suture. Subsutural ramp smooth except for more or less regularly spaced thickened scars of anal sinus. Spiral cords numerous, fine, low, typically wavy and serrated by growth lines, with narrow interspaces typically not exceeding cord width. Aperture elongate oval to narrowly semicircular, inner lip generally evenly curved. Anal sinus shallow, descending almost vertically from suture in most specimens. Canal long, straight or slightly curved. Colour light orange-brown, typically with characteristic pattern of lighter axial streaks. Some specimens with indistinct light spiral band of varying width on upper base. Early spire whorls purplish in some specimens.
Taxonomic remarks As shown by Criscione *et al.* (2021), the current placement in *Gymnobela* is untenable and further molecular data is required for the correct assignment of this species to a genus.
Distribution Japan, from Tosa Bay and westwards, in 200-300 m; Philippines, in 552-592 m, New Caledonia, living in 365-690 m, shells in 260–700 m. (IOT records 477–675 m.)

***Pagodibela baruna* (Sysoev, 1997)**

Figure 35. Shells of *Pagodibela baruna*. AMS C.548032 [IN2022_V08_133]. Scalebar = 10 mm.

Diagnosis Shell thin, fusiform. First teleoconch whorls with angular periphery, weakly concave anal sinus occupying about two thirds of subsutural ramp, periphery with very short oblique axial ribs, last whorls almost evenly convex. Spiral sculpture of fine spiral cords and strongly sigmoid incremental lines, intersection irregularly reticulate. Colour white, adapical half of last whorls with very pale yellowish-white band.
Distribution West Pacific: Indonesia, PNG, New Caledonia and Vanuatu in the south; Taiwan in the north. South-west Indian Ocean: Madagascar and Glorioso Islands, 318–957. (IOT records 1113–1663 m.)

***Pagodibela maia* Criscione, 2020**

Diagnosis Shell fusiform-biconical, thin-walled, semi-translucent. Protoconch orange, multispiral, broadly conical, with gently convex to indistinctly shouldered diagonally cancellate whorls. Teleoconch with white, strongly angulated whorls; suture deeply impressed. First teleoconch whorl convex to indistinctly shouldered, succeeding whorls pagodiform, with wide, straight or slightly concave subsutural ramp concluded by gemmate carina situated about mid-height of whorl. Whorl base narrowing clearly towards lower suture. Subsutural ramp sculpture of low and rounded cords and evenly spaced, raised arcuate riblets producing somewhat reticulate pattern. Supraperipheral two last cords stronger and more narrowly spaced. At whorl base, regularly spaced, alternate strong and weak cords, somewhat gemmate due to weak nodules at intersections of cords with dense collabral riblets. Last adult whorl with almost triangular base, shortly constricted to and clearly demarcated from straight, tapering siphonal canal. Aperture elongate, nearly half of shell length; outer lip thin; inner lip whitish, with thin callus, straight. Anal sinus narrow.
Distribution Coral Sea, 1093–1013. (IOT record 1608–1663 m.)

Figure 36. Shell of *Pagodibela maia*. C.593498 [IN2022_V04_040]. Scalebar = 10 mm.

***Pueridaphne cirrisulcata* Criscione, Hallan, Puillandre & Fedosov, 2020**

Figure 37. Shell of *Pueridaphne cirrisulcata*. AMS C.548142 [IN2021_V08_183]. Scalebar = 10 mm.

Diagnosis Shell fusiform, opaque. Protoconch multispiral, first whorl exhibiting punctate sculpture; subsequent whorls diagonally cancellate. Teleoconch of uniformly white whorls. Suture impressed. Teleoconch whorls with wide subsutural ramp and well-defined shoulder in immature whorls, lower whorl portion and shell base with fine cancellate sculpture. Siphonal canal long, straight. Anal sinus wide, deeply U-shaped. Animal reddish brown.

Taxonomic remarks This species is very similar to *Xanthodaphne agonia* and *X. bruneri*, both described for the W. Atlantic. The assessment of their relationship is pending availability of molecular data on the two latter species.

Distribution Off southern Australia, 2667–3850. (IOT record 3948–4047 m.)

Ecology and life history As with probably all Raphitomidae, this species is likely a predator of polychates. The prey is stabbed and envenomated through a modified hollow tooth.

***Typhlosyrinx supracostata* (Schepman, 1913)**

Diagnosis Shell fusiform-elongate. Teleoconch with up to at least nine whorls, suture shallow, impressed. Whorls weakly convex, subsutural ramp very concave and periphery in lower third on spire whorls, ramp poorly defined and periphery at about mid-whorl height on adult whorls. Axial ribs rather high, weakly nodulose, on early whorls occupying abapical half of whorl, most prominent point in whorl middle. Last two or three adult whorls usually smooth. Spiral cords low, separated by narrow grooves, occupying lower half of whorls with axial ribs, and becoming obsolete together with the ribs. Base and siphonal canal with strong cords but prominence and extension vary between specimens. Based on growth lines, anal sinus deepest at middle of subsutural ramp, broad and shallow.
Distribution Off Indonesia and Philippines, 450–1244 m. (IOT record 643–997.)

***Xanthodaphne charcotiana* Bouchet & Warén, 1980**

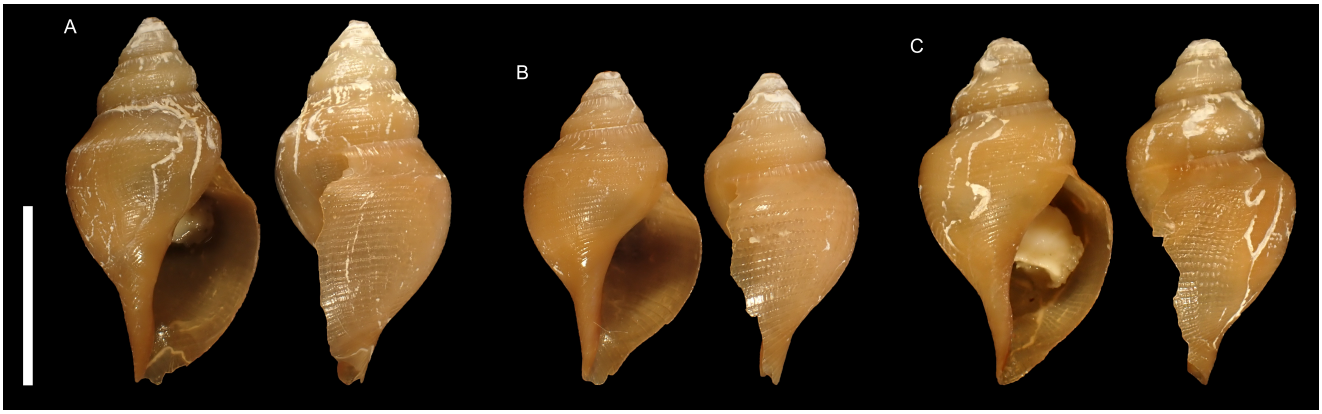

Figure 39. Shells of *Xanthodaphne charcotiana*. (A) AMS C.548078 [IN2022_V08_103]. (B) C.548048 [IN2022_V08_151]. (C) C.594973 [IN2022_V08_028]. Scalebar = 10 mm.

Diagnosis Shell thin, pinkish-brown, whorls very convex with a moderately deep suture. Subsutural sinus zone is broad and slightly concave. Axial sculpture of incremental lines, becoming stronger just below the suture and rather obsolete on the main part of the whorl. Spiral sculpture of punctulate grooves, rather widely spaced and more crowded below suture. Aperture profile evenly convex. Columella and last whorl regularly curved, with inner lip thinly covering columellar wall. Siphonal canal short and broad.
Taxonomic remarks The placement in *Xanthodaphne* (A.W.B. Powell, 1942) is tentative pending thorough genus revision.
Distribution Only known for its NE Atlantic type material, but recently collected off SE Australia (Criscione & Hallan, pers. comm.), 2656–4612 m. (IOT records 2760–3611 m.) While such wide distribution is pending molecular confirmation, there is growing evidence that other species of deep-sea conoidean gastropods can have similarly wide distributions (Criscione *et al.*, 2021; Zaharias *et al.*, 2020).

Family Turridae

***Cryptogemma phymatias* (R. B. Watson, 1886)**

Diagnosis Shell thin but solid, greyish olive, turreted with a small aperture and a short; rather straight canal. Whorls first ones radially rib-sculptured, the following ones bearing a peripheral row of pointed nodules, with slight spiral striae above and below it, the ultimate with definite spiral lirae on its underside down to the tip of the canal. This surface sculpture is crossed by growth lines that recede angularly at the row of nodules. Aperture pear-shaped, with straight, thin edges and a small but evident notch at the periphery, at the end of the row of nodules.
Taxonomic remarks This species can be distinguished from its sister species *C. praesignis* primarily by its distinct bathymetry, being the only turrid species reported to occur below about 1400 m (Zaharias *et al.*, 2020).
Distribution From the central Indo-Pacific (Banda Sea) to the North Atlantic Ocean (Bermuda Island), 1400–

3000 m. (IOT records 2617–3078 m.) Zaharias *et al.* (2020) anticipated that this species would be found in the Indian Ocean, where it had not been yet recorded due to a lack of sampling at bathyal depths.

Figure 40. Shell of *Cryptogemma phymatia*. AMS C.571821 [IN2022_V08_145]. Scalebar = 10 mm.

***Cryptogemma praesignis* (E. A. Smith, 1895)**

Figure 41. Shell of *Cryptogemma praesignis*. AMS C.548147 [IN2021_V08_159]. Scalebar = 10 mm.

Diagnosis Shell solid, white, with an ashy pale-brown periostracum. Suture distinct, not channelled, anal notch rather anterior, about as deep as wide, separated from suture by somewhat excavated area. Spiral sculpture of prominent row of tubercles around the middle of the whorls, subsutural keel, outer lip sinus broad.

Taxonomic remarks See *C. phymatias.*
Distribution Western Indian Ocean to the eastern Pacific Ocean, 300 to 1400 m. (IOT records 603–1013 m)
Ecology and life history Mature females of this species develop a tertiary apertural notch. It has been hypothesised that this structure was possibly connected with the process of fertilization (Kantor & Sysoev, 1991).

***Cryptogemma timorensis* (Tesch, 1915)**

Diagnosis Shell white, large, tall-spired with short and flexed anterior canal. Whorls sculptured with a strong subsutural cord and a weaker spiral above it, the latter forming the margin of suture. Two or three threads between the subsutural cord and the peripheral carina. The latter is studded with closely-spaced, prominent, squarish nodules, 18 to 22 per whorl, obscurely overridden by three flat-topped linear-spaced spirals. Two spiral threads and one primary cord are between the peripheral carina and the lower suture. Base with two or three strong spiral cords above, and 8 or 9 spiral threads below on neck and anterior canal. Spire about 1.3 times the height of the aperture plus canal; spire angle 30° to 33°. Sinus broadly V-shaped, relatively shallow, with a broadly rounded apex at peripheral sinus angulation.
Distribution From Western Indian Ocean to central Indo-Pacific, 300–1200 m. (IOT records 1113–1850 m).

Figure 42. Shell of *Cryptogemma timorensis*. AMS C.587227 [IN2021_V04_040]. Scalebar = 10 mm.

Infraclass "Lower Heterobranchia"

Order Architectonicoidea

Family Architectonicidae

Architectonica grandiosa **Iredale, 1931**

Figure 43. Shell of *Architectonica grandiosa*. AMS C.548092 [IN2022_V08_172]. Scalebar = 10 mm.

Diagnosis Shell large, conical, whorls slightly convex, periphery sharply angulate, whorls eight, umbilicus large and perspective. Coloration: each whorl is bounded by a raised cingulum of cream, regularly blotched with reddish brown, the intervening space varying from deep pink to deep cream. The base shows an unspotted wrinkled rib surrounding the umbilicus, followed by a spotted one, then an intervening space, which is also spotted, and two spotted ribs at the edge. The sculpture consists of oblique evenly spaced cuts, overriding the earlier whorls, where a couple of concentric grooves are seen, but with growth both cuts and grooves decrease in strength and become obsolete on the last whorl, a fine striation only appearing there. The base is similarly striate. Columella straight. perpendicular, basally terminating in a notched projection. Mouth subquadrate.
Distribution Endemic to Australia: central WA, northwards around northern Australia, to Sydney, NSW. (IOT records 169–-176 m).
Ecology and life history All Architectonicidae are ectoparasites of colonial cnidarians (Beesley *et al.*, 1998). While the host(s) of this species is unknown, the diet of the congeneric *A. nobilis* has been shown to be actinarians. The snail rasps a hole in the base of a large polyp, extends the proboscis into the host and continues feeding until the prey dies (Bandel, 1976).

Order Cephalaspidea

Superfamily Cylichnoidea

Family Cylichnidae

***Cylichna consobrinoides* Kuroda & Habe, 1952**

Figure 44. Shell of *Cylichna consobrinoides*. AMS C.548010 [IN2021_V08_159]. Scalebar = 10 mm.

Diagnosis Shell solid, elongate, with nearly parallel sides. Only one whorl forming nearly the entire shell, with the exception of a small visible portion of the spire. Apex rounded, deeply umbilicate, with the aperture lip rising from the left side and forming a short, triangular wing. Anterior end of the shell rounded. Aperture as long as the shell, wider anteriorly and narrowing gradually at about one fourth of its length. Columellar margin conspicuously thickened. Columella simple, with no folds. Umbilicus closed. Sculpture of about 5 simple spiral grooves near the posterior end and about 8 grooves near the anterior end. These grooves are absent from the central part of the shell, which is covered with faint growth lines. Colour uniform shiny white.

Taxonomic remarks This species differs from other congeners by its elongate shell with the aperture lip rising from the left side and forming a short, triangular wing.

Distribution Japan Sea and Coral Sea, 50–970 m (IOT record 603–675 m).

Ecology and life history Cylichna species ingest foraminiferans, both incidentally and selectively, but very little else is known on their diet (Beesley *et al.*, 1998).

Superfamily Philinoidea

Family Scaphandridae

Scaphander mundus **R. B. Watson, 1883**

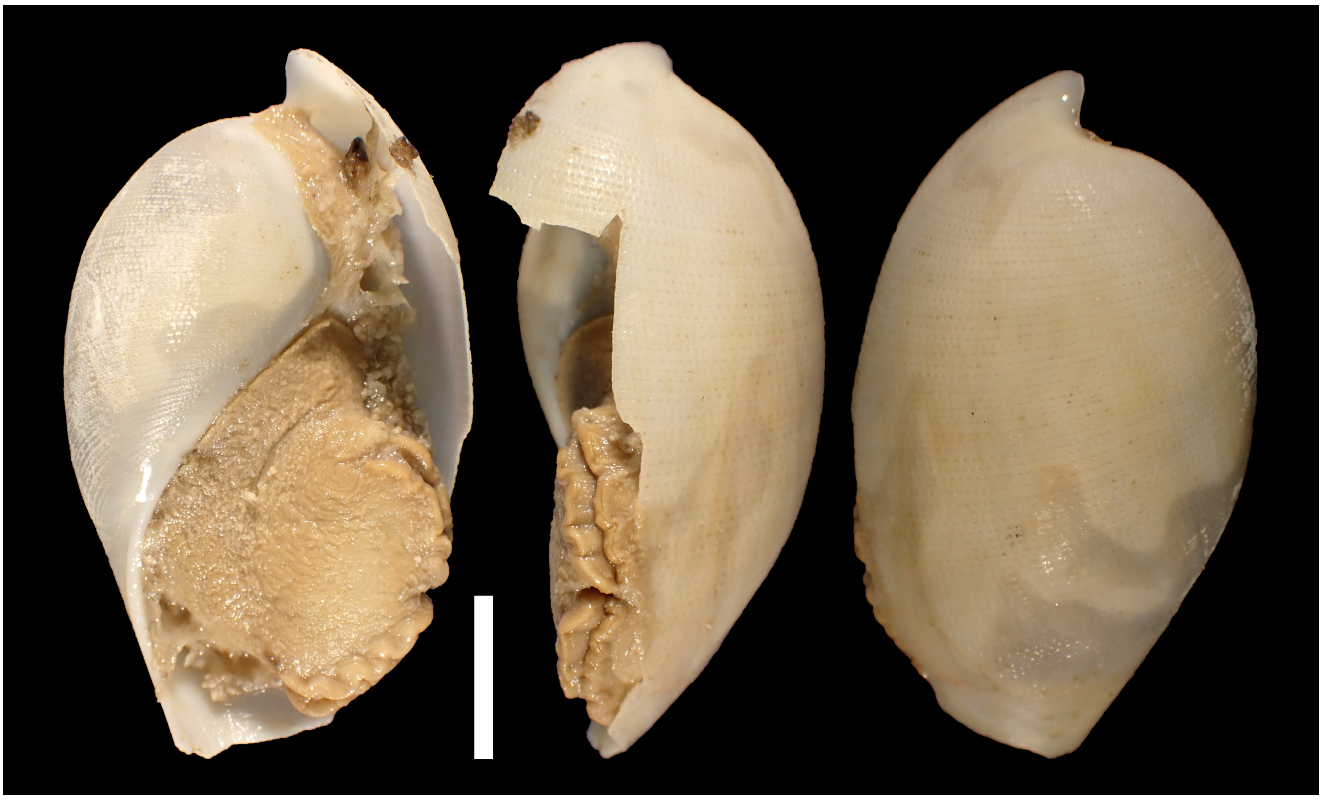

Figure 45. Shell of *Scaphander mundus*. AMS C.548126 [IN2022_V08_105]. Scalebar = 10 mm.

Diagnosis Shell fragile, oval, with convex sides. Only one whorl forming nearly the entire shell. Apex variable, rounded, slightly depressed, not umbilicate, with the aperture lip rising from the left side, forming a wing. The wing is wider in larger specimens, shorter and narrower in smaller specimens. Anterior end of the shell rounded. Aperture as long as the shell, wider anteriorly and narrowing abruptly near the middle of the shell in larger specimens, and more gradually in smaller specimens. Columellar margin thickened, more conspicuously in smaller specimens, with no callus. Sculpture of punctuated spiral grooves. The punctuations are small, oval, almost rectangular, and situated next to each other within each groove. The grooves are separated by gaps narrower than the grooves themselves, and occasionally narrower grooves are intercalated. Colour uniform snowy white.
Taxonomic remarks This species can be distinguished from the similar *S. japonicus* by its larger, more oval non-pigmented shell.
Distribution Central and SW Pacific, 545–2800 m (IOT records 463–2435 m).
Ecology and life history The diet of the congeneric *S. lignarius* is composed by foraminiferans, polychaetes, scaphopods, bivalves, gastropods, echinoderms and crustaceans (Beesley *et al.*, 1998).

Cephalaspidea ***incertae sedis***

Cylichnium mucronatum **Á. Valdés, 2008**

Figure 46. Shell of *Cylichnium mucronatum*. AMS C.548014 [IN2022_V08_120]. Scalebar = 10 mm.

Diagnosis Shell elongate with convex sides, one whorl forming nearly the entire shell. Apex pointed, forming an elongate cone. Anterior end of the shell rounded. Aperture as long as the shell, wider anteriorly and constricted posteriorly, ending in a long, narrow canal. Columellar side thickened. Columella twisted near the anterior end of the shell. Sculpture of fine, irregular spiral lines, crossed by thin axial lines.
Distribution Coral Sea, Fiji and Indonesia, 1004–1012 m. (IOT records 3510–3780 m.)

***Cylichnium nanum* Á. Valdés, 2008**

Figure 47. Shell of *Cylichnium nanum*. AMS C.548090 [IN2021_V08_149]. Scalebar = 10 mm.

Diagnosis Shell solid, oval-elongate, with nearly parallel sides. Only one whorl forming nearly the entire shell. Apex and anterior end of the shell rounded. Aperture as long as the shell, wider anteriorly, narrowing abruptly at about one quarter of the shell length, and ending in a narrow canal. Columellar margin conspicuously thickened. Columella with a conspicuous denticle. Sculpture of a number of fine, irregular, punctuated spiral grooves. The punctuations are small and situated next to each other, occasionally fused together forming irregular continuous lines. Colour uniform whitish.

Taxonomic remarks This species differs from other congeners by its smaller shell, the presence of a conspicuous tooth on the columella, and the more rounded apex.

Distribution Philippines, Indonesia, New Caledonia, Vanuatu and Fiji, 470–1030 m. (IOT records 1834–3078 m.)

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Family index

Species index

Appendix - Gastropoda from voyages IN2021_V04 and IN2022_V08 to the Australian Christmas Island and Cocos (Keeling) Islands Territories

Family	Species name	Operation	Acc. no	Num	AM Reg. no*
Epitoniidae	*Amaea* cf. *thielei*	IN2022_V08_181	131	1	C.548102
Capulidae	*Hyalorisia tosaensis*	IN2021_V04_031	119	1	C.593515
Cypraeidae	*Naria labrolineata*	IN2022_V08_172	156	1	C.594988
Xenophoridae	*Xenophora pallidula*	IN2021_V04_005	107	1	C.593557
Bursidae	*Lampasopsis rhodostoma*	IN2022_V08_179	164	1	C.547976
Bursidae	*Lampasopsis rhodostoma*	IN2022_V08_179	185	1	C.548097
Cassidae	*Oocorys sulcata*	IN2022_V08_115	168	1	C.547995
Cassidae	*Oocorys sulcata*	IN2021_V04_005	106	1	C.593550
Cassidae	*Oocorys sulcata*	IN2022_V08_120	123	1	C.547985
Cassidae	*Oocorys sulcata*	IN2022_V08_103	153	1	C.548135
Cassidae	*Oocorys sulcata*	IN2022_V08_103	154	1	C.548140
Cassidae	*Oocorys sulcata*	IN2021_V04_028	?	1	C.594110
Belomitridae	*Belomitra brachytoma*	IN2021_V04_013	115	1	C.593513
Belomitridae	*Belomitra brachytoma*	IN2021_V04_037	152	1	C.593520
Belomitridae	*Belomitra decapitata*	IN2022_V08_120	118	2	C.548006
Belomitridae	*Belomitra decapitata*	IN2022_V08_120	114	1	C.548033
Belomitridae	*Belomitra decapitata*	IN2022_V08_183	121	1	C.548339
Fasciolariidae	*Amiantofusus maestratii*	IN2021_V04_009	131	1	C.593533
Fasciolariidae	*Amiantofusus pacificus*	IN2022_V08_159	148	1	C.548042
Fasciolariidae	*Fusinus alcyoneum*	IN2022_V08_126	140	1	C.547979
Fasciolariidae	*Fusinus alcyoneum*	IN2022_V08_136	167	1	C.548026
Nassariidae	*Nassarius papillosus*	IN2022_V08_179	120	1	C.547994
Nassariidae	*Nassarius* cf. *roissyi*	IN2021_V04_018	102	1	C.593537.001
Nassariidae	*Tritia ephamilla*	IN2022_V08_189	135	1	C.548082
Nassariidae	*Tritia ephamilla*	IN2022_V08_143	194	3	C.548129
Nassariidae	*Tritia ephamilla*	IN2021_V04_040	128	1	C.593524
Nassariidae	*Tritia ephamilla*	IN2022_V08_153	124	2	C.594969
Cochlespiridae	*Aforia moskalevi*	IN2022_V08_120	117	2	C.548013
Cochlespiridae	*Sibogasyrinx elbakyanae*	IN2022_V08_187	108	1	C.548131
Cochlespiridae	*Sibogasyrinx elbakyanae*	IN2022_V08_189	137	1	C.594974
Conidae	*Conus tessulatus*	IN2022_V08_179	134	4	C.548093
Marshallenidae	*Marshallena* nierstraszi	IN2021_V04_012	122	1	C.594123
Raphitomidae	*Pagodibela baruna*	IN2022_V08_143	198	1	C.571826
Raphitomidae	*Pagodibela baruna*	IN2022_V08_143	197	1	C.548032
Raphitomidae	*Pagodibela maia*	IN2021_V04_040	127	1	C.593498
Raphitomidae	*Pueridaphne cirri sulcata*	IN2022_V08_183	142	1	C.548142
Raphitomidae	*Speoides yoshidai*	IN2022_V08_159	149	1	C.548020
Raphitomidae	*Speoides yoshidai*	IN2022_V08_193	145	1	C.548027
Raphitomidae	*Speoides yoshidai*	IN2022_V08_163	164	1	C.548081
Raphitomidae	*Speoides yoshidai*	IN2022_V08_193	146	1	C.548141
Raphitomidae	*Typhlosyrinx supracostata*	IN2021_V04_005	104	1	C.593503
Raphitomidae	*Xanthodaphne charcotiana*	IN2022_V08_151	138	1	C.548048
Raphitomidae	*Xanthodaphne charcotiana*	IN2022_V08_103	158	1	C.548078
Raphitomidae	*Xanthodaphne charcotiana*	IN2021_V04_028	140b	1	C.594973
Turridae	*Cryptogemma phymatias*	IN2021_V04_037	153a	2	C.593521
Turridae	*Cryptogemma phymatias*	IN2022_V08_147	164	2	C.548030
Turridae	*Cryptogemma phymatias*	IN2022_V08_115	160	1	C.548034
Turridae	*Cryptogemma phymatias*	IN2022_V08_147	165	2	C.548036
Turridae	*Cryptogemma phymatias*	IN2022_V08_181	151	1	C.548055
Turridae	*Cryptogemma phymatias*	IN2022_V08_115	159	1	C.548056
Turridae	*Cryptogemma phymatias*	IN2022_V08_145	119	13	C.548156
Turridae	*Cryptogemma phymatias*	IN2022_V08_145	120	1	C.548166

Family	Species name	Operation	Acc. no	Num	AM Reg. no*
Turridae	*Cryptogemma phymatias*	IN2022_V08_145	120	1	C.548167
Turridae	*Cryptogemma phymatias*	IN2022_V08_145	119	1	C.571821
Turridae	*Cryptogemma phymatias*	IN2022_V08_143	194	1	C.594986
Turridae	*Cryptogemma praesignis*	IN2022_V08_143	198	2	C.548070
Turridae	*Cryptogemma praesignis*	IN2022_V08_159	154	1	C.548005
Turridae	*Cryptogemma praesignis*	IN2022_V08_126	138	1	C.548016
Turridae	*Cryptogemma praesignis*	IN2022_V08_143	205	1	C.548071
Turridae	*Cryptogemma praesignis*	IN2022_V08_126	145	1	C.548086
Turridae	*Cryptogemma praesignis*	IN2022_V08_159	155	1	C.548147
Turridae	*Cryptogemma praesignis*	IN2022_V08_193	174	1	C.548152
Turridae	*Cryptogemma timorensis*	IN2022_V08_143	166	1	C.547990
Turridae	*Cryptogemma timorensis*	IN2021_V04_035	122b	1	C.571820
Turridae	*Cryptogemma timorensis*	IN2021_V04_040	126	1	C.587227
Turridae	*Cryptogemma timorensis*	IN2021_V04_035	122a	3	C.593529
Turridae	*Cryptogemma timorensis*	IN2021_V04_048	123	2	C.593531
Turridae	*Cryptogemma timorensis*	IN2021_V04_053	115	3	C.593532
Turridae	*Cryptogemma timorensis*	IN2021_V04_037	153b	2	C.594985
Turridae	*Cryptogemma*	IN2021_V04_012	nf	1	C.594126
Mitridae	*Imbricaria amoena*	IN2022_V08_179	133	1	C.548022
Muricidae	*Chicomurex globus*	IN2022_V08_179	165	1	C.547982
Muricidae	*Chicomurex gloriousus*	IN2022_V08_179	130	1	C.547984
Muricidae	*Chicoreus aculeatus*	IN2022_V08_179	129	1	C.547986
Muricidae	*Chicoreus loebbeckei*	IN2022_V08_179	132	1	C.547975
Muricidae	*Cytharomorula vexillum*	IN2022_V08_172	156	1	C.548110
Muricidae	*Emozamia licina*	IN2022_V08_193	136	1	C.548017
Muricidae	*Emozamia licina*	IN2022_V08_193	137	1	C.548124
Muricidae	*Coraliophila inflata*	IN2022_V08_163	166	1	C.548111
Muricidae	*Morula coronata*	IN2022_V08_172	156	1	C.548108
Ptychatractidae	*Exilia claydoni*	IN2022_V08_159	147	1	C.548099
Architectonicidae	*Architectonica grandiosa*	IN2022_V08_172	155	1	C.548092
Cephalaspidea *incertae sedis*	*Cylichnium mucronatum*	IN2022_V08_120	112	1	C.547981
Cephalaspidea *incertae sedis*	*Cylichnium mucronatum*	IN2022_V08_120	116	3	C.548014
Cephalaspidea *incertae sedis*	*Cylichnium mucronatum*	IN2022_V08_103	149	1	C.548052
Cephalaspidea *incertae sedis*	*Cylichnium mucronatum*	IN2022_V08_103	150	1	C.548136
Cephalaspidea *incertae sedis*	*Cylichnium nanum*	IN2022_V08_149	127	1	C.548090
Cephalaspidea *incertae sedis*	*Cylichnium nanum*	IN2022_V08_145	119	2	C.548162
Cylichnidae	*Cylichna consobrinoides*	IN2022_V08_159	146	1	C.548010
Scaphandridae	*Scaphander mundus*	IN2022_V08_105	173	1	C.548120
Scaphandridae	*Scaphander mundus*	IN2022_V08_105	174	1	C.548126
Scaphandridae	*Scaphander mundus*	IN2021_V04_035	131	1	C.593500
Scaphandridae	*Scaphander mundus*	IN2021_V04_018	117	1	C.593548
Scaphandridae	*Scaphander mundus*	IN2021_V04_012	124	1	C.594117
Calliotropidae	*Bathybembix abyssorum*	IN2021_V04_033	109	3	C.593501
Calliotropidae	*Calliotropis hondoensis*	IN2022_V08_120	184	1	C.547993
Calliotropidae	*Calliotropis hondoensis*	IN2022_V08_120	115	3	C.548000
Calliotropidae	*Calliotropis hondoensis*	IN2022_V08_115	167	1	C.548002
Calliotropidae	*Calliotropis hondoensis*	IN2022_V08_120	111	1	C.548004
Calliotropidae	*Calliotropis hondoensis*	IN2022_V08_151	143	1	C.548025
Calliotropidae	*Calliotropis hondoensis*	IN2022_V08_115	166	1	C.548132
Calliotropidae	*Calliotropis hondoensis*	IN2022_V08_103	147	1	C.548137
Calliotropidae	*Calliotropis hondoensis*	IN2022_V08_103	146	3	C.548138
Calliotropidae	*Calliotropis infundibulum*	IN2021_V04_028	?	3	C.594114
Margaritidae	*Gaza daedala*	IN2021_V04_002	105	2	C.593551.001
Margaritidae	*Gaza daedala*	IN2021_V04_002	106	2	C.593552
Solariellidae	*Bathymophila aages*	IN2022_V08_153	124	1	C.548153

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