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Two New Subspecies in the Genus *Zoila* (Gastropoda: Cypraeidae)

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With 1 Text-Figure, 2 Maps, 2 Tables, and 38 Figures on Plates 1-7

Keywords

Australia, *Zoila*, new subspecies.

Abstract

Zoila marginata nudispira n. ssp. from the southern coast of Western Australia represents a deep-water subspecies sharing features with three, probably derived, taxa: *Z. m. marginata*, and *Z. m. albanensis* from adjacent shallower habitats, and *Z. orientalis* from the eastern side of the Great Australian Bight. It is considered ancestral to these.

Zoila jeaniana praeclara n. ssp. differs from *Z. friendii thalamega* and *Z. jeaniana jeaniana* by its shape and color pattern, which are intermediate between these taxa. Its sparsely spotted, pale and high margins are sharply separated from the black color of the base, which makes it different from these.

Zusammenfassung

Zoila marginata nudispira n. ssp. von der westaustralischen Südküste repräsentiert eine Tiefwasserunterart, die Merkmale von drei offenbar abgeleiteten Taxa in sich vereint: *Z. m. marginata* und *Z. m. albanensis* aus angrenzenden Flachwasserhabitaten, und *Z. orientalis* von der Ostseite des Great Australian Bight.

Zoila jeaniana praeclara n. ssp. unterscheidet sich von *Z. friendii thalamega* und *Z. jeaniana jeaniana* durch ihre Gehäuseform und Musterung, die intermediär sind. Ihre spärlich gepunkteten, hohen, hellen Seiten sind deutlich von der schwarzen Basis abgesetzt, was sie von ihren Verwandten abgrenzt.

Abbreviations and Acronyms

AT Dr. ANJA THEILE, Bochum, Germany
 CLSF CHIAPPONI LORENZ Seashell Foundation,
 Lecco, Italy
 MSF Molluscan Science Foundation, Inc.,
 Owings Mills, Maryland, USA
 WAM Western Australian Museum,
 Perth, Western Australia

The shell formula (after BRIDGES & LORENZ 2012) enumerates length (width/length – height/length – height/width), labral : columellar teeth (normalized), and [mass ratio].

Introduction

The collecting activities using a remotely operated vehicle (ROV) along the coast of Western Australia, conducted by RAY WALKER and his team, have yielded fascinating and new Gastropods. In the cowries, the discoveries of *Zoila rosselli raywalkeri* LORENZ, 2013 and *stricklandi* LORENZ, 2015 are the most noteworthy. But also, hitherto elusive taxa could be documented in greater numbers, among them *Umbilia armeniaca andreysi* LORENZ & BEALS, 2012, *Zoila perlae* LOPEZ & CHIANG, 1975, and *Zoila friendii kostini* LORENZ & CHIAPPONI, 2007. This paper describes two subspecies of the genus *Zoila* from deeper water which have been collected recently. Although single specimens of both taxa had been known from trawlers for many years, only now has there been sufficient material and documentation to formally describe them.

Methods

Measurements of types are listed as length × width × height in millimeters (labral teeth counted: columellar teeth counted) [weight in grams].

Systematics

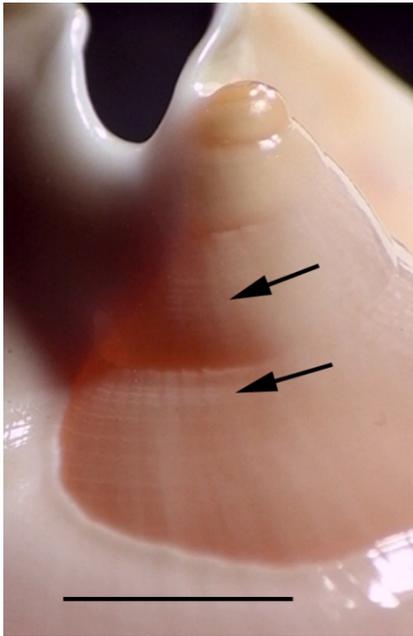
Superfamily: Cypraeoidea RAFINESQUE, 1815

Family: Cypraeidae Rafinesque, 1815

Genus: *Zoila* JOUSSEAUME, 1884*Zoila marginata nudispira* n. ssp.(Map 1, Plate 1 Figs 1-3, Plate 2 Figs 1-5,
Plate 3 Figs 7-8, Plate 7 Fig. 1)

Description

The Holotype is a live collected, fully adult specimen. The shell's body is pyriform and inflated. The dorsal dome is humped, reaching its highest point in the posterior third. The spire is pointed and barely covered with callus, so that the orange protoconch is visible. The three post-nuclear whorls of the spire, visible in the adult shell, show a distinct, wavy-spiral sculpture



Text-Figure 1: *Zoila marginata nudispira*. Close-up view on the spire of the adult Paratype 14. The arrows point at the distinct spiral sculpture not covered by callus. Scale: 5 mm.

(Fig. 1). The labral side is bordered by a delicate, angular margin with a slightly indented outline. The margin on the columellar side is weak in the mid-section, but prominent posteriorly, forming a deep groove below the spire. The posterior extremity is delicate and separated from the margin. There is an indentation above the extremity; left of the spire. Anteriorly, the flanges formed by the margins evenly taper to the narrow, thin-shelled tips. The marginal callus forms an iridescent collar covering both extremities dorsally, but leaving the spire partly exposed. The base is distinctly convex and calloused, forming a discernible longitudinal ridge along the shell's axis. The teeth are well-produced and coarse on both sides of the narrow aperture, which is curved posteriorly. The fossula is rather flat. The dorsal surface is of high gloss and shows a faint malleated sculpture, whereas, the marginal collars have a somewhat irregular surface. The dorsal ground color is plain white, without secondary pattern. The marginal collars are pale greyish-brown. The interior of the shell is orange. There are numerous large and confluent dark brown basal spots, some of them extending towards the aperture. They form slight depressions in the marginal callus. There are also some smaller, slightly paler spots on the margins, well-visible on dorsal view.

In the paratypes, there is no discernible difference between specimens from the western localities

(Windy Harbour to Augusta) and the eastern type locality (Salisbury Island), either in coloration or shape, the latter of which is reflected by the formulae. Their data also shows, that the mass ratio of the shells varies. In all paratypes, the orange protoconch is exposed; in 25 % of the shells, the spire itself is at least partly covered with iridescent enamel, but the whorls of the spire are always well-discernible. The width of the base, defined by the marginal callus, varies considerably. In most shells, the left side of the body whorl is visible on the basal view. The density and darkness of the basal spotting varies among the paratypes, but in all shells there are darker spots also visible from the dorsal view. In all but one shell (Paratype 5), the collars formed by the iridescent marginal callus are stained darker than the dorsum itself. In 50 % of the shells, there is a darker, secondary dorsal pattern. This varies from a few isolated pale brown spots to mottled cloudy blotches covering most of the dorsum.

The animal characteristics are unrecorded.

Material

Twenty live taken and five fresh dead specimens.

Holotype: 48.7 × 29.9 × 23.3 (27:20) [12.0] 5 km SE of Salisbury Island, W Australia, at 85 m. Coll. WAM; **Paratype 1:** 49.6 × 28.5 × 23.5 (23:18) [14.1], coll. CLSF 17001; **Paratype 2:** 48.8 × 29.1 × 23.0 (26:18) [10.8]; **Paratype 3:** 50.6 × 29.9 × 23.7 (25:21) [10.1] Coll. MSF 11028; **Paratype 4:** 51.8 × 30.9 × 24.2 (24:18) [9.7] Coll. MSF 11029; **Paratype 5:** 52.2 × 34.4 × 25.6 (27:22) [14.3]; **Paratype 6:** 51.3 × 32.4 × 24.5 (26:20) [13.0] Coll. MSF 11030; **Paratype 7:** 47.6 × 32.3 × 23.7 (27:19) [12.9] Coll. CARLO COLI; **Paratype 8:** 48.0 × 29.2 × 22.3 (25:19) [10.5]; **Paratype 9:** 54.8 × 33.1 × 24.9 (26:20) [12.9]; **Paratype 10:** 52.2 × 32.0 × 24.5 (24:18) [14.3], coll. AT; **Paratype 11:** 53.4 × 30.7 × 24.2 (25:19) [15.1]; **Paratype 12:** 51.3 × 30.3 × 23.6 (29:22) [11.8]; all from the type locality. **Paratype 13:** 49.8 × 30.9 × 23.8 (27:18) [8.2] southwest of Augusta, at 148 m; **Paratype 14:** 49.6 × 30.0 × 25.3 (25:20) [13.9] Augusta, at 142 m, coll. CLSF 17003; **Paratype 15:** 50.3 × 30.8 × 24.6 (26:21) [12.3] Augusta, at 142 m. Coll. MSF 11031; **Paratype 16:** 50.5 × 31.2 × 24.2 (25:19) [15.1] Wilson Island, Cape Le Grand, at 78 m, coll. AT; **Paratype 17:** 51.0 × 32.7 × 24.7 (27:19) [14.1] Windy Harbour, at 95 m, coll. CLSF 17004; **Paratype 18:** 47.2 × 29.2 × 22.3 (25:17) [10.1] Windy Harbour, at 95 m; **Paratype 19:** 54.2 × 32.9 × 25.1 (27:22) [12.9] South of Augusta, at 98 m (Depicted on Plate 114: 12, in LORENZ, 2018). **Paratype 20** coll. CLSF 17002; **Paratypes 21-24:** 47.3 to 52.9 mm, dead collected at Salisbury Island, at 85 m.

Shell formulae

Salisbury Island (Holotype, Paratypes 1 to 12): 51 (61 – 47 – 77) 20 : 16 [11.3].

Other localities (Paratypes 13 to 19): 50 (62 – 48 – 78) 20 : 16 [11.1].

Distribution and Habitat

Zoila marginata nudispira n. ssp. has been recorded from the northwest of Cape Naturaliste (LORENZ 2018: pl. 114, fig 13), which constitutes the westernmost locality. Shells have been found between Augusta and Salisbury Island, Recherche Archipelago, along the southwestern coast of Western Australia (see Map 1). Living specimens have been collected from sponges at 70 to 150 meters by ROV. WILSON & CLARKSON (2004) illustrated a specimen tentatively allocated to the western Great Australian Bight (Plate 229: c, see discussion below).

Etymology

The name is derived from the Latin word *nudus* = naked, referring to the exposed spire that is not fully covered by callus as in the other subspecies of *Z. marginata*.

Discussion

The most obvious conchological feature of *m. nudispira* is the partly or completely exposed spire not covered by prominent iridescent callus, and the conspicuous orange protoconch, which is well-discernible in all specimens. These features are only rarely found in adult specimens of other taxa in the *marginata*-complex. In comparison to the adjacent shallow water populations of *m. marginata* (GASKOIN, 1849) and *m. albanensis* RAYBAUDI, 1985, *m. nudispira* is considerably smaller (1 cm on average), and its columellar callus is less developed.

Along most of the range of *m. nudispira*, the southern subspecies *m. albanensis* inhabits the shallower coastal waters. This subspecies is characterized by its moderately solid, often plain white shell in which the basal spots are not visible from dorsal view and the marginal collars are not notably darker. The margins of *m. albanensis* are less delicate than in *m. nudispira*, in which the aperture is somewhat narrower than in *m. albanensis*. While the dorsal pattern of *m. albanensis* and *m. nudispira* are similar in varying from plain white to cloudy brown. The more delicate shell of *m. nudispira*, however, is more similar to *m. marginata*. This impression is

supported by their lower mass ratios. Especially southern specimens of *m. marginata* from the Mandurah area can resemble *m. nudispira* in general appearance (see Pl. 3, Fig. 2).

Although there are exceptions to all of these characteristics, the side-by-side comparison of *m. albanensis* with *m. nudispira* makes the different appearance obvious.

The tall, exposed spire of *m. nudispira* reminds one of shells of the rare, conchologically extreme deep-water variation of *orientalis* RAYBAUDI, 1978. Two such shells had previously been called a variation of *marginata* (LORENZ 2001: pl. 27, figs 1, 2), which reflects the uncertainty about their taxonomic identity. One of these (Plate 2, Fig. 7) was first illustrated in WILSON (1993: pl. 29, fig. 6B) as coming from the Abrolhos Islands from the opposite side of the Australian continent. The shell was later sold to me, along with the second specimen, with a label claiming “Cape Recherche”. Most likely, the two shells in question originated from the eastern part of the Great Australian Bight (GAB), as further findings of similar shells have been made in due course (Pl. 2, Fig. 8).

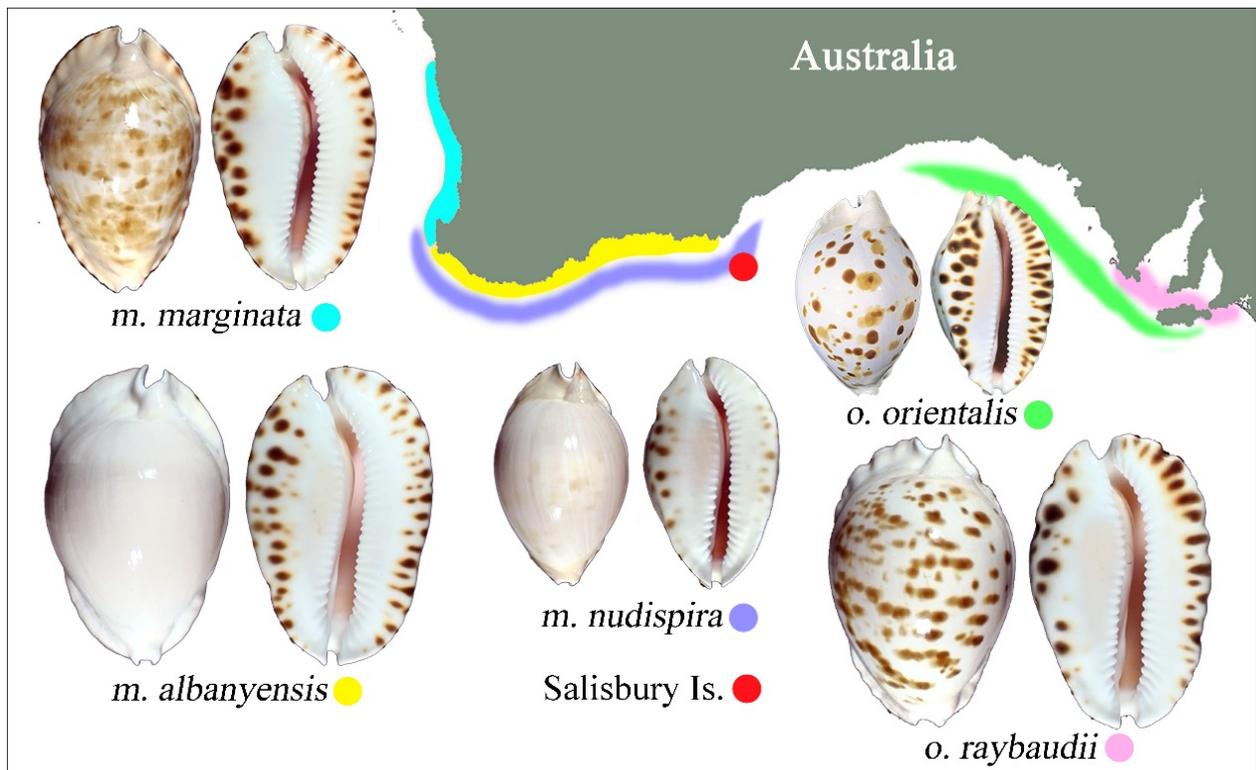
WILSON & CLARKSON illustrated a specimen that resembles *m. nudispira* (2004: 229, text-fig. c) (Pl. 3, Fig. 9 herein), of unknown provenance. They discuss it as conchological intergrade between *marginata* and *orientalis* and place it to the west of the Bight in their map 14. The specimen shows a slightly darker collar around the extremities.

The combination of features found in *m. nudispira* link it with the tall-spined *o. orientalis* from the deep water (100 to 150 m) of the eastern Great Australian Bight, and also, the conchologically less extreme eastern shells from the 70 to 100 m range, to which the holotype of *orientalis* belongs (Plate 3: 5). Its shallow water subspecies *o. raybaudii* LORENZ, 1992 shares the remarkable dorsal pattern, but is otherwise more similar to the western *m. albanensis* in general shape and in being the heavier shell.

As in other deep water populations of the genus *Zoila*, *m. nudispira* is here interpreted as ancestral to the three shallow water taxa of the *marginata*-complex distributed along the southwestern coast of Australia (*m. marginata*, *m. albanensis*, and *orientalis*), as it combines features of all three, as shown in the comparative Table 1. The shared features are marked with the color assigned to each taxon (see also Map 1).

Table 1: Comparison of shell features and distributions. The table does not list the shallow water *orientalis raybaudii* separately, but the features are very similar, apart from the larger dimensions, the less projecting spire, and the somewhat broader and more humped shell, as discernible in the formula of *o. raybaudii*: 59 (64 – 51 - 80) 19 : 16 [12.9].

	<i>m. marginata</i> •	<i>m. albanensis</i> •	<i>m. nudispira</i> n. ssp.	<i>o. orientalis</i> •
Distribution	Jurien Bay to Augusta	Augusta to Recherche Arch.	Cape Naturaliste to Recherche Arch. •	GAB to St. Vincent Gulf
Depth Range	10 to 70 m	5 to 70 m	70 to 150 m •	70 to 150 m
Formula	60 (58-46-79)	61 (62-49-79)	51 (61-48-78)	43 (62-47-77)
Teeth (norm.)	21 : 17	20 : 15	20 : 16	20 : 17
Mass ratio	[10.9]	[13.6]	[11.2] •	[13.9]
Col. Margin	very produced	Produced	less produced	reduced
Left side basally	concealed	often visible	visible •	visible
Labral margin	angular, thin	Rounded	angular, thin •	rounded
Aperture	narrow	Widest	narrow •	wide
Callus on spire	rather thick	Thick	mostly absent •	mostly absent
Dorsum	humped	less humped	rounded •	rounded
Midw. col. teeth	distinct	less distinct	distinct •	less distinct
Collars/dorsum	darker	mostly white	darker •	mostly white
Dorsal pattern	dark, diffuse	absent or pale and cloudy •		distinct spots
Basal spots dorsum	visible	not visible	visible •	not visible



Map 1: Distributions of the southern taxa of the *marginata*-complex. Explanations in the text and in Table 1.

The bathymetrical border along which the modern shallow water populations approach the archaic deep water fauna is at approximately 70 meters. From this depth, shells of the deep water *m. nudispira*, as well as, the respective shallow water *m. marginata* (in the Augusta area) or *m. albanensis* (e.g. from Hopetoun), have been reported. Below this depth, only small-shelled *m. nudispira*, with more or less exposed spires, and the other characteristics attributed to the new

subspecies, have been found. As a result of ocean level fluctuations during the Pleistocene, this approximate depth is also a demarcation along which the morphological features and the coloration of *Zoila* species change. The number of pale-shelled individuals increases, and also, a separation between archaic deep water populations and derived shallow water populations can be observed.

This description does not consider the taxa of the *marginata*-complex found along the Central Western to the North Western part of Australia, namely *ketyana* (RAYBAUDI 1978) and its subspecies and forms. More comprehensive information on the *marginata*-complex and the impact of the sea level fluctuations during the Pleistocene on the evolution of the genus *Zoila* can be found in WILSON & CLARKSON 2004, and LORENZ 2017.

***Zoila jeaniana praeclara* n. ssp.**

(Map 2, Plate 4 Figs 1-4, Plate 5 Figs 1-3, Plate 7 Figs 2-3)

Description

The holotype is a fresh dead specimen showing all characteristics of the subspecies. The shell is elongate-pyriform, with short extremities. The dorsal dome is rather low and evenly rounded, with the highest in the mid-section of the shell. The tips of the posterior extremity are rather sharp, but are not raised upwards. The spire is completely concealed by the callus of the extremity. The aperture is narrow and rather straight. The teeth are short, but distinctly developed labrally. On the columellar side, they are barely discernible in the posterior half, but short and gradually more distinct towards the anterior. The base is calloused and slightly convex. The margins are angular throughout on both sides of the shell. The dorsal ground colour consists of compact black blotches leaving only small areas in which the paler greenish-brown background colour is visible. The base is black, with a thin yellow-orange frame along the aperture on both sides. The margins are whitish cream, rising far towards the dorsum on both sides. Towards the extremities, they form cream-colored collars which gradually become brown towards the tips. The extremities are blotched with black on both sides. The margins are sparsely spotted with large black and blue blotches above their lower area. The zones raising onto the dorsum are unspotted and finely framed with a blue halo. The microstructure of the cream marginal callus is conspicuously iridescent. The fossula area is smooth and flat, and of white colour.

The animal has a smooth, semi-transparent mantle of greenish grey colour. The foot and the siphon are black.

All paratypes agree with this description. All specimens are small-sized and show remarkably

little variation in their measurements and tooth counts. In most paratypes, the posterior columellar teeth are weak, but discernible. The degree of rostration varies slightly, but in all shells, the extremities do not conspicuously protrude from the shell's outline on dorsal view. The black dorsal blotching may form a solid black coat leaving only a well-defined dorsal line. In some specimens, the spotting is less confluent and the bluish or greenish dorsal background color is visible. The base is always calloused and solid black. The spotting of the margins is always sparse labrally. The color of the margins varies from cream to orange brown. The border between the black color of the base and the pale margins is always well-defined, the black does not extend across the angle of the transition between the base and the margins.

Material

Twenty-two live taken and two fresh dead specimens.

Holotype: 80.3 × 48.4 × 39.2 (31:23) [53.3] Big Bank, northwest of Kalbarri, at 70 to 85 m. Coll. WAM; **Paratype 1:** 70.0 × 40.8 × 33.4 (28:24) [26.2] Coll. MSF 11031; **Paratype 2:** 68.5 × 39.4 × 32.9 (27:23) [29.4], coll. CLSF 16997; **Paratype 3:** 70.1 × 42.0 × 33.1 (28: -) [34.1], coll. AT; **Paratype 4:** 70.1 × 42.5 × 33.0 (29:23) [41.2]; **Paratype 5:** 75.2 × 43.6 × 35.9 (28:24) [38.4], coll. CLSF 16998; **Paratype 6:** 71.3 × 41.9 × 33.9 (29:22) [29.5], coll. AT; **Paratype 7:** 79.0 × 43.2 × 34.8 (28:26) [31.6], coll. CLSF 16997; **Paratype 8:** 80.2 × 44.7 × 37.0 (30:24) [40.0]; **Paratype 9:** 74.8 × 41.8 × 33.4 (27:22) [31.0] Coll. MSF 11033; **Paratype 10:** 76.4 × 43.0 × 34.4 (26:24) [37.9], coll. CLSF 17000; **Paratype 11:** 73.4 × 41.8 × 34.0 (29: -) [33.3]; **Paratype 12:** 65.1 × 39.7 × 32.5 (32:22). **Paratype 13:** 82.1 × 49.0 × 39.9 (31:27) [34.2] Coll. MSF 11034, and ten additional Paratypes. All from the type locality.

Shell formula

73 (58 – 47 – 81) 20 : 17 [11.0]

Distribution and Habitat

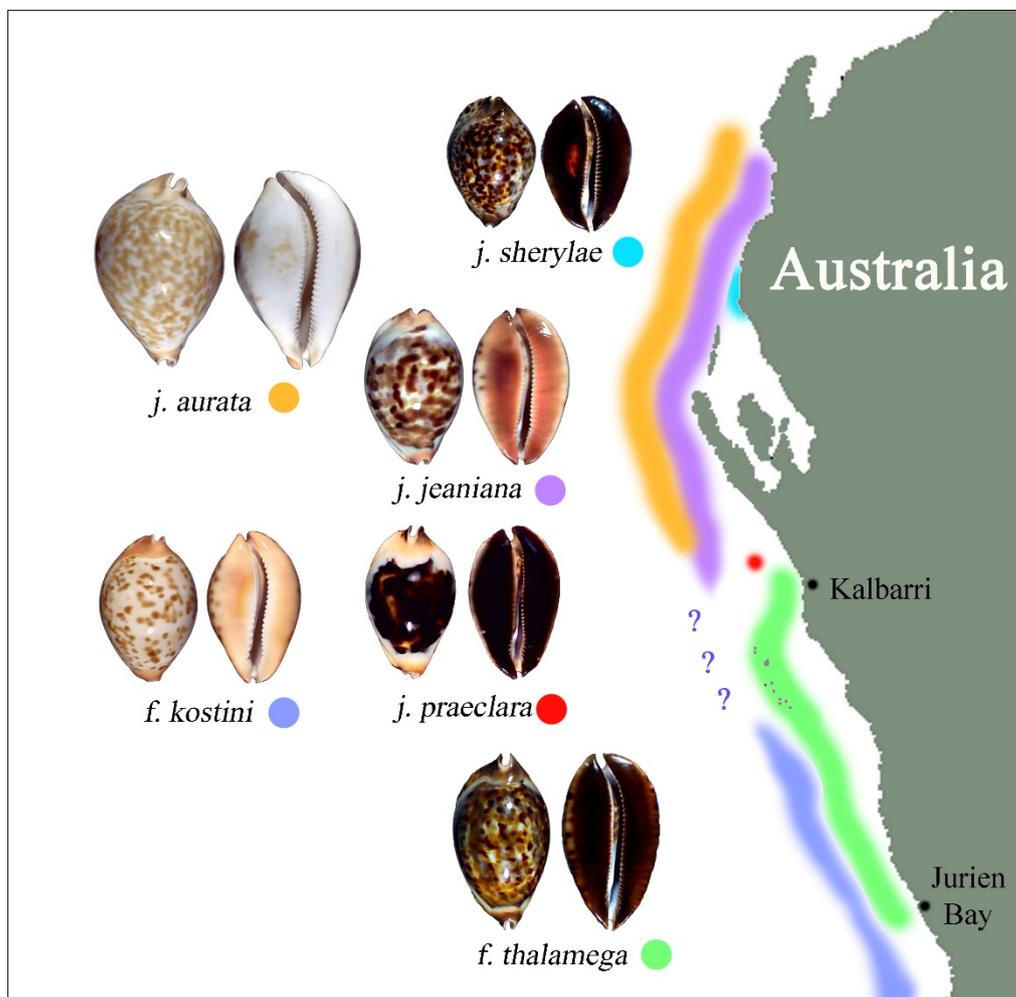
Zoila jeaniana praeclara n. ssp. is only known from the area of the “Big Bank”, 50 kilometers northwest of Kalbarri, Western Australia (27°15'S 113°25'E). All specimens have been collected from sponges at 70 to 85 meters by ROV.

Etymology

The name is derived from the Latin word *praeclarus* = remarkable, splendid.

Table 2: Comparison of shell features and distribution.

	<i>jeaniana jeaniana</i>	<i>jeaniana praeclara</i> n. sp.	<i>friendii thalamega</i>
Distribution	Coral Bay to offshore Kalbarri	Big Bank, offshore Kalbarri	Coastal Kalbarri to Abrolhos
Depth Range	50 to 120 m	70 to 85 m	28 to 60 m
Formula	77 (63 - 51 - 81)	73 (58 - 47 - 81)	89 (53 - 42 - 79)
Teeth (normalized)	20 : 17	20 : 17	19 : 18
Mass ratio	11.5	11.0	12.6
Shape (outline)	inflated, oval	pyriform	narrow, rostrate
Dorsal dome	high, slightly humped		lower, less humped
Extremities	rather short, less rostrate		produced, rostrate
Posterior tip	not bent up		usually bent up
Anterior tip	short, not bent up	short, barely bent up	produced, bent up
Spire	obscured	obscured	partly exposed
Base	flat	slightly convex	flat to concave
Paler marginal callus	mostly rather low	rising onto dorsum	mostly rather low
Marginal spotting	coarse, dense	sparse to absent	finer, distant to dense
Darker color of base	extending to margin	restricted to base	extending to margin



Map 2: Distributions of *Z. jeaniana* and associated taxa

Discussion

Geographically, the population of *j. praeclara* inhabits the area and depth in between the southern distributional limit of *Zoila jeaniana jeaniana* (CATE, 1968) and *Zoila friendii thalamega* LORENZ, 2002. It is assigned to *jeaniana* because of its shorter extremities that are not as conspicuously rostrate or even bent up (“gondola-shaped”) as in *f. thalamega*. The general shape resembles that of a slender *jeaniana* in being more inflated, rather than narrow to cylindrical as in *f. thalamega*. The shell formulae reflect this difference. They also show that the normalized number of teeth and the height to width ratio are more or less identical.

The high, cream- to reddish-brown margins of *j. praeclara* often form a contrasting frame encircling the black dorsal pattern. This striking coloration is known from a local variation of *j. jeaniana* from Bernier Island, known as the “snowy white” form, which is usually larger, with more densely spotted margins and a more inflated shape typical of *j. jeaniana* from that area. The scarce or absent marginal spotting, especially on the labral side, are a feature seldom found in either *j. jeaniana* and *f. thalamega*. In most specimens of *j. jeaniana*, the base is dark, and this coloration extends across the margins, merging with the marginal spotting. The same is observed in those *f. thalamega* with a dark base. In contrast, *j. praeclara* has a distinct separation between the cream margins and the black base. Furthermore, the type material of *j. praeclara* stands out as being consistently small-shelled, compared to *j. jeaniana* and *f. thalamega*, which show a considerable variability in the shell’s length.

Interestingly, all the type specimens of *j. praeclara* have a solid black base, whereas, in *f. thalamega* from the shallower waters in the coastal area of Kalbarri, about one of four specimens has a pale cream base. Table 2 compares the three taxa.

When the first specimens of *j. praeclara* surfaced, they were tentatively identified as a variation of *f. thalamega* and given the preliminary nickname “bigbankensis” (RAY WALKER and DREW STRICKLAND, pers. comm.). However, as the comparative Table 2 demonstrates, the new taxon has more features in common with *jeaniana* than with *f. thalamega*, whose shell morphology and geography place it in the group of southern *friendii* (*f. friendii* (J. E. GRAY, 1831), *f. thalamega*, *f. vercoi* F. SCHILDER 1930) and

thersithes (GASKOIN 1849), rather than the northern *jeaniana* (*j. jeaniana*, *j. aurata* RAYBAUDI 1979, *j. sherylae* RAYBAUDI 1990, and *j. praeclara*). Incidentally, the deep water taxa *Z. jeaniana aurata* from the northern part of these group’s ranges is replaced by *Z. friendii kostini* in the southern part. Although both are currently assigned to a respective shallow water taxon (the nominate one), they should be considered separate on species level. Both apparently represent an ancestral lineage from which the shallow water populations merged towards the end of the Pleistocene, when ocean levels rose. The molecular data supports this interpretation, which is shared also by those who observed these fascinating animals in their habitat (CHRISTOPHER P. MEYER and RAY WALKER, personal communication).

Near the area and depth where *j. praeclara* was collected, a specimen of a typical *j. jeaniana* was found. It is large and of a completely different appearance (see Plate 6: 1). The black color of the base extends onto the orange brown margin, melting with dense dark brown spots. This specimen might be an invader from the large-shelled population of *j. jeaniana* found a little further north, west of White Cliffs (Plate 6: 2). All other specimens collected at Big Bank so far are typical *j. praeclara* and show an amazing constancy in size, coloration, pattern, and shape. Further collecting will be conducted at Big Bank and adjacent areas to shed more light on the status of these fascinating shells. Perhaps, in later revisions, and depending on the outcome of further prospecting in the area, the name *praeclara* will be reduced to that of a form or variation, but in any case, this population deserves being given its own name. The contrasting coloration combined with its elegant shape make it one of the most beautiful *Zoila*.

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Plate 1 (on opposite page)

Zoila marginata nudispira n. ssp., types without dorsal pattern.

Fig. 1: (48.7 mm) Holotype. Coll. WAM.

Fig. 2: (49.6 mm) Paratype 1.

Fig. 3: (52.2 mm) Paratype 5.

All from Salisbury Island, Recherche Archipelago, at 85 m

Plate 2 (on p. 32)

Zoila marginata nudispira n. ssp., types with dorsal pattern.

Fig. 1: (50.6 mm) Paratype 3, Salisbury Island, at 85 m.

Fig. 2: (49.8 mm) Paratype 13, Southwest of Augusta, at 148 m.

Fig. 3: (51.3 mm) Paratype 12, Salisbury Island, at 85 m.

Fig. 4: (54.8 mm) Paratype 9, Salisbury Island, at 85 m.

Fig. 5: (53.4 mm) Paratype 11, Salisbury Island, at 85 m.

Zoila orientalis orientalis RAYBAUDI, 1985, variations from deep water. Explanations in the text.

Fig. 6: (51.5 mm) Great Australian Bight. Coll. CLSF 11179.

Fig. 7: (48.8 mm) Great Australian Bight. Coll. CLSF 11179a.

Fig. 8: (51.6 mm) Ceduna, at 150 m.

Figs 9, 10: Eastern Great Australian Bight, at 100-130 m. After WILSON & CLARKSON (2004).

Plate 3 (on p. 33)

Comparison of the taxa of the *marginata*-complex from southern Australia.

Fig. 1: *Zoila marginata marginata* (59.2 mm) Rottnest Island, at 20 m.

Fig. 2: *Zoila marginata marginata* (54.8 mm) Mandurah, at 12 m.

Fig. 3: *Zoila marginata albanyensis* (62.0 mm) Bremer Bay, Albany, at 28 m.

Fig. 4: *Zoila orientalis raybaudii* (58.7 mm) Grindal Island, Thorny Passage, at 19 m.

Fig. 5: *Zoila orientalis orientalis* (44.5 mm) Holotype, Ceduna, at 80 m. Coll. CLSF 11182.

Fig. 6: *Zoila orientalis orientalis* (41.3 mm) Great Australian Bight. Coll. CLSF 3624.

Fig. 7: *Zoila marginata nudispira* n. ssp. (51.0 mm) Paratype 17, Windy Harbour, at 95 m.

Fig. 8: *Zoila marginata nudispira* n. ssp. (48.0 mm) Paratype 8, Salisbury Island, at 85 m.

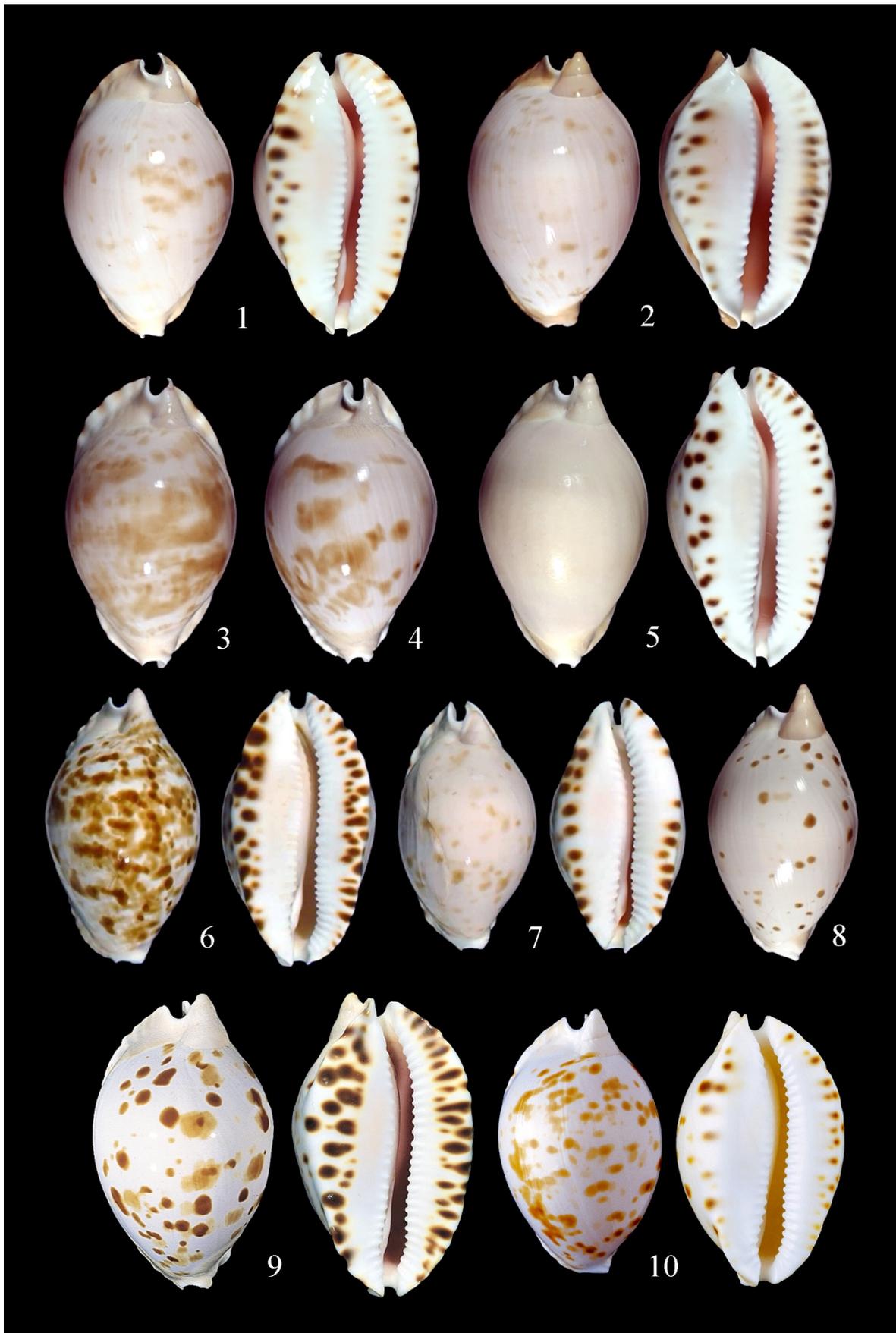
Fig. 9: *Zoila* cf. *marginata nudispira* n. ssp. Locality unknown, after WILSON & CLARKSON (2004).

Plate 1



Explanation on opposite page

Plate 2



Explanation on page 30

Plate 3



Explanation on page 30

Plate 4 (on opposite page)

Zoila jeaniana praeclara n. ssp.

Fig. 1: (80.3 mm) Holotype, coll. WAM.

Fig. 2: (70.0 mm) Paratype 1.

Fig. 3: (68.5 mm) Paratype 2.

Fig. 4: (70.1 mm) Paratype 4.

All from Big Bank, North of Kalbarri, at 70 to 85 m.

Plate 5 (on p. 36)

Zoila jeaniana praeclara n. ssp.

Fig. 1: (73.4 mm) Paratype 11.

Fig. 2: (80.2 mm) Paratype 8.

Fig. 3: (79.0 mm) Paratype 7.

All from Big Bank, Northwest of Kalbarri, at 70 to 85 m.

Zoila friendii thalamega LORENZ, 2002

Fig. 4: (77.4 mm) Kalbarri, at 35 m.

Fig. 5: (96.6 mm) Kalbarri, at 55 m.

Plate 6 (on p. 37)

Fig. 1: *Zoila jeaniana jeaniana* (87.4 mm) West of White Cliffs, Kalbarri, at 95 m.

Fig. 2: *Zoila jeaniana jeaniana* (90.7 mm) Big Bank, Northwest of Kalbarri, at 85 m.

Fig. 3: *Zoila jeaniana jeaniana* (78.3 mm) Western Bernier Is., at 45-48 m. "Snowy White" form. Coll. CLSF 9348.

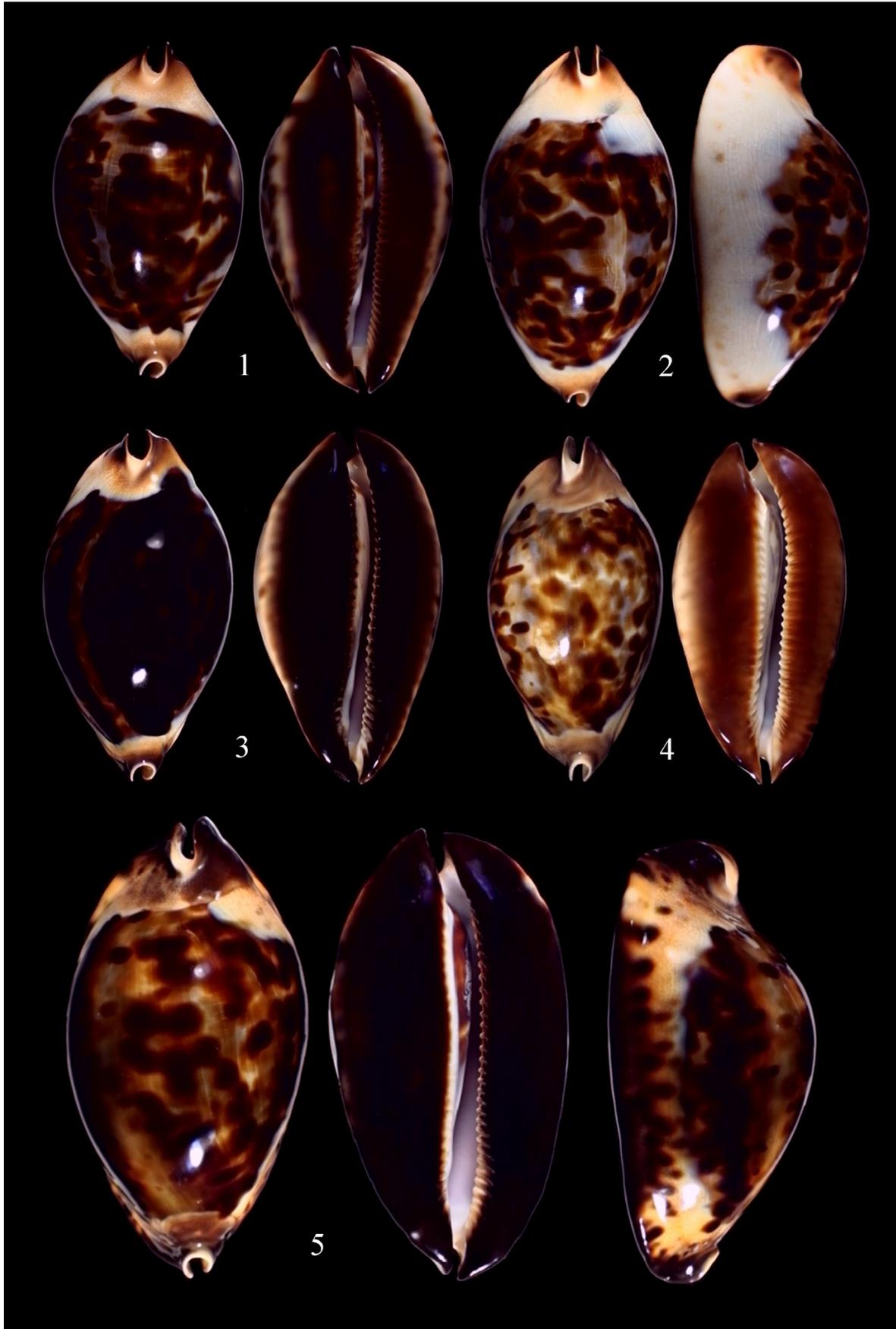
Fig. 4: *Zoila jeaniana jeaniana* (69.5 mm) Paratype 4. Dorre Island, at 120 m. Coll. CLSF 9346a.

Plate 4



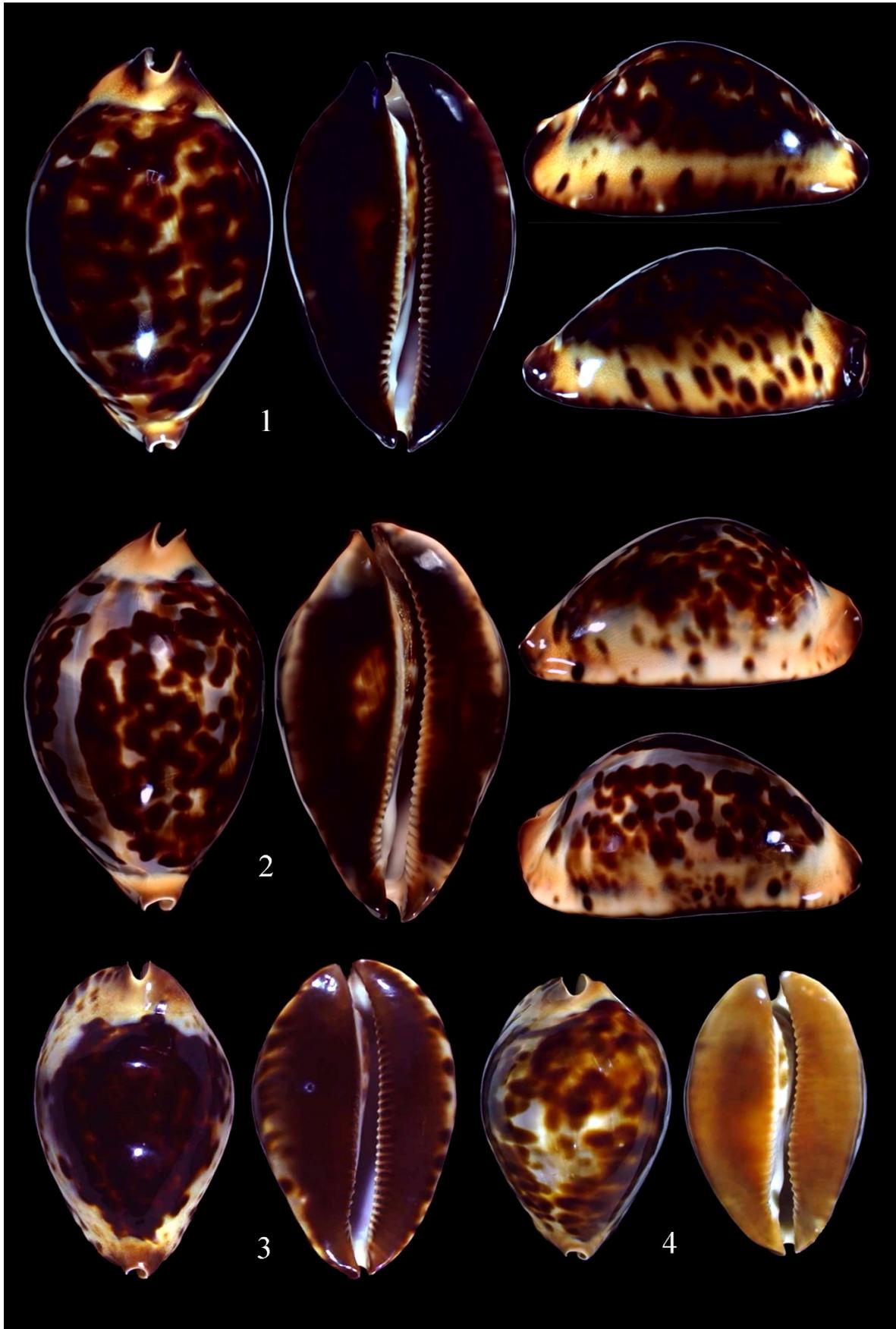
Explanation on opposite page

Plate 5



Explanation on page 34

Plate 6



Explanation on page 34

Plate 7



Fig. 1: *Zoila marginata nudispira* n. ssp. Salisbury Island, at 90 m.
Figs 2, 3: *Zoila jeaniana praeclara* n. ssp. Big Bank, Northwest of Kalbarri, at 85 m.
Photos taken by ROV, courtesy RAY WALKER and DREW STRICKLAND.