

A new subspecies of the *Eugeniconus nobilis* complex from north-western Sumbawa, Indonesia

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ABSTRACT This paper describes a new member of the *Eugeniconus nobilis* (Linnaeus, 1758) complex from Bungin Island in north-western Sumbawa, Indonesia. It shares some of the features of the subspecies found on geographically separated neighbouring islands and the nominate subspecies. To recognize the distinctness of this new population we name it as a new subspecies in honour of Steven Lie's daughter.

KEY WORDS *Eugeniconus*, *E. nobilis*, *E. n. gisellelieae*, Bungin Island, Sumbawa, Indonesia

INTRODUCTION

Early July of this year, the junior author Steven Lie showed us images of cones shells he acquired from local divers collecting shells off an island in the north-western part of Sumbawa, Indonesia. He sent 5 shells to John Abbas for us to study. At first glance these shells appeared to simply represent a new population of *Eugeniconus nobilis* (Linnaeus, 1758). However, upon closer examination these shells were found to share a mixture of some of the morphological features found in various subspecies in the *E. nobilis* complex, which are geographically separated living on neighbouring islands (see map on Figure 27).

Eugeniconus nobilis skinneri (da Motta, 1982), *E. n. victor* (Broderip, 1842) and *E. n. abbai* (Poppe & Tagaro, 2011) have similar necklace-line patterns, and these patterns all differ from those of the new subspecies, which are more similar to those of the nominate species *E. n. nobilis*. The new subspecies differs from the

lectotype of *E. n. nobilis* in having the white macules concentrated into adapical, central and basal zones (or bands) like those of the three subspecies mentioned above, except they sometimes appear in four zones (or bands) in *E. nobilis skinneri*. A comparison and contrast is also made with the other two subspecies, *E. nobilis friedae* (da Motta, 1991) and *E. nobilis renateae* (Cailliez, 1993). Overall the mixture of these morphological features found in this new population show it to be distinctly separable from its neighbours and it is herein described as a new subspecies.

Materials and Methods.

Shells were measured using digital Vernier callipers (0.01 mm resolution), sculpture examined under low magnification (10x) using a jeweler's loupe and via digital images. Whorl count includes the apex and counted precise to 0.125 ($\frac{1}{8}$ whorl). Relative shell sizes for the genus *Conus* mentioned follow Röckel *et al.*, 1995: small 15-25 mm; moderately small 25-35

mm; medium 35-55 mm; moderately large 55-80 mm; and large >80 mm.

Three shells make up the type series, two paratypes (JP) and the holotype, which will be stored in the MZB and has passed the procedure of deposition. Photography credits appear below

the plates. The species description and variation were determined from dry empty shells obtained for Steven Lie by local divers in north-western Sumbawa. Comparative material comprised of shells from primary author's private collection and images of two museum types.

Abbreviations used for museums and private collections:

LSL:	The Linnaean Shell Collection held at the Linnean Society of London, at Burlington House, Piccadilly, Mayfair, London, UK
MHNG	Museum d'Histoire Naturelle, Geneva, Switzerland
MZB	Museum Zoologicum Bogoriense, Bogor, West Java, Indonesia
NBC:	Naturalis Biodiversity Center, Leiden, Netherlands
ZMA.MOL:	NBC specimen label code, ex-Zoologisch Museum Amsterdam (ZMA)
JA:	John Abbas collection
JP:	Jeff Parsons collection

Abbreviations for shell morphometry, shell coiling and other:

D:	shell width or greatest 'diameter' as per literature usage
H:	shell height or length
H/D:	shell height/shell width ratio
N:	whorl count
JP	comments, data, images, observations or other by Jeff Parsons

Taxonomic remarks

We use the concept of the *Eugeniconus nobilis* complex as accepted by Röckel *et al.*, 1995, except we place all the subspecies in the genus *Eugeniconus* da Motta, 1991, and include another subspecies named after their publication, *E. nobilis abbai* (Poppe & Tagaro, 2011), as well as the new subspecies named herein.

SYSTEMATICS

Family: Conidae Fleming, 1822

Genus: *Eugeniconus* (m.) da Motta, 1991

Type species: *Conus nobilis* (m.) Linnaeus, 1758

Eugeniconus nobilis gisellelieae

Parsons, Abbas and Lie new subspecies

(Plate 1, Figures 1-5 and 7; Plate 2, Figure 12)

Description. (Holotype) Medium-sized obconical shell, solid. Last whorl conical and slightly convex near the carinate shoulder, sides straight below. Spire very low, outline slightly concave and almost flat with a projecting protoconch of about 2 whorls, about 0.55 mm wide. Teleoconch of 9 closely-coiled whorls, adapical whorls have flat sutural ramps and a bead-like border, and later whorls are slightly concave and carinate with about 8 spiral threads crossed by very fine, closely-spaced curved threads. Last whorl decussated with fine collabral and spiral threads; basal third has 8 variably spaced spiral grooves above 10 spiral cords on the base. Protoconch and early teleoconch pink, rest of spire yellowish brown with brown outer borders on later whorls, and superimposed with large white blotches, many subquadrate.

Last whorl yellowish brown, slightly darkened toward the lip and has two zones (or bands) of thin necklace-lines (~ 0.30 mm wide) positioned above and below the midbody, 8 or more in each zone. The necklace-lines are composed of brown lines partially superimposed with evenly-spaced, white rounded or axially aligned rectangular markings. This basal pattern is overlain with white macules concentrated at base, centre and below shoulder; mostly medium-sized (2 to 3 mm), some small (< 1 mm) and others larger (> 4 mm), the latter occur randomly and mostly between the three zones (or bands). White macules are cordate, rounded, subtriangular or irregular, mostly with a brown shadowy border on their apertural side.

Aperture white and narrow, 3.5 mm wide medially and 6.7 mm anteriorly; anal notch moderately deep and 2.69 mm wide, apical outline parabolic. Inner lip almost straight, no pattern loss. Columella white, thickened, short (~ 6 mm long) and hooked at its tip. Outer lip thin and its external edge bordered with dark brown. Base dark red-brown.

Type Material. Three adult shells, all from the type locality. Holotype (MZB. Gst. 21. 784, Plate 1, Figures 2 and 7) H 43.53 mm, D 23.01 mm, H/D 1.89 and N 11. Paratypes (JP) Paratype 1 (Plate 1, Figure 3) H 41.18 mm; and Paratype 2 (Plate 1, Figure 4) H 35.05 mm.

Other Material Examined. Two adult shells from the type locality (JA) specimen 1, H 51.12 mm Plate 1, Figure 1 and Plate 2, Figure 12); and specimen 2, H 38.43 mm (Plate 1, Figure 5).

Type Locality. Bungin Island, Alas, Sumbawa Regency in West Nusa Tenggara, Indonesia.

Distribution. Currently known only from the type locality.

Ecology/Habitat. Collected by local divers on fringing reef around Bungin Island.

External Features of Animal. Unknown.

Soft Parts. Not available for study.

Etymology. Named in honour of Steven Lie's daughter Giselle Natalie Lie.

Shell Variation. The five shells studied (Plate 1), do not show substantial variation between them, indicating a stable gene pool. The columella's tip is hooked in the holotype (Figure 2) and specimen 1 (Figure 1), and straight in the other 3 shells. Ground colour variation occurs as: 1) progressive darkening toward the lip, which is slight in the holotype and distinct in specimen 1; 2) rapidly darkening after a growth stoppage in specimen 2 (Figure 5); or 3) the dorsum is distinctly darker than the ventral side as in paratype 1 (Figure 3). Outer lip with a thin dark brown border as in the holotype, or a narrow dark brown or greyish-brown zone, as in paratype 1, paratype 2 (Figure 4) and specimen 1. The anal notch is deeper in paratypes 1 and 2. The dark shadowy border of the white macules is very distinct on a pale ground, as in the ventral side of paratype 1, and less distinct on a dark ground as in the dorsal side of specimen 1. The spire is very low in four shells and low in specimen 2, which has the early to mid-whorls raised. Periostracum smooth, translucent, pale pinkish buff (yellowish grey) and very thin, similar to that of *E. n. skinneri* (da Motta, 1982).

DISCUSSION

We do not attempt to discuss the following parameters as used by Cailliez, 1993: 1) percentage spire elevation, 2) shell weight to height ratio, and 3) shell angle. Such data comparisons are not useful as it does not show

anything outstanding and only proves the general interconnections between each population of the *E. nobilis* complex, thus recognition of each of these geographically isolated populations as subspecies is appropriate. One parameter used by Cailliez, 1993, “the average number of white markings on the spire”, was found to be useless since there is a great variability within specimens of *E. nobilis victor* (Broderip, 1842) from Lembata. *E. nobilis gisellelieae* n. ssp. differs from all the other species in that the early spire whorls have flat sutural ramps and a bead-like border and later whorls are slightly concave with a carinate border. A biogeographical map showing the distributions of each of the geographically isolated populations of the *E. nobilis* complex is shown here at Figure 27.

Comparison to Other Populations.

• *E. nobilis nobilis* (Linnaeus, 1758) (Plate 1, Figure 6 and Plate 2, Figures 16 and 24)

Accepted Distribution. Seribu Archipelago north of Jakarta, Java (type locality; Finet & Cailliez, 1993); and Sumatra — western coast and islands to the southern tip.

The lectotype (Plate 2, Figures 16) is similar to the new subspecies in sculpture and having white, more or less rounded macules that have a dark shadowy border on their apertural side. It differs in having a narrower shell, pale yellow-brown ground without a gradual or distinct changes its tone, no dark border to the lip, non-browned base and white macules randomly scattered. It also has a weakly carinate shoulder that is less rounded below and spire whorls are progressively flattened. The necklace-lines (Plate 1, Figure 6) are similar, *i.e.* “beaded”, but fainter with more white markings.

The modern *E. nobilis nobilis* specimen figured herein (Plate 2, Figure 24) has a similar shaped shell, sculpture and pattern to the lectotype. It differs in having a darker coloured ground and has a brown base like that of the new subspecies, and differs from both in having very faint necklace-lines with very few white markings, *i.e.* appear to be absent. Other pale-coloured specimens seen that are similar to the type shell, differ in having more distinct necklace-lines and a brown base as in the new subspecies.

• *E. nobilis friedae* da Motta, 1991 (Plate 1, Figure 8 and Plate 2, Figure 15)

Distribution (as per type locality). Dutch Bay Point, northwest of Colombo, Sri Lanka.

The holotype (Plate 2, Figure 15) is similar to the new subspecies in having a sharply carinate shoulder and the white macules concentrated into apical and basal zones (or bands), but differs in having 2 central zones, *i.e.* 3 zones of brown. Other differences include slightly rounded sides, wider anterior end, a purplish-brown base that tints the columella, weakly carinate shoulder and the spire is not flattened with its height gradually reduced. The white macules differ in being more triangular, often smaller and lack a dark shadowy border. The necklace-lines (Plate 1, Figure 8) differ from those of the other subspecies in being more like a series of numerous very small and closely-spaced white beads, occasionally interspersed with larger ones, and their interspaces are the same colour as the background.

• *E. nobilis renatae* (Cailliez, 1993) (Plate 2, Figure 14)

Distribution. Andaman and Nicobar Islands.

The holotype (Plate 2, Figure 14) is similar to *E. n. gisellelieae* n. ssp. in shape, flattened spire with a projecting protoconch and rounded white macules. It differs in having a purplish base with a brown border above, finer sculpture, weakly carinate shoulder and thinner columella. The white macules differ from those of the new subspecies in having a faint shadowy border, being mostly large in size, less numerous and widely scattered, hence more of the orange-brown ground colour showing. The necklace-lines differ in being made of alternating darker brown and white markings that are sparse and highly interrupted, basically absent on the holotype.

• *E. nobilis skinneri* (da Motta, 1982) (Plate 1, Figure 9 and Plate 2, Figures 13 and 22)

Distribution. Bali to Sumbawa (including Lombok) and the “Moluccas”.

It is similar to *E. n. gisellelieae* n. ssp. in shape, ground colour, body whorl sculpture and having the white macules concentrated into adapical, central and basal zones (or bands) (Plate 2, Figure 13), except sometimes appearing in 4 zones (Plate 2, Figure 22). It differs from the new subspecies in having a weakly carinate shoulder, coarser spire sculpture, purplish brown base and occasionally has small white axial markings between the white blotches on the spire. White macules differ in being commonly smaller and usually triangular with a paler shadowy border or lacking on some macules. The necklace-lines (Plate 1, Figure 9) differ in being made of axially aligned and variably shaped dark brown markings, usually with white interspaces; more widely-spaced, cover much of the ground below the white macules and on average are wider, although sometimes thin and similar to those in the new subspecies.

• *E. nobilis victor* (Broderip, 1842) (Plate 1, Figure 10 and Plate 2, Figures 17-21 and 25-26).

Distribution. Rinca Island; SW Flores — coastal sand bar on the Sumba Strait; E. Flores — north coast (between Maumere and Babi Id.), Larantuka, Babi Id., Permatang Id., Tanjung Bunga and off Baupukan; and NW Lembata.

Low spired specimens are similar to *E. n. gisellelieae* n. ssp. in shape, body whorl sculpture and shoulder carination. It differs in having a pale to dark brown base, a less flattened spire, coarser transverse spire sculpture, and white, pink or purple early whorls. Ground colour is more variable than in the new subspecies: pale to dark and yellowish-brown (Plate 2, Figures 18-21 and 25-26) or orange-brown (Plate 2, Figure 17). Some shells have a distinct difference between the colour of the ground and necklace-lines (Plate 2, Figures 17, 19 and 25-26), little difference (Plate 2, Figures 18 and 20) and almost no difference with the necklace-lines appearing absent (Plate 2, Figure 21). Other shells have very few small tents and pale to dark necklace-lines (Plate 2, Figures 20 and 19 respectively).

E. nobilis victor is also similar to the new subspecies in having the white macules concentrated into adapical, central and basal zones (or bands), and some shells may have slightly or distinctly darkened border to a previous lip. White macules are often similar in shape, but may also be rhomboid or diamond-shaped, and tend to have a brown shadowy border only when present on top of the necklace-lines, rarely more widely present. The necklace-lines (Plate 1, Figure 10) are different in being similar to those of *E. nobilis skinneri*, except closely-spaced, often wider, more numerous, pale to very dark in colour and usually lack white interspaces.

- *E. nobilis abbai* (Poppe & Tagaro, 2011) (Plate 1, Figure 11 and Plate 2, Figure 23).

Distribution (as per type locality). Solor Island.

The figured shell (paratype 4, JA; Plate 2, Figure 23) appears more yellowish in the figure than it is in reality due to type of lighting used during photography. This subspecies is similar to *E. n. gisellelieae* n. ssp. in shape, low spire, body whorl sculpture, dark-bordered carinate shoulder and having the white macules concentrated into adapical, central and basal zones (or bands). It differs from the new subspecies in having a dark brown or purple base, white or pink protoconch that projects more, tapered columella and slightly coarser transverse spire sculpture. The white macules differ in being smaller with very small ones present on the zones, sometimes rhomboid or diamond-shaped and lack a dark shadowy border. The necklace-lines (Plate 1, Figure 11) are different in being composed of thin brown markings with or without white interspaces, like those of *E. nobilis victor*, except thinner, more numerous and typically slightly darker than the ground.

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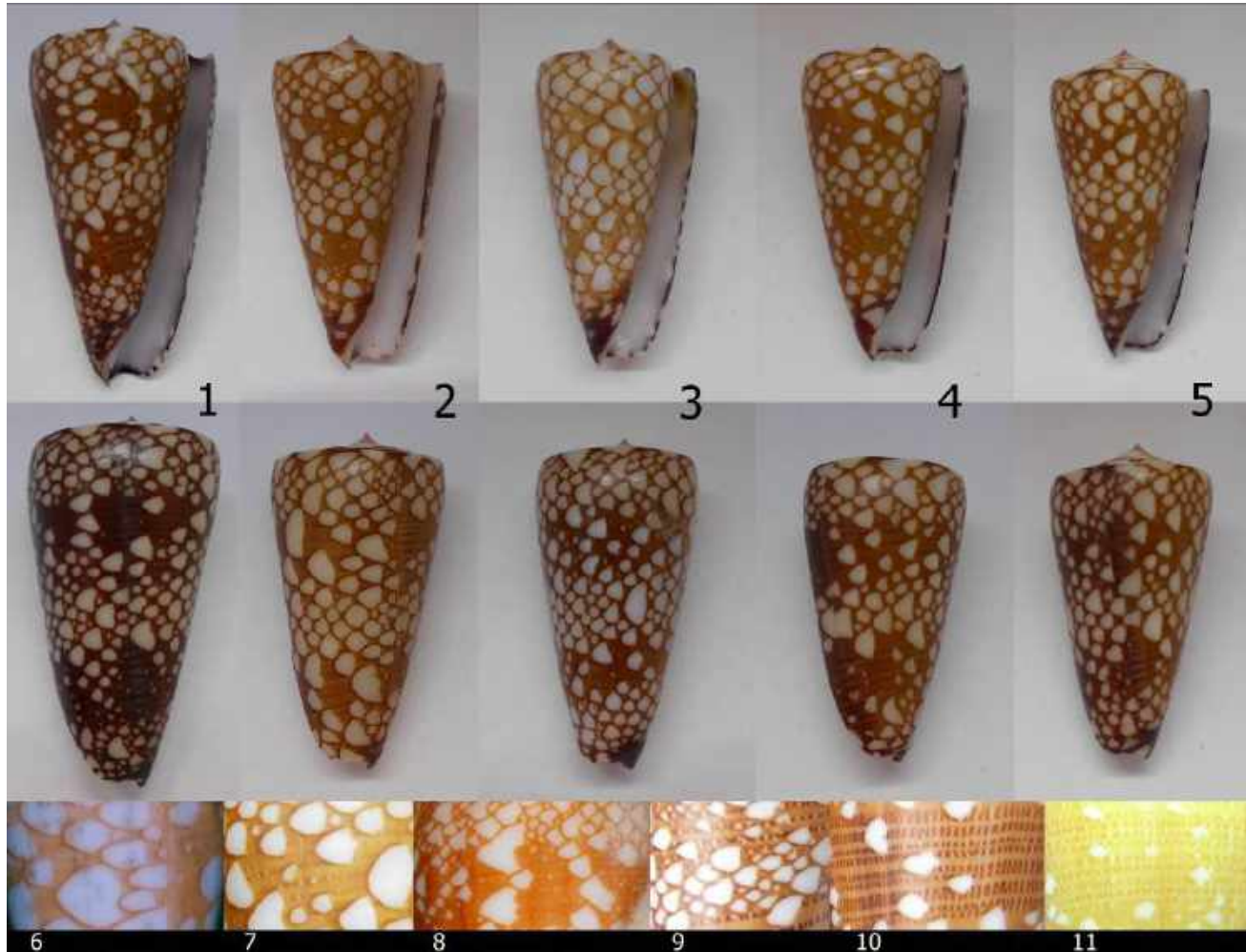


Plate 1. Variation of *Eugeniconus nobilis gisellelieae* n. ssp. and a comparison of the necklace-lines of 6 subspecies: **First & second rows, Figures 1-5**, 1 specimen 1, 2 holotype, 3 paratype 1, 4 paratype 2 and 5 specimen 2 (paratypes and specimens, JA); **Third row, Figure 6** *E. nobilis nobilis* lectotype; **Figure 7** *E. nobilis gisellelieae* n. ssp. holotype; **Figure 8** *E. nobilis friedae* Holotype; **Figure 9** *E. nobilis skinneri* Bali (JP); **Figure 10** *E. nobilis victor* NW Lembata (JP); **Figure 11** *E. nobilis abbai* paratype 4. [Image credits: 1-5, & 7 JA; 6, & 8-11 cropped (JP) from images seen in plate 2, see that for credits].

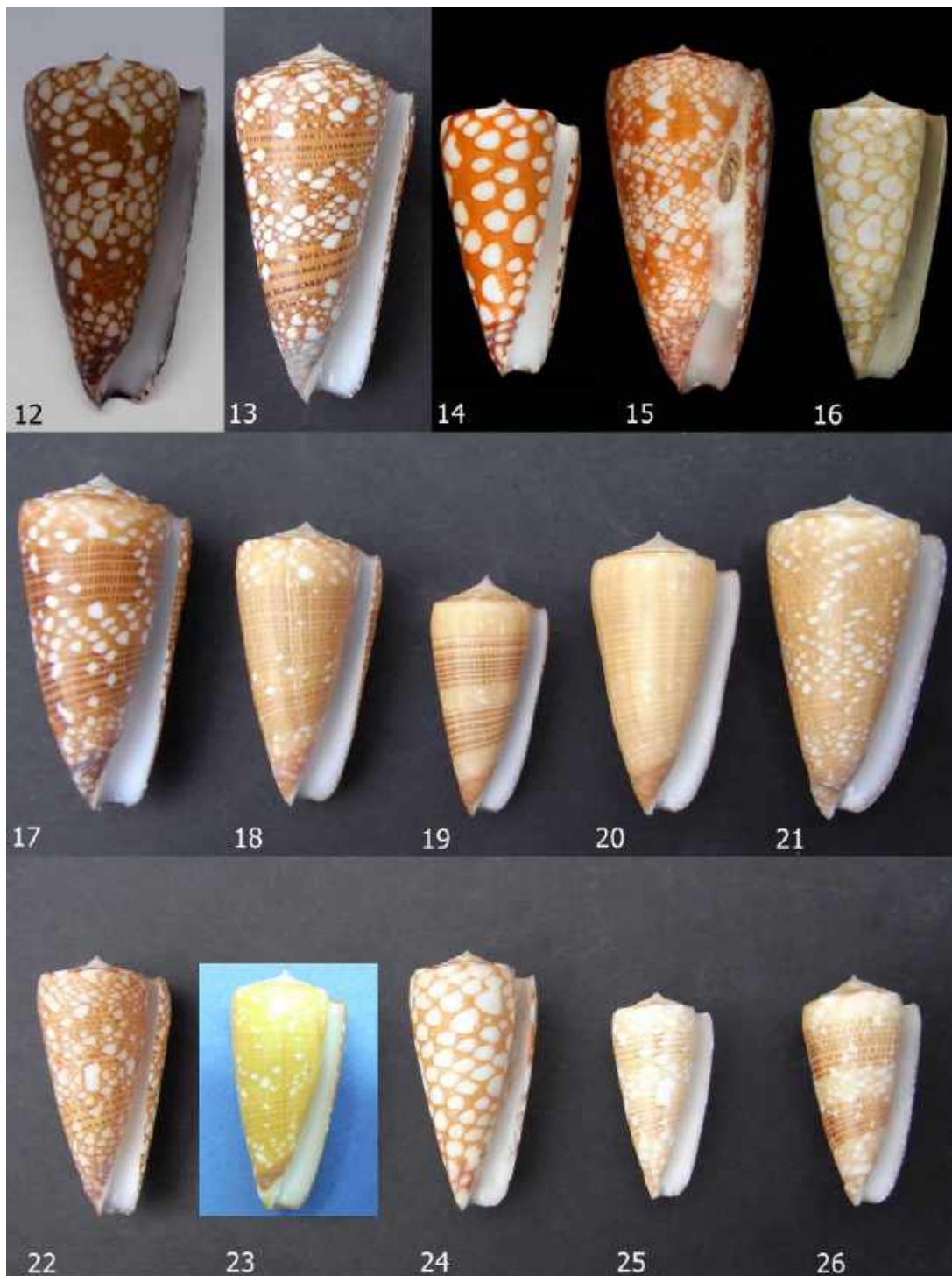


Plate 2: Comparison and contrast of *E. nobilis gisellelieae* n. ssp. with other members of the *E. nobilis* complex. **First row, Figure 12** *E. nobilis gisellelieae* n. ssp.; **Figure 13** *E. nobilis skinneri* Bali (JP); **Figure 14** *E. nobilis renateae* Holotype, Andaman Islands; **Figure 15** *E. nobilis friedae* Holotype, northwest of Colombo, Sri Lanka; and **Figure 16** *E. nobilis nobilis* lectotype; **Second row, Figures 17-21** *E. nobilis victor* NW Lembata (JP); **Third row, Figure 22** *E. nobilis skinneri* Lombok; **Figure 23** *E. nobilis abbai* paratype 4, Solor; **Figure 24** *E. nobilis nobilis* Sri Lanka (JP); **Figures 25-26** *E. nobilis victor* (JP): **25** SW Flores, Sumba Strait and **26** Permatang Island, E. Flores. [Image credits: 12 JA; 13 JP; 14 Kohn, 2014a; 15 Kohn, 2014b; 16 Kohn, 2014c; 17-26 JP].

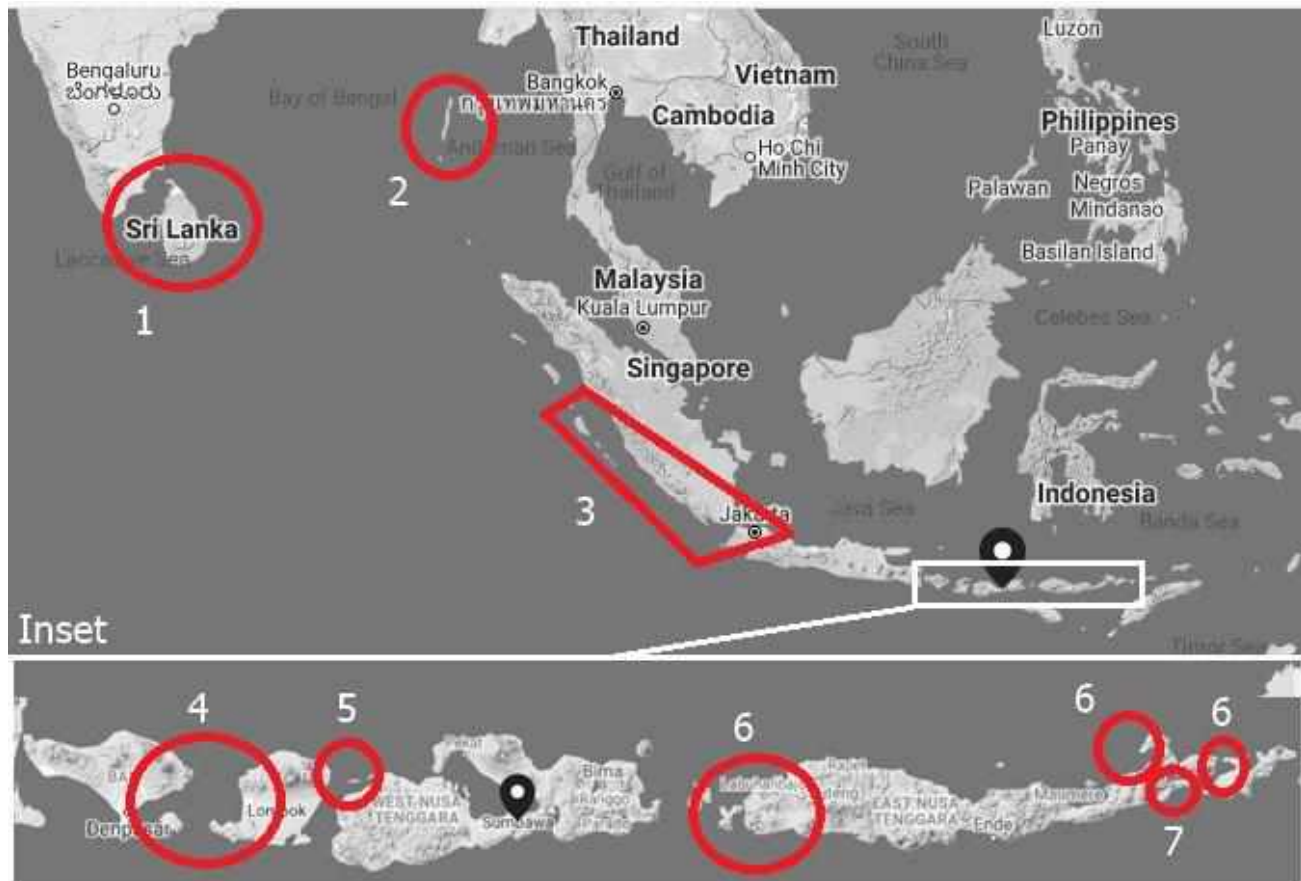


Figure 27. Distribution of all members of the *Eugeniconus nobilis* complex. The following numbers appear next to red circles or other shape on the above map: 1. *E. nobilis friedae*; 2. *E. nobilis renatae*; 3. *E. nobilis nobilis*; 4. *E. nobilis skinneri*; 5. *E. nobilis gisellelieae* n. ssp.; 6. *E. nobilis victor*; and 7. *E. nobilis abbai*. [adapted from Google Maps, 2020].

Taxonomic Note: *Macrocypraea mammoth* Simone & Cavallari, 2020. A new cowrie species from Trindade, a remote oceanic island off Espirito Santo, Brazil. Reillustrated here is the holotype: 133.1 mm by 54.6 mm by 72.4 mm; MZSP 108077.



Quote from abstract: “The new species can be distinguished from other Western Atlantic species by its larger size, proportionally heavier and more solid shell, more rounded and wider outline, longer posterior tapered ending and slightly inflated base.”

Simone L.R.L., & D.C. Cavallari. 2020. A new species of *Macrocypraea* (Gastropoda, Cypraeidae) from Trindade Island, Brazil, including phenotypic differentiation from remaining congeneric species. PLoS ONE 15(1): e0225963.