

**A new subspecies of *Amphidromus (Amphidromus) capistratus*
von Martens, 1903 from Sabah, Malaysia**

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ABSTRACT This paper describes a new subspecies of *Amphidromus (Amphidromus) capistratus* von Martens, 1903 from Sabah, Malaysia. A comparison with three close relatives, found conchological features that distinguish it from those species: *A. (A.) mundus* (Pfeiffer, 1853), *A. (A.) entobaptus* Dohrn, 1889 and *A. (A.) similis* Pilsbry, 1900.

KEY WORDS *Amphidromus, capistratus, chuai*, Tawau District, Semporna District, Sabah, Malaysia.

INTRODUCTION

Late 2012, Andy Tan from Malaysia showed me photos of empty shells of an unidentified *Amphidromus* Albers, 1850, originally collected by the late Mr. Chua whilst working in the logging industry in Tawau District, Sabah, Malaysia (Figure 1.). Only six adult shells were available and sent to me for study. The nearest species I could find as a probable name for these shells was *Amphidromus (Amphidromus) capistratus* von Martens, 1903, only known from three syntypes with the type locality of “Kutei Sultanat, Ost-Borneo”. That area in modern Indonesia is now four separate political divisions, making it hard to identify a specific location or habitat in which that species lives. Regardless at least 300 km separate both populations, and conchological features alone separate them from each other and their congeners studied here: *A. (A.) mundus* (Pfeiffer, 1853) from Pulau Besar, Johor, Malaysia; *A. (A.) entobaptus* Dohrn, 1889 from Palawan Province, Philippines; and *A. (A.) similis* Pilsbry, 1900 from southern Sarawak, Malaysia and NW Kalimantan, Indonesia.

In February 2017, I received a seventh shell that was possibly live-collected by Mr. Chua purchased from Andy Tan. This shell has a full pattern, unfaded colours and its sculpture is well preserved. A search of museum databases found photos of further specimens like Mr. Chua's snail, collected on islands of the Semporna District, Sabah between 1904 and 2007 (Figure 1.). This area is close to where Mr. Chua collected his specimens. The Semporna shells match the conchological features of the Tawau shells and thus considered as the same species, although most of them are “plain” and only a few have stripes. A comparison made with *A. (A.) capistratus* found the snail from Sabah differs in pattern, coloration and last whorl sculpture, and described herein as *Amphidromus (Amphidromus) capistratus chuai* new subspecies.

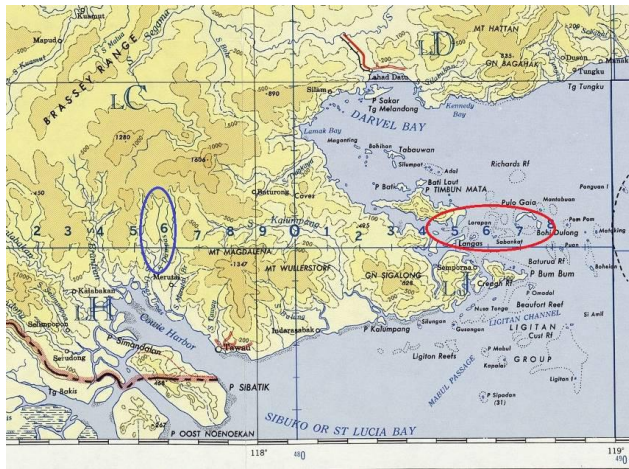


Figure 1 Location map showing the type locality for *Amphidromus (Amphidromus) capistratus chuai* new subspecies (blue oval) and secondary range based on paratypes (red oval). Modified from a map of “Sandakan” (University of Texas Libraries, 2017).

Materials and Methods. Shells were measured using digital Vernier callipers (0.01 mm resolution). The abbreviation “D” aligns with the usage of ‘diameter’ in the literature. Shell sculpture was examined under low magnification (10x) using a jeweller’s loupe. Whorl count includes the apex as per Haniel (1921, p. 22, fig. 10) and counted precise to 0.125 ($\frac{1}{8}$ whorl). Shell weight was measured in grams (g) using a pocket-sized electronic scale (capacity 300 g x 0.01 g). The term ‘paries’ (adj. parietal) refers to the ‘inner apertural wall’, and ‘palatum’ (adj. palatal) is the interior surface of the ‘outer apertural wall’. Relative shell sizes for the subgenus *Amphidromus* mentioned are as follows: small < 40 mm, medium 40-60 mm and large > 60 mm.

Abbreviations used for museums and private collections:

BMC:	Borneensis Malacology Collection, Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, Kota Kinabalu, Malaysia
BOR.MOL:	BMC specimen label code
CUMZ:	Chulalongkorn University, Museum of Zoology, Bangkok, Thailand
MCZ:	The Louis Agassiz Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA
MN:	Museum für Naturkunde, Leibniz Institute for Research on Evolution and Biodiversity, Berlin, Germany
NBC:	Naturalis Biodiversity Center, Leiden, Netherlands
NHMUK:	Natural History Museum, London, England, UK
ZMB:	MN specimen label code with abbreviation for the museum’s previous name, Zoologisches Museum Berlin
ZMA.MOLL:	NBC specimen label code, ex-Zoölogisch Museum Amsterdam
CF:	Chua Family collection
JP:	Jeff Parsons collection

Abbreviations for shell morphometry and shell coiling:

D:	shell width (abbreviation for ‘diameter’ as per literature usage)
H:	shell height
H/D:	shell height/shell width ratio
N:	whorl count
W:	shell weight
DEX:	dextral coiling
SIN:	sinistral coiling

Of the empty shells obtained by the late Mr. Chua, the shell selected as the holotype is now in the NHMUK and three paratypes remain in the Chua Family collection (Sabah, Malaysia). Paratypes housed in the BMC (Brahim, 2015), NBC (BioPortal, 2016) and MCZ (photos provided by Adam J. Baldinger, Curatorial Associate/Collection Manager) were studied using digital images found on their respective websites or provided personally. Christine Zorn (Malacological Collection Curator, MN) supplied the photos of the *A. (A.) capistratus capistratus* syntypes. Three additional specimens of the newly named subspecies (ex-CF) and remaining comparative material belong to the author's private collection (JP). Photography credits are as indicated below each image.

SYSTEMATICS

Family Camaenidae Pilsbry, 1895

Genus *Amphidromus* Albers, 1850

Subgenus *Amphidromus* Albers, 1850

Type species: *Helix perversa* Linnaeus, 1758

Amphidromus (Amphidromus) capistratus chuai
new subspecies

Figures 2–5

Type Material. Tawau District, Sabah, Malaysia [leg. Mr. Kim Chua] - **Holotype** (1 DEX, Figure 2) NHMUK 20170207; H 35.66 mm, D 20.44 mm, H/D 1.74, N 6.625 and W 1.96 g. **Paratypes** 1-3 (2 DEX, 1 SIN; CF, Figure 3): H 30.79-36.31 (av. 34.17) mm, D 20.13-21.24 (av. 20.77) mm, H/D 1.53-1.71 (av. 1.64), N 5.875-6.25 (av. 6.083) and W 1.52-1.77 (av. 1.67) g.

Semporna District, Sabah, Malaysia — **Paratypes** 4-49 (shells not measured): Maigu Id., ZMA.MOLL.396026 (2 DEX, leg. Mrs M. Saul Aug. 1904; Figure 4A); Selangan Id.

Forest Reserve, MCZ 230008 (1 DEX, leg. HG Keith, Aug 13 1948; Figure 4B); Bod Gaya Id., BOR.MOL 4724 (1 DEX, 1 SIN; Figure 4C), BOR.MOL 4777 (2 SIN; Figure 4D), BOR.MOL 4805 (1 DEX, 3 SIN; Figure 4E) and BOR.MOL 5324 (1 SIN; & 1 DEX, 1 SIN fragments; Figure 4F) [Leg. TS Liew, Abdul & Ladja 02-06/05/2007]; and Bohey Dulang Id., BOR.MOL 4623 (4 SIN; & 3 SIN fragments; Figure 4G) [Leg. TS Liew 28-30/04/2007], BOR.MOL 4694 (1 DEX, 2 SIN adults; 2 SIN juveniles; & 7 DEX, 6 SIN fragments; Figure 4H) [Leg. TS Liew & Markus Ruf. 27/05/2007] and BOR.MOL 3520 (2 DEX, 17 SIN adults; & 1 DEX, 1 SIN juveniles) [Leg. M Schilthuizen & AS Cabanban 30/04/2005].

Other Material. Tawau District - (1 DEX, 2 SIN, leg. Mr. Kim Chua; JP, Figure 5) H 33.00-36.08 (av. 34.28) mm, D 19.61-20.43 (av. 20.04) mm, H/D 1.62–1.80 (av. 1.71), N 5.875-6.375 (av. 6.167) & W 1.48-2.10 (av. 1.72) g.

Semporna District (shells not measured) - Bod Gaya Id., BOR.MOL 4764 (1 DEX, 1 SIN adults; & 1 SIN juvenile) and BOR.MOL 4834 (1 SIN adult fragment) [Leg. TS Liew, Abdul & Ladja 02-06/05/2007].

Type Locality. Commercially logged forest west of Taman Bukit Tawau (Tawau Hills Park), Tawau District, Sabah, Malaysia (Figure 1), with no specific site recorded by Mr. Chua. Based on logging activity at the time of his employment, and the fact the original forest has since been converted to roads and plantations of soft wood, oil palm or cacao, the type locality is here restricted to the residual forests along Sungai (River) Dumpas, Tawau District, Sabah.

Distribution. Based on museum material, this species also lives on the islands of Bod Gaya (Bodgaya or Gaya), Bohey Dulang (Boheydulang), Maigu (Maiga) and Selangan in

the Semporna District, Sabah, Malaysia (Figure 1).

Habitat. Lowland to hill mixed dipterocarp forest.

Animal and Soft Parts. Unknown; one specimen appears to have been live collected

(JP, Figure 5C), but the animal was removed and discarded many years ago, and all other specimens were collected as empty shells.

Etymology. Named in honour of the late Mr. Kim Chua, who collected this snail whilst working as a commercial logger.



Figure 2. *Amphidromus (Amphidromus) capistratus chuai* new subspecies, Holotype NHMUK 20170207 [photos: JP].

Comparative Material.

A. (A.) capistratus capistratus
Nominotypical subspecies
Figure 6

Type Material. H 39-47 mm, D 23-25.5 mm; & aperture height including lip 19-24.5 mm & excluding lip 15.5-20.5 mm [data: von Martens, 1903; Syntypes ZMB 59670, 1 DEX, 2 SIN, leg. M. Schmidt 1902; Figure 6].

Type Locality. Sultanat Kutei, Ost-Borneo with no further details provided.

Distribution. Sultanat Kutei, Ost-Borneo.

Habitat. Unknown.

Animal and soft parts. Unknown.

Original Description. (translated from von Martens, 1903).

Shell fusiform-ovate, flavous, white sutural zone rather narrow, decorated with an olivaceous-green basal fascia on the last whorl and a stripe of the same colour behind the aperture, both angularly conjunct; aperture height almost equal to the length of the shell.

Description. (based upon the holotype)

Shell small, dextral and solid, conic-ovate with a moderately long spire; apex subpapillate and slightly protruding. Surface eroded in places, protoconch and early teleoconch whorls worn smooth. Unworn parts of shell show coarse spiral striae overlaid by weak ridgelets on the spire; last whorl weakly spirally striate, worn early on the upper surface becoming subplicatulate behind the lip, and the base plicate. Whorls 6½, convex apically and remainder subconvex; last whorl not inflated, non-descending and base gently convex, periphery rounded. Suture impressed on the upper whorls, becoming shallow and subcrenulate on the last whorl.

Protoconch whitish; next two whorls bright white with a grey suprasutural fillet; sutural margin grey becoming intense yellow on the penult. Lower whorls very pale lemon with brown oblique stripes, eluted at the end of the penult and early on the last whorl, distinct on the paries and behind the lip; either almost straight or ragged, and the final one (telostripe) separated from the lip by a gap of about twice its width. Stripes stop at a very faint white subsutural band on the last whorl, imperceptible on the penult; and bordered below by a whitish circumumbilical zone. Periostracum absent, shell denuded.

Aperture oblique, subovate and its base weakly effuse. Palatum dull white, translucent and showing the external markings. Scarcely perceptible, thin colourless parietal callus with two white tubercles: parieto-columellar, c. 6 mm sickle-shaped extension of the columellar margin; and parieto-labral, c. 4 mm long subpyramidal adjunct of a slightly ascending lip terminus. Outer lip gleamy white, strongly reflected, very narrowly expanded and very thick; lip edge bent backward a little and

thickened. Columella gleamy white, subcompressed and narrowly twisted, its base subreflexed dorsally. Columellar margin adnate, dilated as a thick callus covering the umbilicus.



Figure 3. *A. (A.) c. chuai* n. ssp. from Tawau District, Sabah (CF): **A.** paratype 1, **B.** paratype 2 and **C.** paratype 3 [photos: JP]

Shell Variation.

All shells measured are small for the genus, either dextral or sinistral. Shape is variable: conic-ovate (Figures 3B-C), ventricose-ovate (Figure 3A), ovate (Figure 5A) or oblong-ovate (Figure 4C). Spire height and aperture height are equal (Figure 4E) to spire slightly longer (Figure 4D). The penult is rounded or obsoletely subangulated (Figure 3A). Subsutural region on the last whorl is compressed (Figures 3A, 4F) or not. Many shells studied have an abraded surface and patchy erosion, due to natural degradation prior to collection. Shells with well-preserved sculpture show a smooth protoconch,

and the spire has coarse spiral striae, becoming fine on the penult, overlaid by growth lines, threadlets and threads (tips puckered at the suture), and occasionally weak pliculae. Last whorl's upper surface as per the penult and the base plicate, the plicae weakly cross the periphery mid-whorl and become coarser behind the lip (Figures 5B-C). Last whorl sculpture may be coarser (plicate, Figure 4B), or finer (pliculate, Figure 4G). Surface lustre a little shining (gleamy) to glossy, dull on worn specimens.

Protoconch and next two whorls are whitish or bright white, protoconch sometimes faded (Figure 2). Following whorls are lemon yellow

(Figure 5C), straw yellow (Figures 4A, 5B) or greenish yellow (Figure 4G), and whitened behind the lip on the last (Figure 5C) or not (Figures 4A, 4G), and possibly a pale brown form exists (non-type, juvenile BOR.MOL 4764). A grey or greyish-yellow suprasutural fillet on the early whorls is distinct or faded. Sutural coloration separates the two populations. Tawau District shells have an intense yellow sutural margin on the last two whorls, bordered below by a narrow white subsutural band. Semporna District shells only have a wider white band beneath the suture (infrasutural band). For both populations, the white band is distinct (Figure 4A), faint (Figure 5C) or faded-away (Figure 3B).

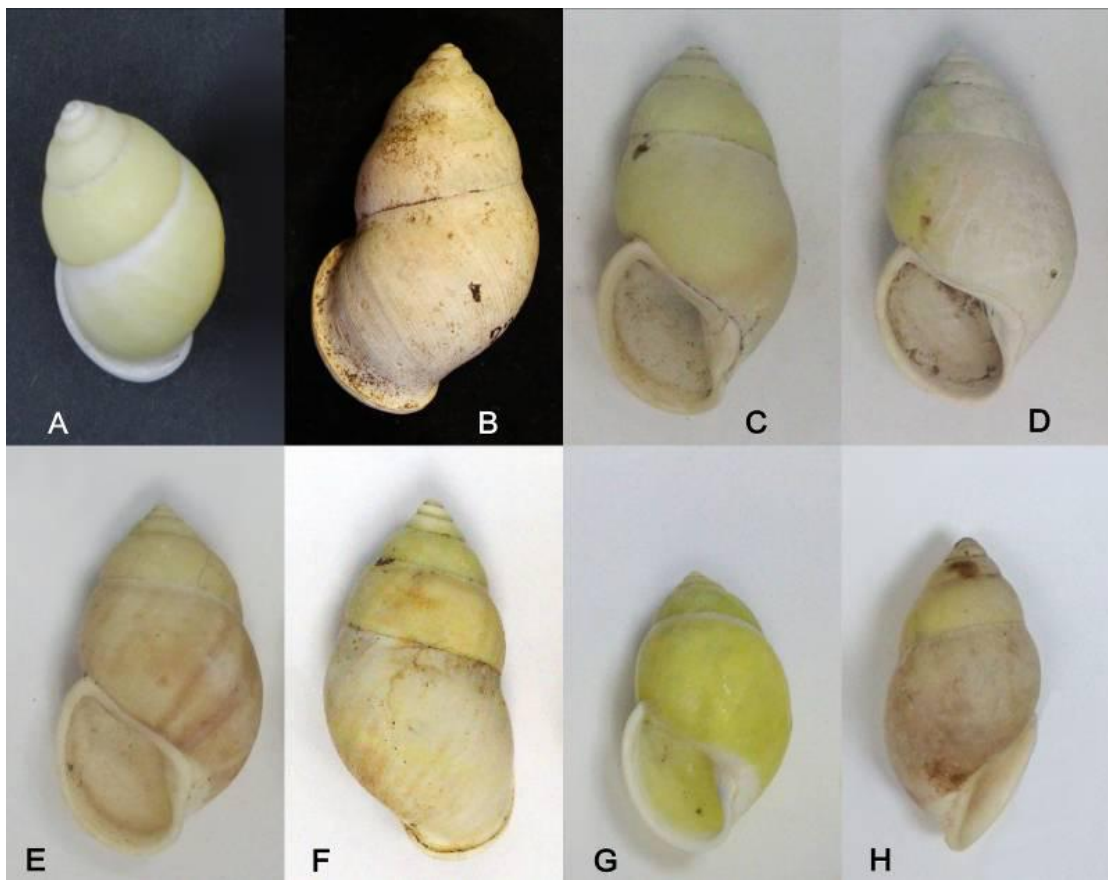


Figure 4. *A. (A.) c. chuai* n. ssp. from Semporna District, Sabah (not shown to same scale): **A.** paratype 4; **B.** paratype 6; **C.** paratype 8; **D.** paratype 9; **E.** paratype 11; **F.** paratype 15; **G.** paratype 17; and **H.** paratype 21 [photos: **A** BioPortal, 2016; **B** Adam J. Baldinger; and **C-H** Amalina Brahim].

Oblique markings start as faint, nearly straight brown lines or stripes that become ragged and darkened behind the lip. They are moderately spaced (Figure 5C), crowded (Figure 3A) or coalesced (Figure 4H), and sometimes partially interrupted by a lemon girdle (Figure 4F). Telostripe is brown like the other stripes (Figure 3B) or slate-purple (Figure 5C), occasionally connected by a basal band of the same hue, which also connects the bases of the other lines or stripes (Figure 3A). Dark-coloured morae that mark the border of a growth stoppage, like the black ones on *A. (A.) atricallosus* (Gould, 1843), are very rare and only one unstriped shell (non-type, adult BOR.MOL 4764) has a slate-purple mora c. $\frac{1}{8}$ whorl behind its lip. One patterned shell (Figure 4E) has two dark ventral stripes, which are probably not morae and resulted from random post-death elution of the pattern. Whitish circumumbilical zone (or umbilical patch) is faint to distinct.

Aperture is subovate and varies slightly in width (narrowest Figure 4C, and widest Figure 4B); weakly subeffuse basally with a slight dent beside the columella, or not dented. Palatum is dull to glimmering, with a paler hue than the exterior deep inside the aperture, and whitened toward the lip. Outer lip, columella, parietal callus and parietal tubercles all have a gleamy lustre. Outer lip and columella are white, except they are bone-coloured on one shell (Figure 5B) that also has a partially brownish-grey tinged parietal margin. Columella is hollow and distinctly twisted to almost straight. Columellar margin is dilated, adnate and generally thickly callused. Outer lip is very narrowly (Figure 2) to narrowly expanded (Figure 4B) with a flat or slightly rounded surface, and its edge bent back slightly like a rim; usually continuously thickened during maturity or distinctly doubled (Figure 5B). Residual periostracum on one shell is very pale tawny (Figure 5B). Umbilicus is usually sealed, rarely slightly open and rimate.



Figure 5. Variation of *A. (A.) c. chuai* n. ssp. non-type shells from Tawau District, Sabah (JP, ex-CF): **A.** ventricose shell with a deteriorated pattern, except for a few residual marks behind the lip (shell 5); **B.** narrow "patternless" shell (shell 6); and **C.** fully patterned shell (shell 7) [photos: JP].

Parietal callus is colourless or whitened and often has two white tubercles, one at each end of its margin (Figure 2), or none (Figure 3A). Parietal-labral tubercle begins as a subdeltoid smudge of callus c. 2 mm long attached to the slightly ascending lip termination (immature stage, Figure 5B). Thickening anteriorly and slightly inward, firstly forms a flattish subtriangular lump (submature stage, Figure 3B), and later a thick subpyramidal lump c. 4 mm long (mature stage, Figure 3C), sometimes elongated (Figure 5A). Parietal-columellar tubercle starts as a slight thickening of the parietal margin (immature stage, Figure 5B). Continued thickening, reduced toward its tip, forms a sickle-shaped (falcate) extension of the columellar margin c. 6 mm long (mature stage, Figure 4E). Among shells from Semporna, one fragment (non-types, BOR.MOL 4834) and one adult (Figure 4E) have a cord-like callus connecting both tubercles, which is absent in all of the Tawau shells.

Discussion.

Shell measurements from this study and the literature (Pfeiffer, 1853; Dohrn, 1889; Pilsbry, 1900; von Martens, 1903; Bartsch, 1917;

Laidlaw & Solem, 1961; Dharma, 2007 & 2012; and Sutcharit & Panha, 2011) deduced the following: *A. (A.) c. chuai* n. ssp. has small shells; *A. (A.) mundus* generally has small shells, rarely medium-sized; and small to medium-sized shells for *A. (A.) c. capistratus*, *A. (A.) entobaptus* and *A. (A.) similis*.

Although originally described as *A. (A.) martensi* var. *capistratus*, von Martens (1908) later raised it to full species status and it is accepted here as *A. (A.) c. capistratus*. However, Laidlaw & Solem (1961) considered it merely a slight colour variant of *A. (A.) martensi* Böttger, 1893 without further elaboration. Current measurements show a clear size difference between the subspecies, with *A. (A.) c. chuai* n. ssp. (H 30.79-36.21 mm) having smaller shells than *A. (A.) c. capistratus* (H 39-47 mm). Future measurements of the other material (types and non-types) of *A. (A.) c. chuai* n. ssp. may show an overlap in the size range.

All three syntypes of *A. (A.) c. capistratus* (Figure 6) are conic-ovate and having faded since collection, they are now light buff to antimony yellow (greyed orange-yellow) with paler early whorls. *A. (A.) c. chuai* n. ssp. displays four shell shapes (ovate and conic-, ventricose- or oblong-ovate), and has whitish early whorls and lemon-, straw- or greenish-yellow lower ones, the last sometimes whitened behind the lip. Both have a colourless parietal callus, except *A. (A.) c. capistratus* has weakly developed white parietal tubercles (Figures 6B-C) like submature ones seen on *A. (A.) c. chuai* n. ssp. (Figure 3B), or they are absent (Figure 6A). On the last whorl, *A. (A.) c. chuai* n. ssp. has fine to coarse plicae, often coarser on the base and weaker above the periphery, whereas *A. (A.) c. capistratus* has fine plicae on the antepenult and penult, slightly coarser on the last.

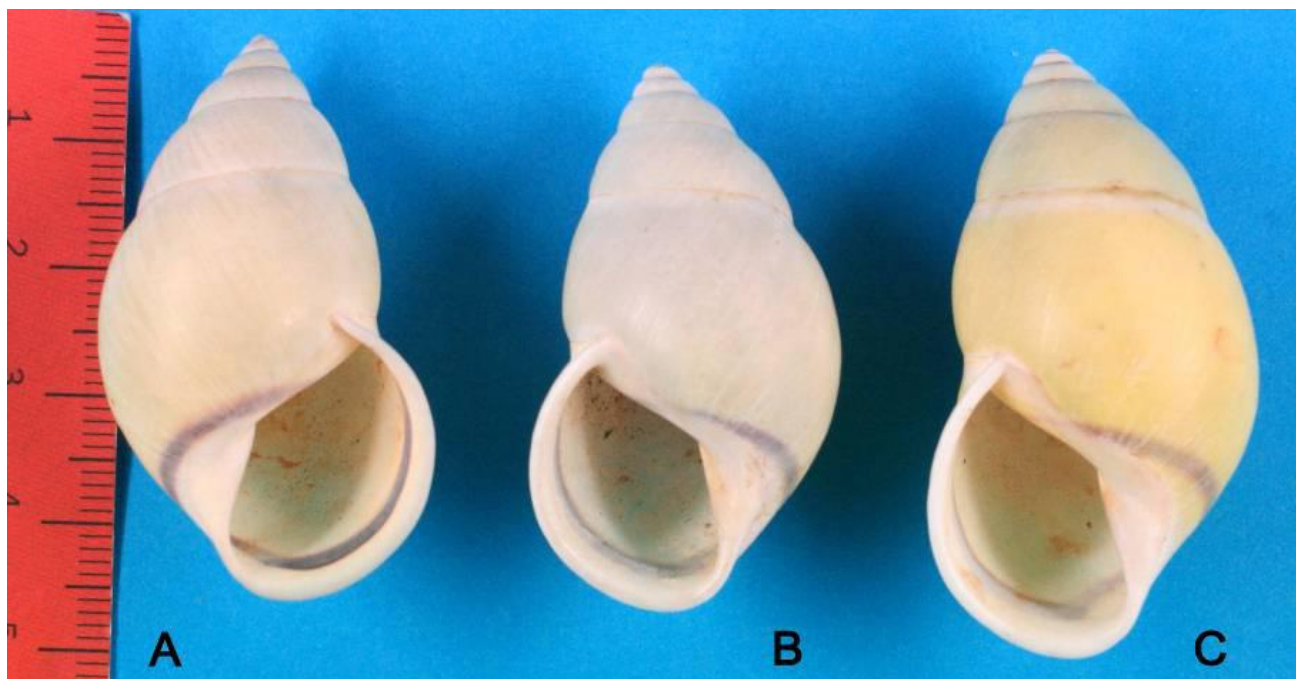


Figure 6. Nominotypical subspecies *A. (A.) c. capistratus* syntypes (MN), ZMB 59670 Sultanat Kutei, Ost-Borneo [photos: Christine Zorn].

Both subspecies are amphidromine and have a whitish umbilical patch, rounded or subangulate penult, and structurally they have the same lip, columella, aperture and protoconch. *A. (A.) c. chuai* n. ssp. very rarely has dark-coloured morae and *A. (A.) c. capistratus* lacks them. *A. (A.) c. capistratus* has a whitish subsutural band below a yellow sutural margin on the lower whorls, as seen on *A. (A.) c. chuai* n. ssp. only from Tawau. The obvious difference is in the dark pattern. *A. (A.) c. capistratus* only has two angularly connected, blackish-purple markings: a telostripe, separated from the outer lip by a gap of about twice its width, and a basal band. Patterned shells of *A. (A.) c. chuai* n. ssp. also have a telostripe, except it is dark brown or slate-purple, and just a few shells have a same-coloured basal band. Its pattern differs by the presence of paler brown stripes or lines, and many shells are “plain” and lack dark coloured markings.

There are several ways to describe the coloration of the early whorls (including protoconch) of the taxa studied here: 1) whitish or white with a grey, coloured-grey or coloured suprasutural fillet; 2) grey, coloured-grey or coloured with a whitish or white apex and infrasutural zone; or 3) whitish or white upper part and grey, coloured-grey or coloured lower part. The following shared or distinct differences with *A. (A.) c. chuai* n. ssp. are noted.

A cursory examination suggests *A. (A.) mundus* is simply a white colour form of *A. (A.) c. chuai* n. ssp., since both have amphidromine shells of similar shape and size. *A. (A.) mundus* differs in being a peninsular-Malaysian species from Pulau Besar, Johor (Sutcharit & Panha, 2011) with only albous (dull white) shells with a straight or twisted columella that is vertical and subcompressed. Its spire is shorter to slightly

longer than the aperture at 0.45-0.59 (Laidlaw & Solem, 1961; Dharma, 2007; JP).

A. (A.) entobaptus is a Philippine species with a large range in the Palawan Province; from Balabac Id. to Busuanga Id. (Dohrn, 1889; Pilsbry, 1900; Bartsch, 1917; Laidlaw & Solem, 1961). It differs in having only sinistral shells that are conic-ovate, subpyramidal-ovate or elongate-ovate. Upper part of the early whorls is white or cream, and sometimes pale yellow on yellow shells. Lower whorls have an appressed subsutural region and the aperture height is larger than the spire at 0.52-0.59 (Dohrn, 1889; Pilsbry, 1900; JP). The last whorl may be inflated (Figure 7F), or partially so (subgibbose, Figure 7G), the base is somewhat tapered to angularly rounded, and whitewashed (white suffusion) in some shells. Translucent morae uncommonly occur singly or in pairs and are grey, similar to the ground colour or whitish, and sometimes with a grey impressed resting line. The outer lip's edge is either: 1) recurved; or 2) retroflexed and firmly attached to the back of the lip (connate behind), sometimes flattened as the lip thickens and rarely partly touching the last whorl (subadnate). The acuminate columella is variable: distinctly twisted to almost straight; vertical; abapertural (Figures 7E–G) or adapertural basally (Figure 7H); and its base subreflexed dorsally to slightly ventrally.

A. (A.) similis is another Bornean species, distributed from the Sadong River Basin, southern Sarawak, Malaysia due south to the Kapuas River Basin, West Kalimantan, Indonesia. It differs in generally having dextral shells that are lemon yellow or occasionally dull white to greyish white in Sarawak. Kalimantan shells are only yellow and very rarely sinistral (Dharma, 2007). Shape is variable: squat to tall conic-ovate; subpyramidal-ovate, sometimes with a tapered spire; or ventricose-ovate. Its spire is shorter to slightly longer than the

aperture height: 0.45-0.59 (Laidlaw & Solem, 1961; Dharma, 2007; JP). Its outer lip's edge is slightly recurved and the columellar margin often has a secondary tubercle (rounded lump) on its outer corner.

A. (A.) mundus and *A. (A.) similis* both lack morae and have a medium-sized aperture with its base subeffuse or not effuse. *A. (A.) entobaptus* and *A. (A.) similis* both lack a whitish circumumbilical zone on non-white shells and the lower part of the early whorls has the following colour separation between their colour-forms: grey in white shells and coloured-grey in non-white shells.

A. (A.) mundus, *A. (A.) entobaptus* and *A. (A.) similis* all have plain imperforate shells with a finer teleoconch sculpture, non-plicate last whorl, white infrasutural band, slightly wider outer lip, and the last whorl has a shallow or indented suture with a simple or slightly irregular margin that is never yellow. However, *A. (A.) similis* may have a few brown subsutural spots (Schepman, 1896), and has a more

regularly spaced and slightly coarser transverse sculpture.

A. (A.) entobaptus contrasts with the other taxa in a number of features. It has a medium to large acuminate-oblong aperture with a non-effuse base and much larger for an equivalent shell size. The callused columellar margin expands upwards from the columella's base, whereas it expands outward from the columella's side in the other taxa. The ground colour is more variable: whitish, cream, yellow, orange-yellow or flesh-coloured and rarely white. Some colonies may have the whole shell or upper part red-, violet- or green-tinted (Hidalgo, 1897; Bartsch, 1917). The palatum is generally yellow (pale citron to ochreous-orange), and of a different tone to the exterior on yellow shells. The palatum on pale yellow shells may be pale yellow or paler deep inside and whitened toward the lip; and rarely yellowish-cream on whitish shells or white on white shells. *A. (A.) similis* contrasts with the other taxa in having a different coloured paries: purplish-brown or reddish-brown with a darker or blackish margin at full maturity.

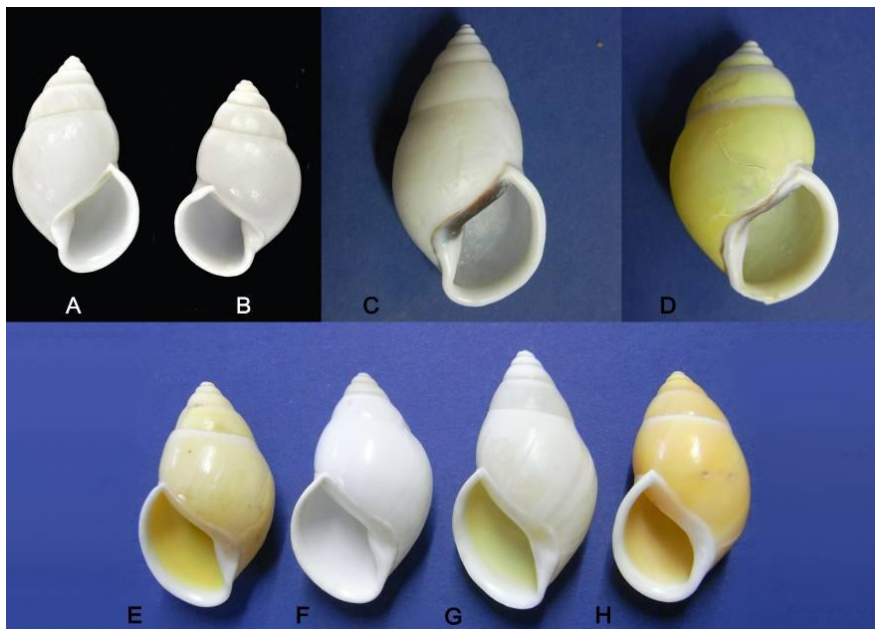


Figure 7. Nearest relatives of *A. (A.) chuai* n. ssp.: **A-B** *A. (A.) mundus* Pulau Besar, Johor, Malaysia, **A.** Neotype CUMZ 4917; **B.** topotype CUMZ 4914; **C-D** *A. (A.) similis* Bukit Ranchan, Serian District, Sarawak, Malaysia (JP); and **E-H** *A. (A.) entobaptus* Palawan Province, Philippines (JP): **E.** Balabac Id., **F-G** location not specified, probably Culion Id. and **H.** Bituan, Busuanga Id. [photos: **A-B** Sutcharit & Panha, 2011; and **C-H** JP].

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