

Research Article

A review of the Recent *Agaronia* Gray, 1839 (Caenogastropoda: Olividae) of the Sundaic region, with description of a new species

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Abstract

The present study reviews the recent species of the genus *Agaronia* in the Sundaic region based on conchological characteristics and geographical information. Five species with rather well defined and restricted distributional ranges are recognised. *Agaronia adamii* is determined to be the only species occurring along the South China Sea coasts of Borneo. *Agaronia gibbosa* is an Indian Ocean species found only at the western fringes of Sundaland. *Agaronia java* new species is proposed for a species usually misidentified as *Agaronia nebulosa* in the literature. This Javanese species can be distinguished from its Sundaic congeners by its relatively cylindrical shell, shell patterns and colouration. *Agaronia johnkochi* is distributed along the Indian Ocean coasts of Java. *Agaronia lutaria* occurs sympatrically with *Agaronia johnkochi* in Java, but is also found in Bali.

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Introduction

Species of the olivid genus *Agaronia* Gray, 1839, are characterised by their smooth elongate fusiform shell with a broad glossy fasciolar band at the anterior part of the body whorl that usually extends to over half the aperture height. Some 20 living species and subspecies are distributed in tropical and subtropical regions worldwide (Cilia, 2012 and references therein cited). Kantor et al. (2017) provide a diagnosis of the genus, and include some notes on the anatomy and ecology in a recent treatment of the superfamily Olivoidea Latreille, 1825.

Some half a dozen species of *Agaronia* have thus far been recorded in the Sundaic region (Voskuil, 1990; Sterba, 2003; Dharma, 2005; Cilia, 2012), which encompasses the Malay Peninsula, and the islands of Borneo, Sumatra, Java and Bali on the Sunda Shelf in the Central Indo-Pacific. However, it is apparent that the taxonomy and nomenclature of the species in this region remain confused.

This study attempts to clarify the species diversity and distribution of the Recent Sundaic *Agaronia* based on comparisons of the conchological characteristics of available material and geographic data, with a review of

the literature. Five species, *Agaronia adamii* Terzer, 1992, *Agaronia gibbosa* (Born, 1778), *Agaronia java* new species, *Agaronia johnkochi* Voskuil, 1990, and *Agaronia lutaria* (Röding, 1798), are herein recognised (Fig. 1). A simultaneous neotype is designated for both *Porphyria lutaria* Röding, 1798, and *Oliva subulata* Lamarck, 1811, to fix the identities of both names, and making them objective synonyms. *Agaronia johnabbasi* Cilia, 2012, is synonymised with *Agaronia johnkochi* Voskuil, 1990.

Material and methods

The literature was searched for records and images of all *Agaronia* species with or suspected to have a Sundaic occurrence. Available specimens were compared to the collated records for a review and verification. Species delimitation is based solely on conchological characteristics, which were checked against the original descriptions. For further verification, images of types and possible types were solicited from museums and institutions where type material are known to be or possibly deposited. For species where types cannot be traced, described without figures and cannot be positively determined from their descriptions alone (e.g., Röding, 1798; Lamarck, 1811, 1822), the originally referenced illustrations (e.g., Martini, 1773; Bruguière, 1798) are accepted as representative of the original authors' concept to establish the species identities.

Shell characteristics used to diagnose and describe the species include, but are not limited to, the general shape of the shell, colour and patterns of the shell cloak, anterior band and olivoid band, colour of the spire

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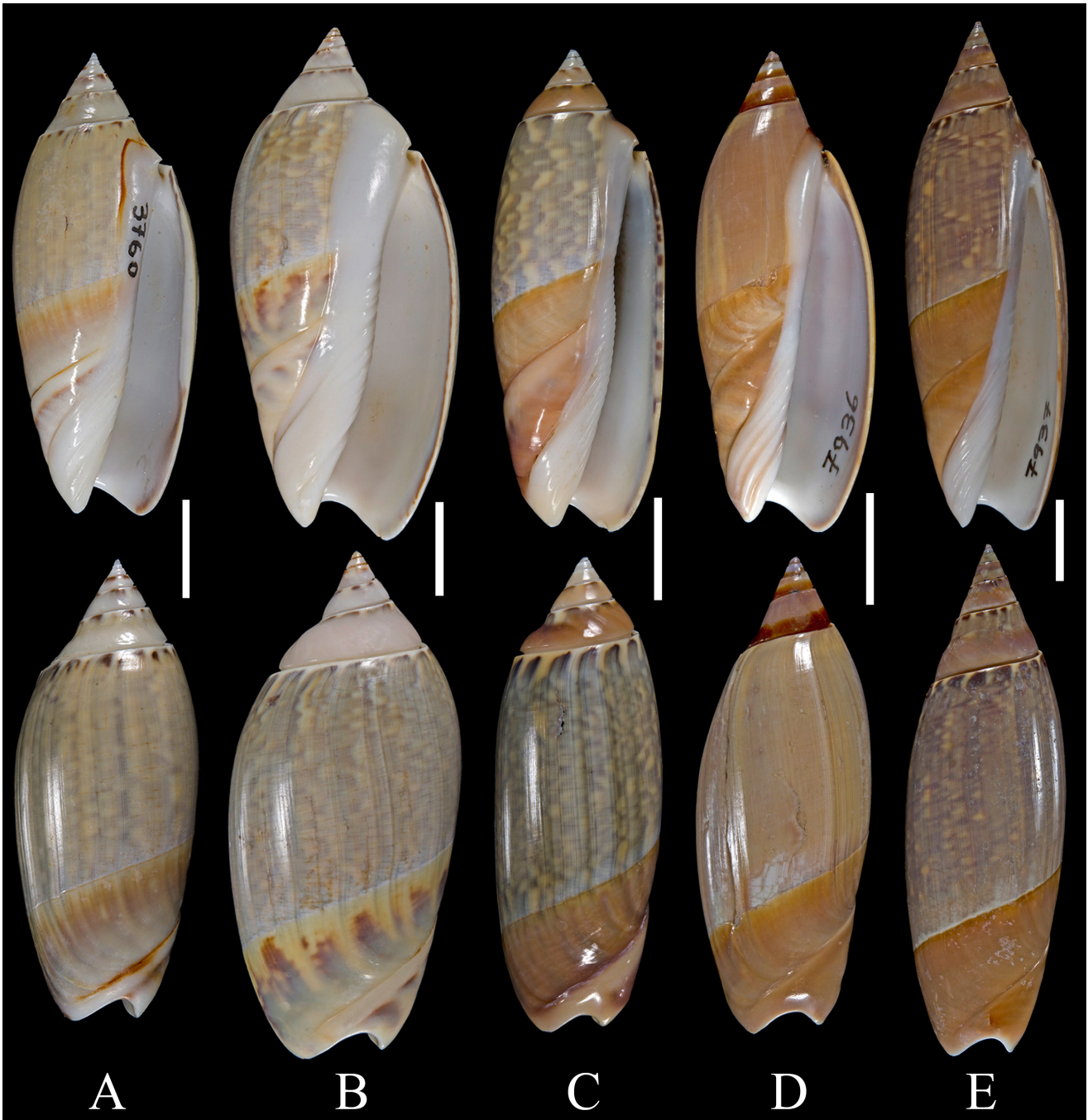


Fig. 1. Recent *Agaronia* species of the Sundaic region. A, *Agaronia adamii* Terzer, 1992; B, *Agaronia gibbosa* (Born, 1778); C, *Agaronia java* new species; D, *Agaronia johnkochi* Voskuil, 1990; E, *Agaronia lutaria* (Röding, 1798).

callus, and form and profile of the spire. Shell terminology largely follow Kantor et al. (2017), with some modifications, such as the use of fasciolar band to refer to the anterior band and olivoid band as a single entity for convenience (see Fig. 2). Measurements are of maximum shell length (SL) and maximum shell width (SW) in millimetres (mm). Shell length is measured from the apex to the anterior-most end of the body whorl parallel to the axis, and shell width is taken at the widest part of the body whorl perpendicular to the coiling axis. In lots with multiple specimens, measurements of only the smallest and largest specimens are provided to show the range.

Repositories for material mentioned are identified by the following abbreviations: ZRC (Zoological Reference Collection of the Lee Kong Chian Natural History Museum, National University of Singapore); MHNG (Muséum d'Histoire naturelle de Genève, Switzerland); MNHN (Muséum national d'Histoire naturelle, Paris, France); MZB (Museum Zoologicum Bogoriense, Java, Indonesia); NHMW (Museum of Natural History Vienna, Austria); ZMMU (Zoological Muséum of Moscow State University, Russia); CLN (private collection of Leo Nguang, Singapore); CNHE (private collection of H.E. Ng, Singapore); CSY (private collection of S.Y. Chan, Singapore); and PRE (private collection of Pierre Recourt, the Netherlands).

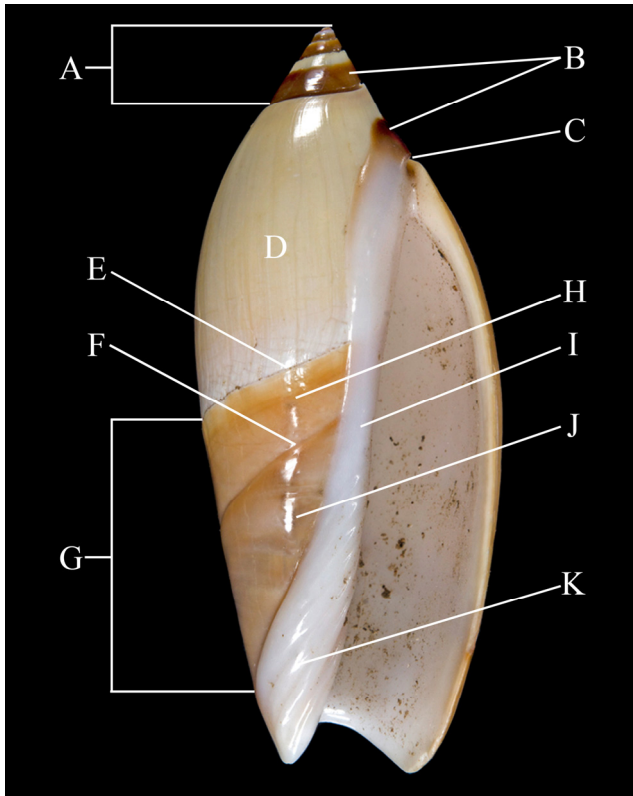


Fig. 2. Shell features and terminology. A, spire; B, spire callus; C, filament channel; D, cloak; E, olivoid groove; F, rear edge of anterior band; G, fasciolar band; H, olivoid band; I, parietal callus; J, anterior band; K, plication plate.

Taxonomic part

Family Olividae Latreille, 1825

Subfamily Agaroniinae Olsson, 1956

Genus *Agaronia* Gray, 1839

Type species. *Voluta hiatula* Gmelin, 1791.

Remarks. *Anazola* Gray, 1858, is often treated as a distinct related genus or a subgenus of *Agaronia* used for the species herein treated (e.g., Sterba, 2004; Dharma, 2005). In this work, *Anazola* is treated as a junior synonym of *Agaronia* following Kantor et al. (2017) who provide other details and information such as diagnosis, synonymy and current classification of the Olividae. Nevertheless, further studies may be necessary to elucidate the relationships between the members of this subfamily from other geographical regions.

Agaronia adamii Terzer, 1992

(Figs. 1A, 3)

Agaronia adamii Terzer, 1992: 47 – Raven & Recourt, 2018: 147, pl. 8, figs. 1–4.

Agaronia nebulosa – Hill et al., 1997: 10 (non *Oliva nebulosa* Lamarck, 1822).

Anazola nebulosa – McIlroy & Yusniasita Dols, 2008: 25–26 (non *Oliva nebulosa* Lamarck, 1822).

Agaronia gibbosa – Raven & Recourt, 2018: 147 (non *Voluta gibbosa* Born, 1778).

Material examined. Malaysian Borneo: 1 ex. SL 48.0 × SW 20.0 mm (ZRC.MOL.3760), 1 ex. SL 44.6 × SW 19.2 mm (ZRC.MOL.4132), 1 ex. SL 44.2 × SW 17.3 mm (ZRC.MOL.4133), Sabah, Kota Kinabalu, coll. 1973; 2 exx. SL 20.1 × SW 13.2, SL 36.7 × SW 16.0 mm (CNHE), Sabah, Kota Belud, coll. Nov.2006; 1 ex. SL 35.1 × SW 13.5 mm (ZRC.MOL.12219), Sabah, Labuan, Jalan Kerupang 2, coll. Jul.2010; 2 exx. SL 41.8 × SW 19.8, SL 47.5 × SW 21.4 mm (ZRC.MOL.10765), 1 ex. [subfossilised] SL 42.3 × SW 19.7 mm (ZRC.MOL.10944), Sarawak, Kuching, Santubong, Pantai Puteri, coll. 27 Sep.2004; 8 exx. SL 17.6 × SW 6.0–SL 43.3 × SW 18.7 mm (ZRC.MOL.7866), Sarawak, Kuching, Santubong, Pantai Puteri, coll. 9 Oct.2009; 34 exx. [not measured] (CLN), 2 exx. SL 34.4 × SW 13.7, SL 47.0 × SW 20.3 mm (ZRC.MOL.9356), Sarawak, Kuching, Lundu, Pantai Pandan, coll. 24 Feb.2015; 14 exx. SL 28.5 × SW 10.5–SL 52.7 × SW 24.4 mm (ZRC.MOL.14037), 121 exx. [not measured] (CLN), Sarawak, Kuching, Santubong, Pantai Puteri, coll. Feb.2015, 15 Feb.2016; 1 ex. SL 34.2 × SW 16.0 mm (CNHE), Sarawak, Kuching, Santubong, Pantai Puteri, no coll. date.

Type locality. Tawitawi, Sulu Archipelago, Philippines (Terzer, 1992).

Distribution. Along the coasts of Brunei, and the Malaysian Bornean states of Sabah and Sarawak facing the South China Sea (Hill et al., 1997; McIlroy & Yusniasita Dols, 2008; Raven & Recourt, 2018; this study). Occurrence and distribution in the Sulu Archipelago and other parts of the Philippines require verification.

Diagnosis. Shell shape variable, slender to rather cylindrically ovate (SL to more than 50 mm). Spire height and profile variable, from high conical with straight profile to low with a concave profile. Edge of filament channel with prominent darker brown spots or blotches on body whorl and extending to spire whorls, along the edge of the spire callus. Olivoid band often with brown hazy lines corresponding to previous terminal edges of anterior outer lip. Anterior band with a brown line just anterior of the raised cord-like rear edge. Middle part of outer lip noticeably thickened in specimens with mature outer lip. Columellar lip profile nearly straight, with very slight concavity around olivoid groove and slight convexity around position of anterior band to plication plate.

Remarks. *Agaronia adamii* is variable in shell shape, from slender and elongate to rather broad and rotund, and the spire varies from high conical with straight profile to low with a concave profile. By contrast, the shell colouration and patterns are quite consistent.

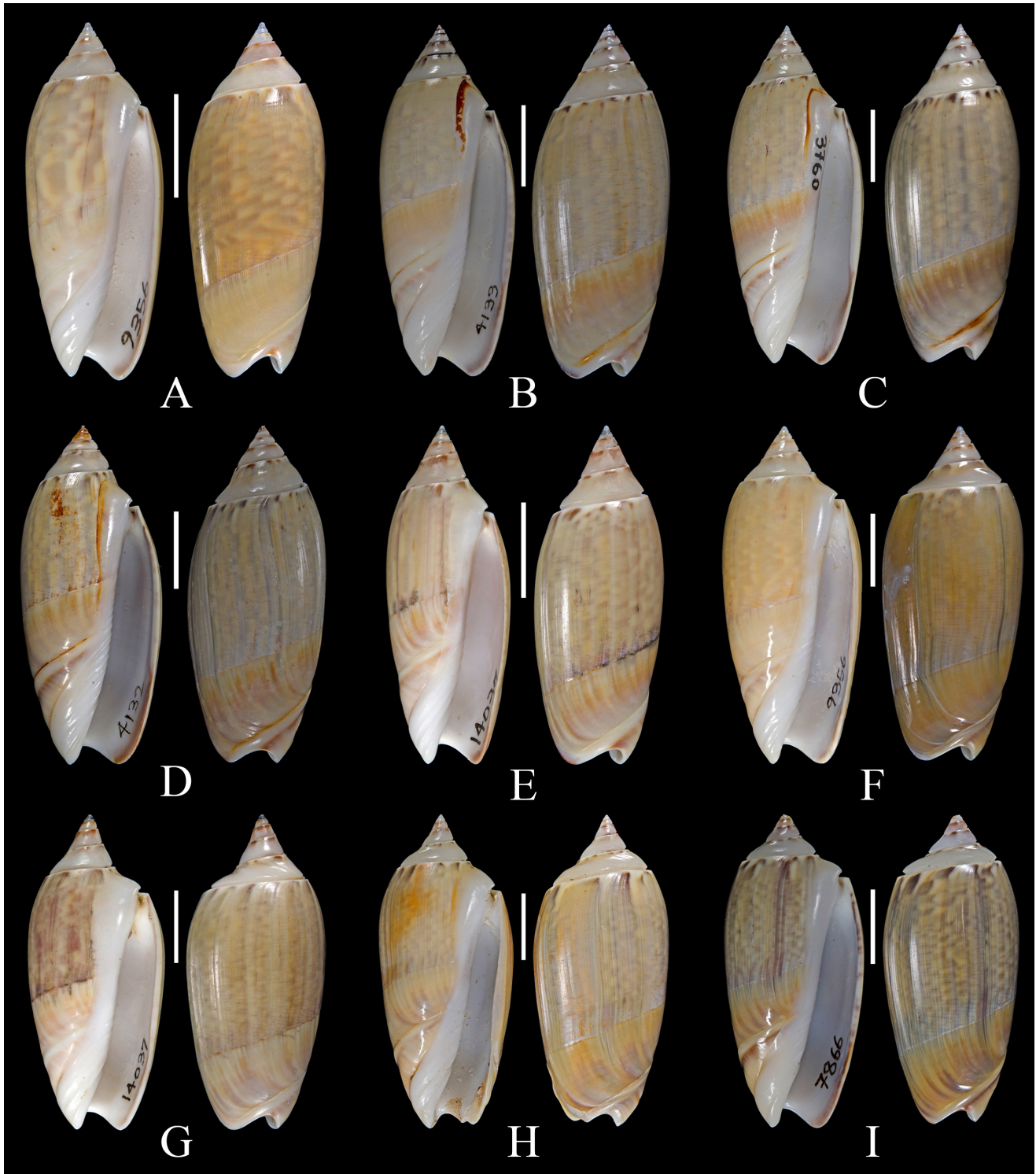


Fig. 3. *Agaronia adamii* Terzer, 1992. A, Pantai Pandan, Lundu, Sarawak, Malaysian Borneo (ZRC.MOL.9356); B–D, Kota Kinabalu, Sabah, Malaysian Borneo (B, ZRC.MOL.4133; C, ZRC.MOL.3760; D, ZRC.MOL.4132); E, G–I, Pantai Puteri, Santubong, Sarawak, Malaysian Borneo (E, ZRC.MOL.14037; G, ZRC.MOL.14037; H, ZRC.MOL.19765; I, ZRC.MOL.7866); F, Pantai Pandan, Lundu, Sarawak, Malaysian Borneo (ZRC.MOL.9356). Scale bar = 10 mm.

Specimens from the opposite ends of the shell shape spectrum can look remarkably different, although the various degrees of intergradation become obvious with a rich material. We therefore consider the different forms to represent a single variable species after examining a large series of material from Sarawak. This variability of the shell shape and spire profile versus the

relative consistency of the colouration and patterns is well illustrated in Raven & Recourt (2018: pl. 8, figs. 1–3 [figs. 3a–c, as *Agaronia gibbosa*]) who treat the forms as distinct species. Most of the material examined have a cream yellowish hue that is especially obvious in weathered specimens. This yellowish tinge is also mentioned in the original description based on the slim

form of this species by Terzer (1992), and is visible in the type specimens figured. Very freshly dead and live specimens are generally a rather dark bluish grey.

Agaronia adamii is most similar in shell form and colouration to *Agaronia gibbosa* (Born, 1778), which it has often been confused with, but does not attain similarly large sizes nor rotundness of the latter. Other diagnostic shell characters of *Agaronia adamii* include the prominent dark spots along the spire callus, fasciolar band without contrasting dark flammules or blotches, and presence of a brown line just anterior of the raised cord-like rear edge of the anterior band. Thickening around the central part of the outer lip of specimens with a mature thick lip is also quite prominent in *Agaronia adamii*. This thickened central part of the outer lip is also found in *Agaronia java* new species, and barely noticeable in *Agaronia gibbosa* and *Agaronia lutaria* (Röding, 1798).

First described from specimens collected from Tawitawi (Tawi-Tawi), the southernmost province of the Philippines. Terzer (1992) correctly speculates a northern Borneo occurrence, but the suggested possible wider distribution in Palawan and Mindanao remains uncorroborated. Indeed, we regard the type locality as possibly erroneous as this species has not been reported from the type locality since its description. Curiously Raven & Recourt (2018) mention that the paratypes originate from Brunei while Terzer (1992) states that all three type specimens are from the type locality. No additional information regarding this discrepancy was found in the literature.

This species is presumed to be a shallow subtidal species and probably inhabits fine sandy sediment. Empty shells are common along sandy beaches on many parts of Sarawak and Sabah (Malaysian Borneo), but live animals are seldom seen. At Bako and Santubong (in Kuching district, Sarawak), the animals can be found in clean sand during periods of extremely low tides between October to February, coinciding with the local 'bamboo clam' (*Solen* spp.) harvesting season (M.E. Marzuki pers. comm., 2016).

***Agaronia gibbosa* (Born, 1778)**

(Figs. 1B, 4, 5)

Voluta gibbosa Born, 1778: 202.

Voluta utriculus Gmelin, 1791: 3441.

Oliva utriculus – Lamarck, 1811: 323; Lamarck, 1822: 433.

Oliva nebulosa Lamarck, 1822: 436 – Reeve, 1850: unnumbered page (sp. 32), pl. XVI, figs. 32a–32b; Satyamurti, 1952: 189, pl. XVIII, fig. 4; Apte, 1998: 76, pl. X, fig. 7.

Oliva gibbosa – Reeve, 1850: unnumbered page (sp. 12), pl. VIII, figs 12a–12b; Melvill, 1904; Satyamurti, 1952: 189, pl. XVIII, figs. 2a, 2b; Apte, 1998: 76, pl. X, fig. 4.

Oliva gibbosa var. *flavescens* Melvill, 1904.

Oliva gibbosa var. *fulgurans* Melvill, 1904.

Oliva gibbosa var. *candicans* Melvill, 1904.

Oliva gibbosa var. *mediocincta* Melvill, 1904.

Oliva intricata Marrat, 1871: 27, pl. 21, figs. 344, 345.

Olivancillaria gibbosa – Tantanasiwong, 1978: 16; Eisenberg, 1981: 125, pl. 107, figs. 8–8c; Abbott & Dance, 1990: 193; Abbott, 1991: 67, pl. 32, fig. 5; Dance, 1992: 158; Drivas & Jay, 2001: 90, pl. 30, fig. 7; Subba Rao, 2003: 292, pl. 72, fig. 14; Dharma, 2005: 150, pl. 50, figs 1a, 1b; Siddiqui, 2007: 203; Win & Swe, 2011: 128; Hossain et al., 2014: 39, pl. 13.

Agaronia nebulosa – Abbott & Dance, 1990: 196; Abbott, 1991: 67, pl. 32, fig. 5; Subba Rao, 2003: 293, pl. 72, fig. 5; Siddiqui, 2007: 204; Apte, 2014: 132, pl. 22, figs. 20, 21; Hossain et al., 2014: 39, pl. 13.

Oliva nebulosa intricata – Apte, 1998: 77, pl. X, fig. 8.

Agaronia (Anazola) gibbosa – Sterba, 2003: 118, pl. 46, figs. 1–8; Perini & Centomo, 2013.

Agaronia (Agaronia) gibbosa – Lhaumet, 2009: 11.

Agaronia gibbosa – Robin, 2008: 385, figs. 7–8; Apte, 2014: 132, pl. 22, figs. 18, 19; Ravinesh & Bijju Kumar, 2015: 34.

"*Olivancillaria gibbosa*" – Teso & Pestorino, 2011: 19, fig. 18 [types of *Voluta gibbosa* Born, 1778 figured].

Agaronia propatula – Hossain et al., 2014: 39, pl. 13 (non *Oliva propatula* Conrad, 1849).

Agaronia travassosi – Hossain et al., 2014: 39, pl. 13 (non *Agaronia travassosi* Lange de Morretes, 1938).

Olivancillaria contortuplicata – Hossain et al., 2014: 39, pl. 13 (non *Oliva contortuplicata* Reeve, 1850).

Material examined. Indonesia: SL 44 × SW 18 mm (CNHE [ex *S. Patamakanthin*]), Sumatra, Aceh, Pulo (Ujong Sudeun), trawled, coll. 1990. **Thailand:** 1 ex. ["golden form"] SL 40.8 × SW 17.5 mm (CSY 181.13.7.0), Ranong, trawled, no coll. date; 2 exx. SL 48.4 × SW 21.3–SL 51.7 × SW 22.3 mm (CNHE), Ranong, trawled, no coll. date. **Bangladesh:** 2 exx. SL 42.4 × SW 16.7–SL 42.5 × SW 17.6 mm (CNHE), Cox's Bazar, trawled, no coll. date. **Sri Lanka:** 2 exx. SL 44.9 × SW 22.0–SL 53.7 × SW 26.2 mm (CSY 181.13.9.1), Mannar, 15–25 m depth, no coll. date. **India:** 1 ex. SL 30.8 × SW 11.9 mm (ZRC.MOL.9559), Tamil Nadu, Parangipettai, Vellar estuary, coll. 12 Mar.2001; 3 exx. SL 50.1 × SW 23.6–SL 65.6 × SW 35.6 mm (CNHE), Tamil Nadu, Kilakarai, trawled around 100 m depth, on sand bottom, coll. 2013; 2 exx. SL 58.4 × SW 29.4–SL 59.0 × SW 29.4 mm (ZRC.MOL.9418), Tamil Nadu, Rameswaram, Kurusadai Island, coll. 10 Mar.2017; 13 exx. SL 25.9 × SW 12.3–SL 62.1 × SW 33.9 mm (ZRC.MOL.14038), west coast of India, coll. 2018; 40 exx. SL 22.6 × SW 8.9–SL 67.6 × SW 34.3 mm (ZRC.MOL.14039), east coast of India, coll. 2018; 2 exx. SL 55.9 × SW 26.4–SL 59.5 × SW 31.2 mm (CSY 181.13.9.0), Tamil Nadu, Madras, no coll. date; 4 exx. SL 37.3 × SW 14.6–SL 54.5 × SW 22.6 mm (CNHE), Tamil Nadu, Kilakarai, no coll. date; 1 ex. [white form] SL 40.3 × SW 18.8 mm (CNHE), Tamil Nadu, Tuticorin, 3 m under sand near reef, no coll. date; 2 exx. [1 acid washed, 1 "golden form"] SL 58.5 × SW 28.5–SL 63.4 × SW 31.6 mm (CNHE), Tamil Nadu, Kilakarai, trawled,

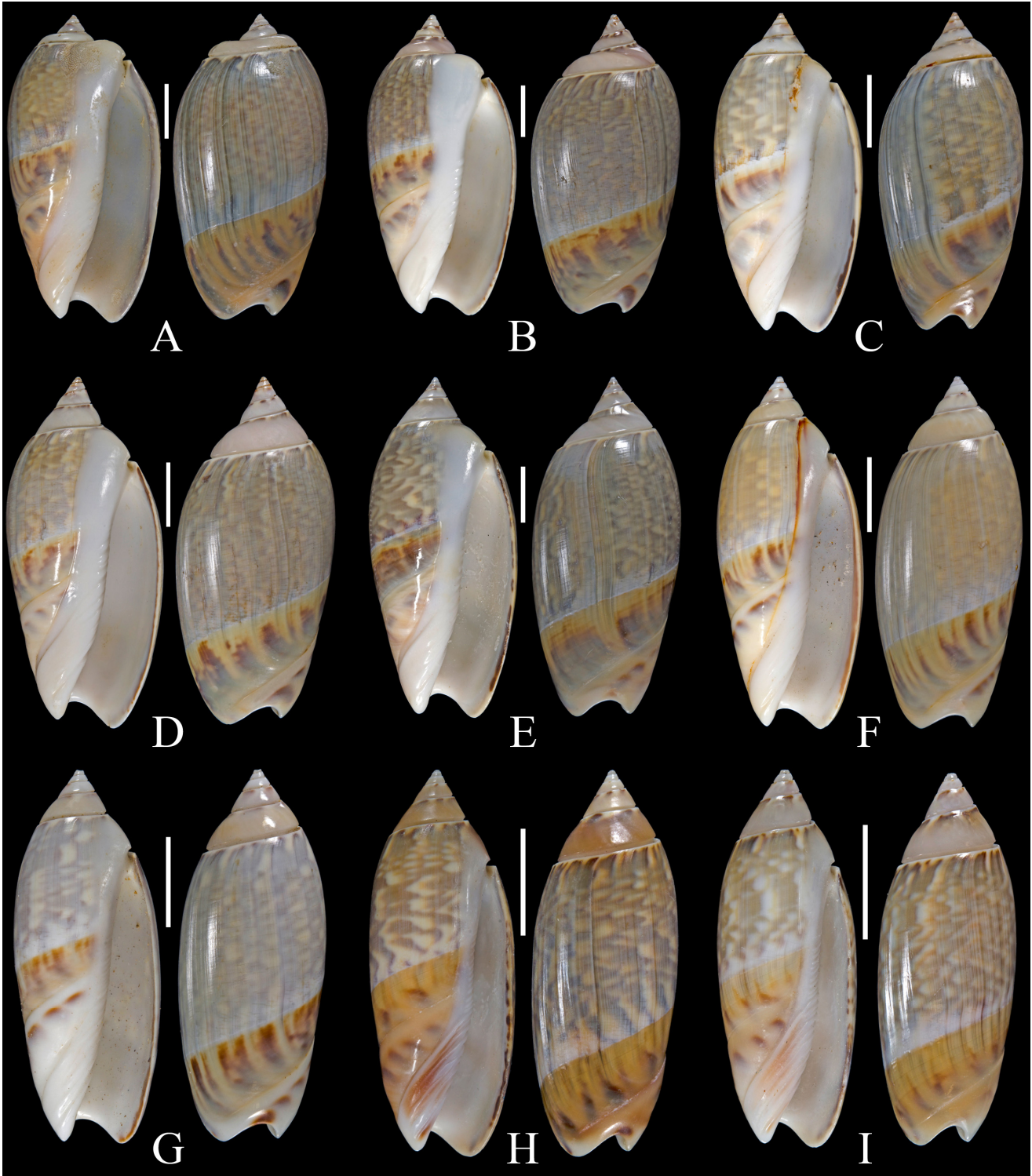


Fig. 4. *Agaronia gibbosa* (Born, 1778). A, southwest coast of India (ZRC.MOL.14038); B, Madras, India (CSY 181.13.9.0); C, Mannar, Sri Lanka (CSY 181.13.9.1); D, Madras, India (CSY 181.13.9.0); E, east coast of India (ZRC.MOL.14039); F, Ranong, Thailand (CNHE); G, Cox's Bazar, Bangladesh (CNHE); H, Kilakarai, Tamil Nadu (CNHE); I, east coast of India (ZRC.MOL.14039). Scale bar = 10 mm.

no coll. date. **Unknown locality:** 1 ex. [acid washed] SL 50.0 × SW 21.9 mm (ZRC.MOL.11048), no coll. date; 1 ex. SL 36.9 mm (MHNG-MOLL-96119), [Delessert collection (ex coll. Lamarck?)] no other data.

Diagnosis. Shell shape variable, slender to cylindrically ovate (SL to more than 60 mm). Spire height and profile

variable, profile usually slightly concave. Spire callus almost entirely covering spire whorl, cream yellow to greyish white and sometimes with purplish tint. Cloak colour variable, usually very light to dark yellowish cream, with brown to bluish grey, often very hazy and indistinct, reticulated pattern. Fasciolar band white to pale orange, with distinct brown flammules or blotches.

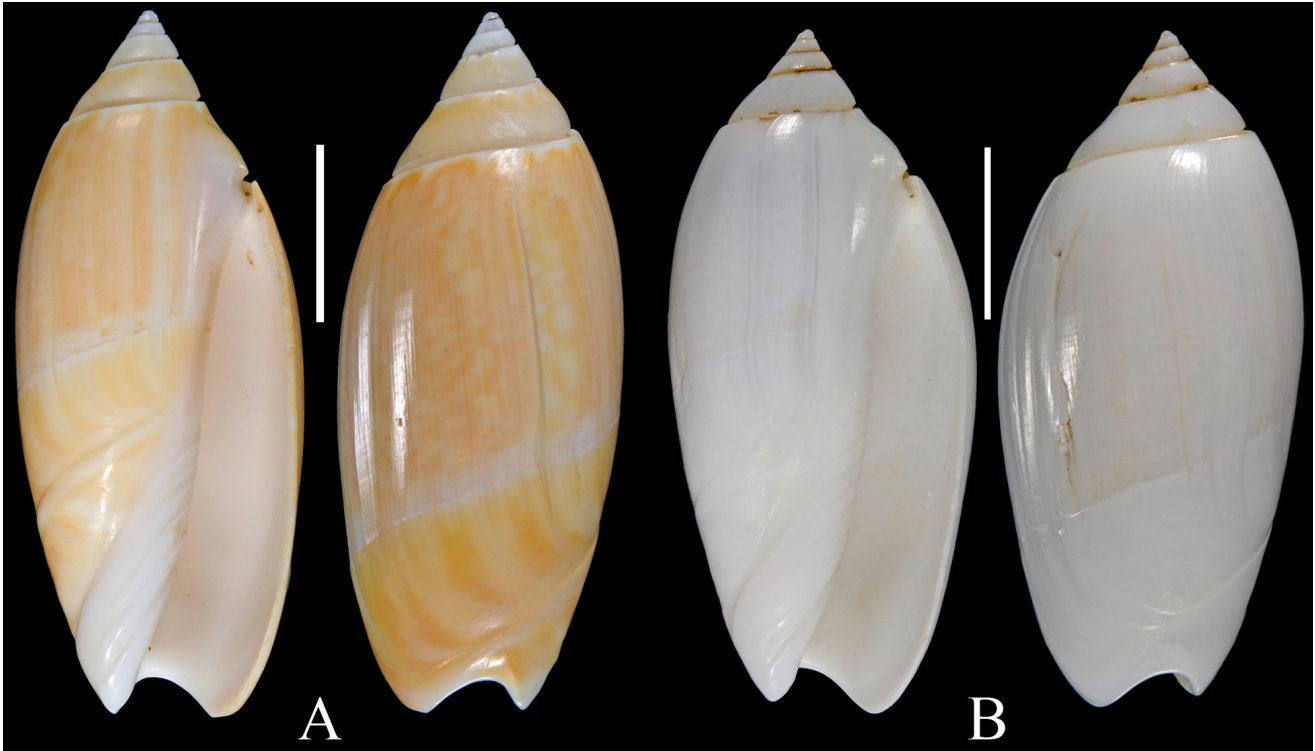


Fig. 5. *Agaronia gibbosa* (Born, 1778). Unusual colour forms. A, Ranong, Thailand (CSY 181.13.7.0); B, Tuticorin, Tamil Nadu, India (CNHE). Scale bar = 10 mm.

Anterior band with brown blotches, often forming an interrupted line just anterior of the raised cord-like rear edge. Parietal callus white, very swollen posteriorly in large specimens; occasionally stained yellow around anterior band. Plication plate generally similar in colour to parietal callus, often orangey in shells with white parietal callus. Small specimens often with purplish brown blotch on plication plate. Columellar lip profile somewhat sinuous, slightly concave posteriorly and convex around position of anterior band.

Type locality. Not stated by Born (1778) for *Voluta gibbosa*. Gmelin (1791) mentions “Oceano indico et aethiopico” (Indian Ocean and [South Atlantic Ocean or Africa?]) for *Voluta utriculus*. Lamarck (1822) states “les côtes de Ceylan” (coast of Sri Lanka) for *Oliva nebulosa*.

Distribution. Widely distributed in the Indian Ocean, along the coasts of the Indian subcontinent, from the Arabian Sea, Laccadive Sea, Bay of Bengal to the Andaman Sea (e.g., Kirtisinghe, 1978; Abbott, 1991; Win & Swe, 2011).

Remarks. *Agaronia gibbosa* is variable in terms of shell morphology (shell shape, and spire height and profile), and to a lesser degree colouration. The shell is usually greyish to light brown, with an orange to cream fasciolar band patterned with dark blotches or flammules. Nevertheless all white ‘albino’ or orangey yellow ‘golden’ varieties are not very rare (see Fig. 5), and a few forms were named by Melvill (1904). The longstanding taxonomic confusion of *Agaronia gibbosa* (including *nebulosa*) with a few other species in the Sundaic region

is perhaps due to uncertainty over the variability of this species and its distribution. Its distribution range is often mentioned to include parts of Southeast Asia and even the whole Indo-Pacific (e.g., Dance, 1990, 1992; Teso et al., 2011, Raven & Recourt, 2018), but there is thus far no reliable evidence of its presence beyond the Indian Ocean. This species appears to be a truly Indian Ocean species that occurs only at the very edges of the Sunda Shelf, along the western coast of Sumatra, Indonesia, and the western side of peninsular Thailand facing the Andaman Sea (e.g., Tantanasiriwong, 1978; Dharma, 2005). Specimens purportedly from Bali was figured by Voskuil (1990: pl. 4, fig. 3), but we have not been able to confirm the presence of this species in that area and consider the locality information to be erroneous. Other records in Sundaland are misidentifications of *Agaronia adamii* Terzer, 1992, and *Agaronia java* new species (see also Remarks and chresonymies listed under those species). Notably *Agaronia gibbosa* is the only species with distinct blotches and flammules on its fasciolar band, which sets it apart from the others easily. Types of *Voluta gibbosa* Born, 1778 in the NHMW (NHMW 14208, NHMW 14209) are excellently figured in Teso & Pestorino (2011: 28, fig. 18).

The identity of *Oliva nebulosa* Lamarck (1822) is evidently confused in the literature and the name has been applied to at least three distinctly different species in the contemporary literature (see e.g., Eisenberg, 1981; Dharma, 1988; McIlroy & Yusniasita Dols, 2008). Duclos (1840), who was the first to revise Lamarck’s *Oliva*

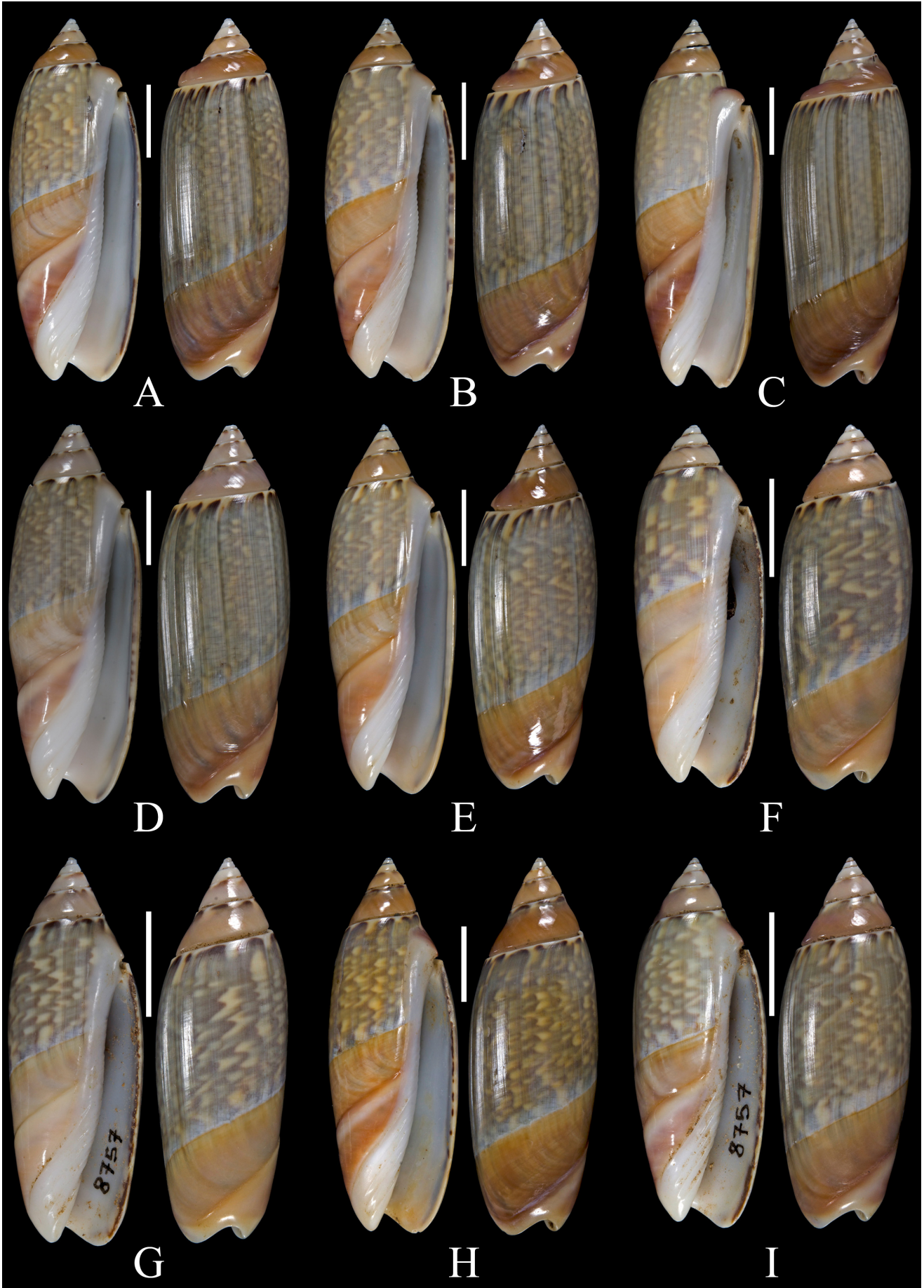


Fig. 6. *Agaronia java* new species. A–I, Pasuruan, northern East Java, Indonesia (A, MZB [holotype]; B–C, F, G, CNHE [paratypes]; D–E, ZRC.MOL.14040 [paratypes]; G, I, ZRC.MOL.8757). Scale bar = 10 mm.

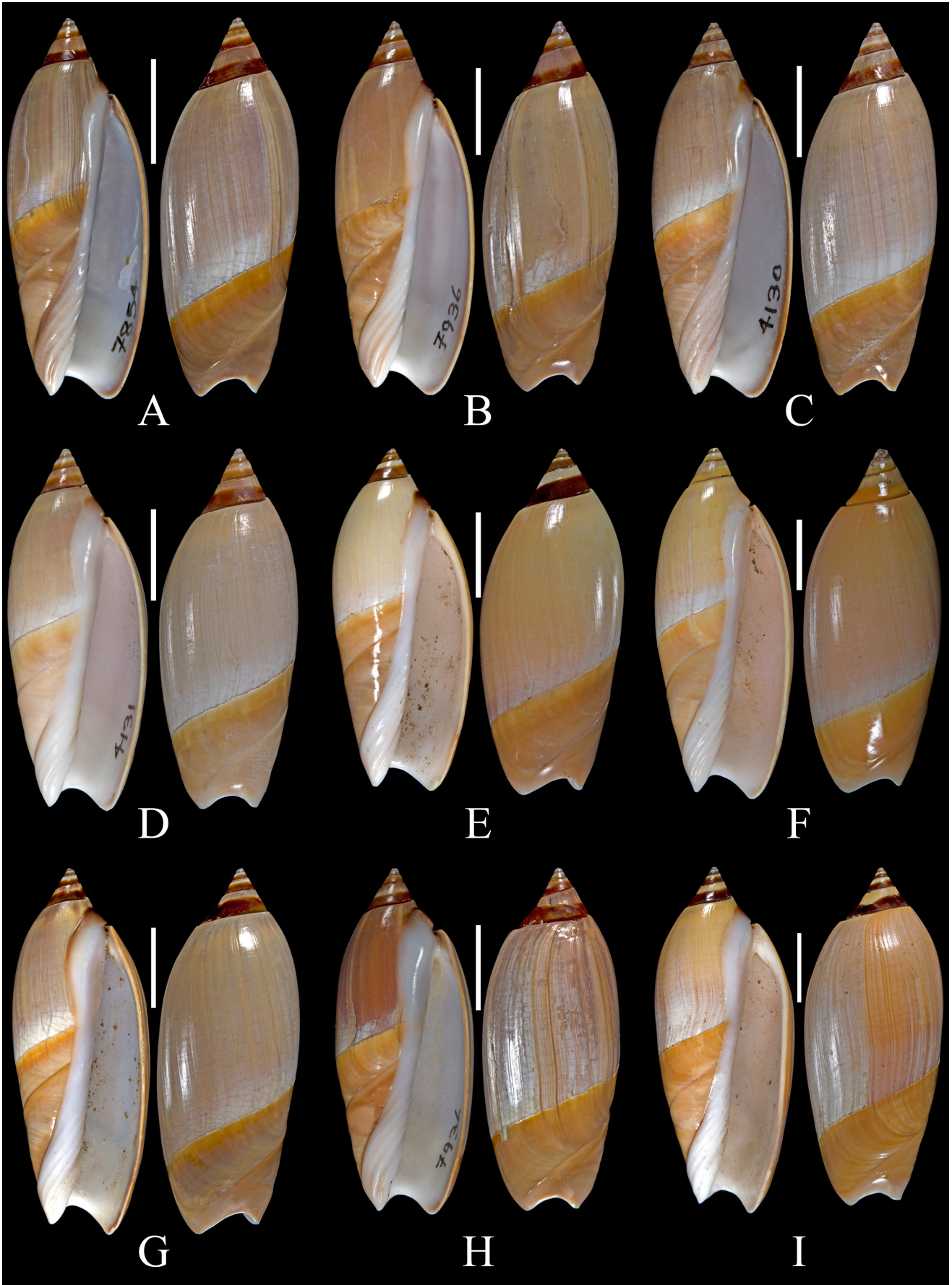


Fig. 7. *Agaronia johnkochi* Voskuil, 1990. A, Teluk Penyau, Cilacap, Java, Indonesia (ZRC.MOL.7854); B–D, H, Nusa Kambangan, Cilacap, Java, Indonesia (B, H, ZRC.MOL.7936; C, ZRC.MOL.4130; D, ZRC.MOL.4131); E–G, I, Nusa Barong (CNHE). Scale bar = 10 mm.



Fig. 8. *Agaronia johnkochi* Voskuil, 1990. Holotype of *Agaronia johnabbasi* Cilia, 2012 (MNHN-IM-2000-23267), SL 38 × SW 14 mm (measurements after Cilia, 2012), East Pangandaran Bay, Java, Indonesia. Reproduced with permission (M. Caballer MNHN, project E-RECOLNAT: ANR-11-INBS-0004).

names, concluded that Lamarck's (1822) *nebulosa* is a juvenile form of *Oliva utriculus* (= *gibbosa*). Interestingly Lamarck himself may have agreed (see Greifeneder *et al.*, 1995). In the original description, Lamarck (1822) describes the fasciolar band as "luteo-fulvâ, fusco-flammulatâ" [loosely translated as "yellow-brown, dark flammules"] and refers to Martini (1773: pl. 49, figs. 539–540) which clearly represent the smaller and slimmer forms of *Agaronia gibbosa*. We therefore regard Lamarck's *nebulosa* to be a junior subjective synonym. Recently Vervaet (2018) came to the same conclusion and treated the taxonomic history in detail (see also Discussion).

***Agaronia java* new species**

(Figs. 1C, 6)

- Voluta utriculus* Gmelin, 1791 (in part).
Porphyria lutaria Röding, 1798: 34 (in part).
Oliva gibbosa – Marrat, 1871: pl. 346 (*Oliva* pl. XIX), fig. 302 ([in part] non *Voluta gibbosa* Born, 1778).
Agaronia nebulosa – Dharma, 1988: 98, pl. 35, figs. 10–10a; Robin, 2008: 386, fig. 5; Hunon, 2009: 127, fig. 3 (non *Oliva nebulosa* Lamarck, 1822).
Agaronia (Anazola) nebulosa – Voskuil, 1990: 20, pl. 4, fig. 5; Sterba, 2003: 112, pl. 43, figs. 20–22; Sterba, 2004:

112, pl. 43, figs. 20–22. (non *Oliva nebulosa* Lamarck, 1822).

Olivancillaria nebulosa – Drivas & Jay, 2001: 90, pl. 30, fig. 4 (non *Oliva nebulosa* Lamarck, 1822).

Anazola nebulosa – Dharma, 2005: 150, pl. 50, figs 3a–3c (non *Oliva nebulosa* Lamarck, 1822).

Anazola adamii – Hunon, 2009: 127, fig. 6 (non *Agaronia adamii* Terzer, 1992).

Material examined. Indonesia: Holotype: SL 50.7 × SW 19.3 mm (MZB), northern East Java, Pasuruan, low tide, no coll. date. Paratypes: 2 exx. SL 49.5 × SW 18.0, SL 52.2 × SW 18.7 mm (ZRC.MOL.14040), 5 exx. SL 45.1 × SW 16.1–SL 55.6 × SW 20.2 mm (CNHE), same data as holotype; 2 exx. SL 30.7 × SW 10.1, SL 49.5 × SW 16.9 mm (PRE), East Java, Situbondo, Panarukan, shallow water, coll. 2017; 2 exx. SL 37.8 × SW 14.2, SL 51.0 × SW 18.4 mm (CNHE), East Java, Pasuruan, intertidal, no coll. date. Non type material: 3 exx. SL 41.8 × SW 15.2–SL 44.5 × SW 16.1 mm (CSY 181.13.1.3), south of West Java, coll. 1 Sep.1989; 1 ex. SL 38 × SW 14 mm (CNHE), Central Java, Jepara, coll. 1995; 1 ex. SL 46 × SW 17 mm (CNHE), northeast Central Java, Rembang, coll. 1995; 5 exx. SL 36.5 × SW 13.6–SL 39.9 × SW 15.2 mm (ZRC.MOL.8757), Indonesia [no other data], coll. Aug.2002; 1 ex. SL 52.1 × SW 18.1 mm (PRE), south East Java, Popoh, coll. 2015; 3 exx. SL39.8 × SW 15.0–SL 41.3 × SW 15.2 mm (PRE), West Java, Merak beach (Sunda Strait), coll. 2017; 39 exx. [not measured] (PRE), East Java, Banyuwangi, coll. 2018; 2 exx. SL 37.6 × SW 13.3–SL 45.2 × SW 16.1 mm (CSY 181.13.1.1 [ex coll. B. Dharma]), West Java, Serang, Karangantu, no coll. date.

Diagnostic description. Shell moderately thick and solid; to more than 55 mm in shell length. Last whorl narrowly cylindrical; outline slightly convex, central part often nearly parallel-sided. Overall cloak colour greenish or bluish grey. Cloak base colour cream, with reticulated pattern formed by crowded light brownish grey fine zigzagging lines; reticulated pattern terminate in a row of dark brown spots or blotches along the edge of the filament channel, which extends to the spire as dark spots along the spire callus. Olivoid band tan, typically with a distinct dark salmon pink line abutting the rear edge of anterior band. Anterior band dark salmon pink, with the raised cord-like rear edge of anterior band cream or light peach. Parietal callus white, commonly with brownish tint around olivoid band, moderately thick; edge straight or very slightly convex. Plication plate white, often with brownish tint at the anterior part. Outer lip slightly thickened centrally in specimens with mature outer lip. Columellar lip profile slightly sinuous, concave posteriorly and convex around position of anterior band.

Type locality. Northern East Java (Madura Strait), Indonesia.

Distribution. Distributed along the northern coasts of Java from the Sunda Strait to Bali Strait (Voskuil, 1990; Dharma, 2005; this study), and possibly in areas immediately adjacent to Java in the Java Sea. Occurrence

of this species in the Indian Ocean requires confirmation.

Etymology. The species epithet is derived from the type locality Java, which is used as a noun in apposition.

Remarks. *Agaronia java* new species, has a shell shape that is distinctly more cylindrical compared to its Sundaic congeners. Some forms of *Agaronia gibbosa* can be very similar in shell colouration, but that species has a fasciolar band with blotches or flammules not seen in this species. *Agaronia lutaria* similarly has a fasciolar band without prominent markings, but can be distinguished from this species by its different shell shape and cloak colour. In specimens of *Agaronia java* with a mature thickened lip, the middle part of the lip is noticeably thickened like *Agaronia adamii*, but confusion with the latter species is unlikely.

Although this species was figured in early works such as Martini (1773: pl. 50, fig. 553), this taxon has not been formally and unambiguously named thus far. It is usually interpreted as a variation of other species by earlier authors (see chresonymy listed). It is well recognised and figured by contemporary authors as a distinct species (e.g., Sterba, 2004; Dharma, 2005), but usually [mis]identified as Lamarck's *nebulosa* (= *Agaronia gibbosa*), which is an Indian Ocean species (see also Remarks under *Agaronia gibbosa*).

This species is found along the northern coasts of Java and appears to be most common around the northeastern part. We consider the likelihood of this species being widespread in the Indian Ocean to be low despite a number of records. A specimen figured by Drivas & Jay (2001: 90, pl. 30, fig. 4 [as *Olivancillaria nebulosa*]) matches *Agaronia java* very well, but it is not known if a specimen from Indonesia was used for illustration. No other figured records from the Mascarene Islands were located. Specimens purportedly from India have also appeared in the shell trade very recently. Similarly, because there have been no historical reports of this species from that area and considering the longstanding confusion of this species with the slimmer “*nebulosa*” form of *Agaronia gibbosa*, a mix-up of the locality information by the suppliers or dealers is very likely. We also consider the lots purportedly from Popoh, southern East Java (PRE) and south of West Java (CSY 181.13.1.3) as very likely mislabelled by the local shell dealers for the same reason. Its presence in southern Java, the Bay of Bengal and other parts of the Indian Ocean require verification.

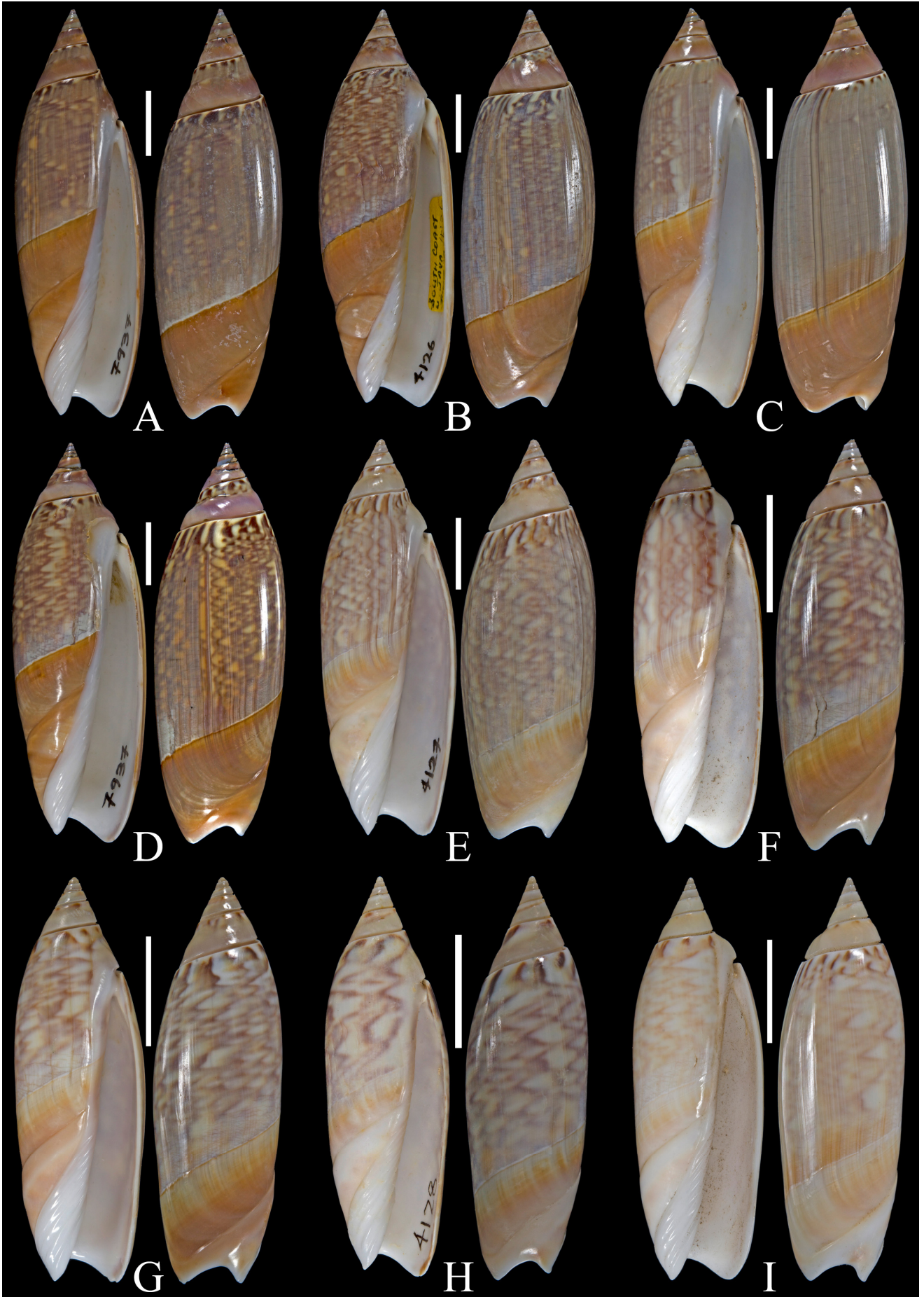
Agaronia johnkochi Voskuil, 1990

(Figs. 1D, 7, 8)

Agaronia sp. Dharma, 1988: 98, pl. 35, figs. 11–11c.

Agaronia (Agaronia) johnkochi Voskuil, 1990: 19, pl. 4, figs. 1–2

Agaronia (Anazola) johnkochi – Sterba, 2003: 112, pl. 43, figs. 30–32; Sterba, 2004: 112, pl. 43, figs. 30–32.



Agaronia johnkochi – Dharma, 2005: 150, pl. 50, figs 4a–d; Robin, 2008: 386, fig. 3.

Agaronia johnabbasi Cilia, 2012: 33, figs. 1–6.

Material examined. Indonesia: 1 ex. SL 44.0 × SW 18.6 mm (ZRC.MOL.3762), 3 exx. SL 37.7 × SW 15.8–SL 44.3 × SW 19.3 mm (ZRC.MOL.4129–4131), 15 exx. SL 36.6 × SW 14.6–SL 44.4 × SW 18.4 mm (ZRC.MOL.7936), Java, Cilacap, Nusa Kambangan, coll. 5 May 1973; 3 exx. SL 31.7 × SW 12.3–SL 37.1 × SW 14.3 mm (ZRC.MOL.7854), Central Java, Cilacap, Teluk Penyau, coll. 4 Jan.2004; 4 exx. SL 41.2 × SW 17.9–SH 50.7 × SW 21.2 mm (CNHE), Java, East Java, Nusa Barong, nets 18–20 m depth, no coll. date. **Peninsular Malaysia:** 3 exx. SL 37.8 × SW 15.9–SL 44.5 × SW 19.5 mm (ZRC.MOL.8755), no other locality information, coll. 1968 [locality data likely erroneous].

Diagnosis. Shell slender cylindrically ovate (SL to more than 50 mm). Spire high conical with straight or very slightly concave profile. Spire callus chocolate brown, covering around half of spire whorls, very rarely a much lighter tan or apricot colour. Cloak yellowish beige to greyish brown without patterns, usually with pale whitish band along olivoid groove. Olivoid band tan, often slightly brighter near olivoid groove. Anterior band similarly tan coloured but usually of a slightly different shade. Dark line usually present along the raised cord-like rear edge of anterior band. Plication plate grooves typically darker brown. Columellar lip profile generally straight, only curving slightly at the anterior end.

Type locality. Cilacap, Java, Indonesia (Voskuil, 1990).

Distribution. Probably restricted to the southern (Indian Ocean) coast of Java, Indonesia (e.g., Dharma, 1988, 2005; Voskuil, 1990; Sterba, 2004; this study).

Remarks. The unicoloured cloak, fasciolar band, and prominent dark brown spire callus easily sets this species apart from the others. In addition, its shell shape and profile, relatively large aperture, and rather thin and light shell, are quite distinctive. Comparatively little variation is noted for this species apart from some slight differences in shell colouration and shape. Locality data of the single lot purportedly from Peninsular Malaysia (i.e. ZRC.MOL.8755) is almost certainly an error. We found no evidence to suggest that the species occurs in the South China Sea or the Malacca Strait.

Agaronia johnabbasi Cilia, 2012 (Fig. 8) recently described from East Pangandaran Bay, Java, is accepted here as a junior subjective synonym of *Agaronia johnkochi*. Both species occur in the same geographical area and the supposedly higher and more acutely angled spire mentioned in Cilia (2012) is still within the

variations of *johnkochi*, especially juveniles that are more slender and pointed. No discernible morphological characters to convincingly separate the two was found. *Agaronia johnabbasi* appears to be merely an unusual colour form, or described based on discoloured specimens.

Agaronia lutaria (Röding, 1798)

(Figs. 1E, 9)

Porphyria lutaria Röding, 1798: 34 (in part).

Voluta utriculus Gmelin, 1791 (in part).

Oliva subulata Lamarck, 1811: 324 – Lamarck, 1822: 434.

Oliva acuminata – Reeve, 1850: pl.16, fig. 33c (in part non *Oliva acuminata* Lamarck, 1811)

Olivancilla [sic] *subulata* – Leehman, 1977: 17.

Agaronia lutaria – Cernohorsky, 1980.

Agaronia (*Anazola*) *lutaria* – Voskuil, 1990: 20, pl. 4, fig. 4; Sterba, 2003: 112, pl. 43, figs. 26–29; Sterba, 2004: 112, pl. 43, figs. 26–29.

Anazola lutaria lutaria – Dharma, 2005: 150, pl. 50, figs. 2a–2c.

Anazola lutaria var. *fikasherinae* Dharma, 2009: 18 [unavailable].

Material examined. Indonesia: Neotype (here designated): SL 69.1 × SW 24.4 (ZRC.MOL.4126), Java, Cilacap, Nusa Kambangan, coll. Jun.1977. Other material: 5 exx. SL 52.0 × SW 20.4–SL 74.8 × SW 26.2 mm (ZRC.MOL.7937), Java, Cilacap, Nusa Kambangan, coll. 5 May 1973; 1 ex. SL 72.8 × SW 26.2 (ZRC.MOL.3761), Java, Cilacap, Nusa Kambangan, coll. Jun.1977; 3 exx. SL 54.3 × SW 18.1–SL 59.3 × SW 20.9 mm (CSY 181.13.6.0), south of West Java, 6 ft. in sand, coll. Oct.1990; 1 ex. SL 44.3 × SW 14.6 mm (ZRC.MOL.8756), no other locality information, coll. Aug.2002; 7 exx. SL 39.2 × SW 13.2–SL 50.8 × SW 17.7 mm (ZRC.MOL.7853), Java, Cilacap, Teluk Penyau, coll. Jan.2004; 1 ex. 56.7 × SW 20.5 (CNHE), Java, Cilacap, no coll. date; 3 exx. SL 68.1 × SW 22.8–SL 76.1 × SW 24.5 mm (CSY 181.13.6.2), south Java, Cilacap, no coll. date; 3 exx. SL 33.2 × SW 11.3–SL 37.7 × SW 12.4 mm (CSY 181.13.10.0), East Java, no coll. date; 3 exx. [not measured] (MZB Gst.14.577), East Java, Banyuwangi, Pantai Lampon, no coll. date; 1 ex. SL 55.7 × SW 20.0 mm (ZRC.MOL.4127), Bali, Kuta, coll. Dec.1970; 1 ex. SL 36.3 × SW 11.2 mm (ZRC.MOL.4128), Bali, Kuta, coll. 27 Jun.1971; 8 exx. SL 35.6 × SW 11.6–SL 40.6 × SW 13.6 (CNHE), Bali, Gilimanuk, intertidal, coll. 1989; 1 ex. SL 44.1 × SW 15.2 (CSY 181.13.10.1), Bali, coll. 1 Jun.1994; 2 exx. SL 42 × SW 14–SL 45 × SW 15 mm (CNHE), south Java, Krakal, coll. 1995. **Unknown locality:** 1 ex. SL 44.7 mm (MHNG-MOLL-96123 [Delessert collection]), no data.

◀ (previous page)

Fig. 9. *Agaronia lutaria* (Röding, 1798). A–B, D, Nusa Kambangan, Cilacap, Java, Indonesia (A, ZRC.MOL.7937; B, ZRC.MOL.4126 [simultaneous neotype of *Porphyria lutaria* Röding, 1798, and *Oliva subulata* Lamarck, 1811]; D, ZRC.MOL.7937); C, south of West Java, Indonesia (CSY 181.13.6.0); E, H, Kuta, Bali, Indonesia (E, ZRC.MOL.4127; H, ZRC.MOL.4128); F, I, Gilimanuk, Bali, Indonesia (CNHE); G, East Java (CSY 181.13.10.0). Scale bar = 10 mm.

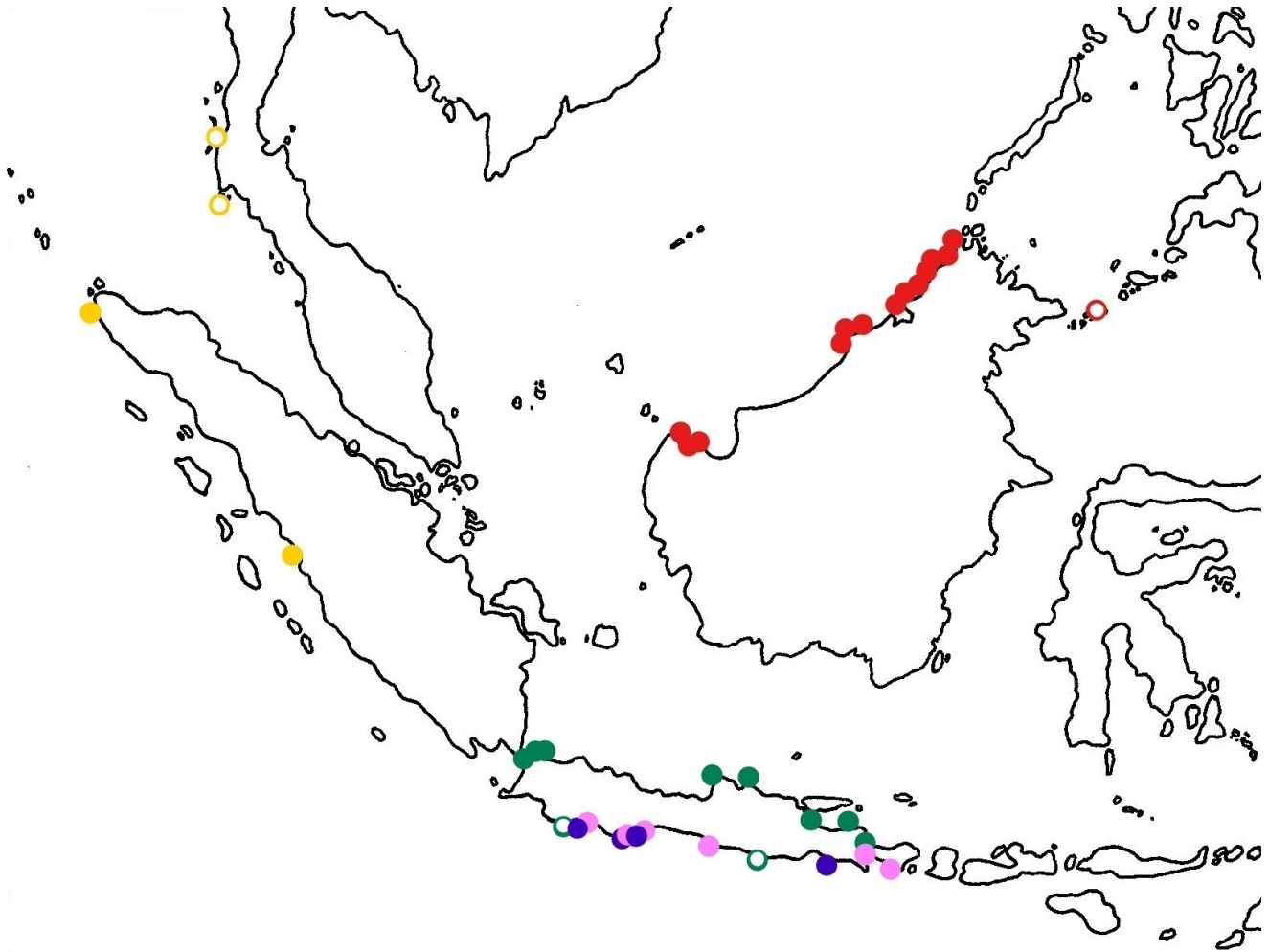


Fig. 10. Distribution of *Agaronia* in the Sundaic region, based on material examined in this study and literature records (Tantanasiriwong, 1978; Dharma, 1988, 2005; Voskuil, 1990; Raven & Recourt, 2018). *Agaronia adamii* (red [open red circle marks the type locality Tawi-tawi]), *Agaronia gibbosa* (yellow [open yellow circles are localities just beyond the Sunda shelf]), *Agaronia java* (green [open green circles indicate localities we consider to be possibly erroneous and requiring verification]), *Agaronia johnkochi* (blue), and *Agaronia lutaria* (pink).

Diagnosis. Shell slender elongately cylindrical, relatively more spindle-shaped (SL to more than 75 mm). Spire high conical with straight or slightly concave profile. Spire callus covering half or more of spire whorls, dark salmon pink, often purplish. Cloak colour varying from light cream to beige, with brown zigzagging lines or reticulated pattern typically accentuated with a band of bold dark brown spots and blotches along edge of filament channel. Cloak usually with a pale band along olivoid groove. Fasciolar band tan to tawny brown. Olivoid band often slightly brighter near olivoid groove. Anterior band usually a lighter shade than olivoid band; often distinctly lighter or darker along rear edge of anterior band. Parietal callus white, rather thin. Plication plate white, sometimes with brownish tint. Columellar lip profile rather straight or with very slight inconspicuous curvature.

Type locality. Nusa Kambangan, Cilacap, Java, Indonesia (neotype). Locality not given by Röding (1798) for *Porphyria lutaria*, “Habite l’Océan indien, les

côtes de Java” (Indian Ocean, coasts of Java) stated by Lamarck (1811) for *Oliva subulata*.

Distribution. Apparently restricted to the southern (Indian Ocean) coasts of Java and Bali, Indonesia (Dharma, 2005; Voskuil, 1990; this study).

Remarks. *Agaronia lutaria* appears to be the largest Sundaic species. Conchological characteristics of this elongate species are generally consistent apart from notable variations in colour and patterns (see also Remarks under *Agaronia adamii* and *Agaronia java*). A new name *fikasherinae* was proposed by Dharma (2009) for pale white or light yellowish beige shells with bold zigzagging patterns. However because this was proposed as an infrasubspecific taxon (i.e. new variety of *Agaronia lutaria*) it did not meet the requirements of the Code and is not available for nomenclatural purposes (ICZN 1999 [Articles 10.2, 45.5, and 45.6.3]). However, we regard a new name or validation as unnecessary as apparent intergrades between this pale

'fikasherinae' form and typical *lutaria* were seen amongst our material and it is here accepted as a mere colour form. Nevertheless, this form seems to be only common, or possibly restricted to, around the easternmost part of Java and the adjacent coasts of Bali. Future research may prove it a geographically distinct taxon.

Type material of *Porphyria lutaria* Röding, 1798, cannot be traced and is presumed to be lost. Type material of *Oliva subulata* and *Oliva acuminata* were also not located in the Lamarck collection in the MHNG (E. Tardy in litt. Dec.2016). Röding (1798) refers to several representative figures (e.g., Martini, 1773: pl. 50, figs. 549, 550 and 553; Knorr, 1768: pl. 17, fig. 2) in the original description of *Porphyria lutaria*. Under scrutiny however, it is apparent that the figures represent at least two distinct species as understood today. To confound things further, the identical Martini figures were also cited by Lamarck (1811) for his *Oliva subulata* (i.e. Martini, 1773: pl. 50, figs. 549, 550) and *Oliva acuminata* (i.e. Martini, 1773: pl. 50, figs. 551, 553). Currently Lamarck's *subulata* is accepted as a junior synonym of *lutaria* since Cernohorsky (1980), and *acuminata* a valid African species (e.g., Cilia, 2012; Kantor et al., 2017), so Röding's (1798) references to the same figures is problematic. Thus, for the sake of nomenclatural and taxonomic stability, a specimen that agrees well with figure 550 of Martini (1773: pl. 50) is here selected as a simultaneous neotype of both *Porphyria lutaria* Röding, 1798 and *Oliva subulata* Lamarck, 1811, to unambiguously fix their identities in accordance with ICZN (1999 [Article 75]). The neotype designation makes them objective synonyms and preserves current usage. Moreover, the selected neotype makes it unquestionably clear that *Porphyria lutaria* Röding, 1798 is distinct from, and not possibly synonymous with *Agaronia acuminata* (Lamarck, 1811).

Discussion

Most Sundaic *Agaronia* can be identified with relative ease based on conchological characteristics and locality information. Traditional shell based taxonomy utilising shell morphology, colouration and patterns appear to be largely reliable for species diagnoses with very few exceptions. Only *Agaronia adamii* and *Agaronia gibbosa* exhibit relatively high intraspecific variability in shell shape (which includes the spire height and profile). Nevertheless we acknowledge that species delimitation remains to be corroborated with molecular evidence. *Agaronia gibbosa* is the only species treated herein that is not restricted to the Sundaic region. It is here included because there are a few records of this species at the western limits of the Sunda Shelf and also because of prevailing taxonomic confusion with other Sundaic species. Its congeners occupy relatively small geographical areas (see Fig. 10). *Agaronia adamii* seems to be restricted to the northern coasts of Borneo facing the South China Sea. Further studies are required to ascertain if it occurs in the Philippines, including its type

locality Tawi-Tawi. *Agaronia johnkochi* and *Agaronia lutaria* seem to be the only species that occur in sympatry along the southern or Indian Ocean coasts of Java. The distributional range of *Agaronia java* is at present somewhat unclear. Members of this genus are notably absent in the molluscan literature focusing on the Philippines (e.g., Springsteen & Leobrera, 1986; Sargent & Petuch, 2008). There are also no records of *Agaronia* from the Riau Archipelago or Kalimantan, the Indonesian section of Borneo. Future surveys of the inadequately sampled regions and further research are needed to elucidate and refine the distribution ranges of the respective species, and to verify the possibly erroneous locality information that may have been perpetrated by the shell trade.

According to Vervaeke (2018), *Agaronia junior* (Duclos, 1840) is the correct name for the *Agaronia nebulosa* of authors, which is usually accepted as a smaller and slimmer species sympatric with *Agaronia gibbosa* (Born, 1778) in the Indian Ocean (e.g., Satyamurti, 1952; Abbott, 1991; Apte, 1998). However, the generally cited diagnoses based on shell shape or profile, and certain conchological characteristics appear to be unreliable as there is much intergradation from the small and slim *junior* (previously *nebulosa*) to the typical large rotund *gibbosa* forms, and we did not find notable differences to separate our material convincingly into the two putative species. Generally smaller shells tend to be slimmer, but it is noted that the rotundness of the shell is not strictly size dependent as this is variable in shells with similar shell lengths (see also Perini & Centomo, 2013). Shell colour is variable and the often-mentioned purplish spot at the base of the columella (plication plate) is inconsistently present in smaller shells of both slim and rotund forms. Consequently, we are of the tentative opinion that Duclos' *junior* merely represents the slim juvenile form, while Lamarck's *nebulosa* is the slightly larger mid-sized form of *Agaronia gibbosa*. Nevertheless we refrain from sinking this well accepted taxon under the synonymy of *Agaronia gibbosa* pending further study.

It must be noted that several fossil olivids cannot be clearly separated from some living species, such as a few described by Martin from Java in the late 1800s to the early 1900s (see Leloux & Wesselingh, 2009 and references therein cited). Glaring examples are *Agaronia cheribonensis* (Martin, 1895) versus *Agaronia adamii* Terzer, 1992, and *Agaronia odengensis* (Martin, 1895) versus *Agaronia johnkochi* Voskuil, 1990 (see Leloux & Wesselingh, 2009: pls. 165–169; see also Dharma, 2005: pl. 130). A Neogene fossil *Agaronia* described by Cox (1948) as *Oliva (Anazola) hattoni* from the Dent Peninsula, Sabah, is known only from the holotype to date. However, much of the outer lip (and possibly part of the body whorl) is missing on this specimen and more topotypic specimens will be required to determine if it is possibly identical to *Agaronia adamii* Terzer, 1992, the only living species in the area. It is premature to conclude that any of the fossil taxa found in the region are conspecific to the living *Agaronia*, or are related



Fig. 11. *Oliva elongata* Fischer von Waldheim, 1807. Lectotype (ZMMU L-450) designated by Ivanov & Kantor (1991), SL 63.2 × SW 23.0 mm (measurements after Ivanov *et al.*, 1993), no locality. Reproduced with permission (Alexander Sysoev, ZMMU).

ancestral forms. Shell colour and patterns, which are useful and often critical for species determination in this group of molluscs are lacking in fossils, and fossils cannot be utilised for current methods of phylogenetic analyses, which make taxonomic decisions difficult, and uncertainties will remain. It may therefore be preferable to treat fossil taxa as separate and distinct, and we consider it prudent and appropriate to maintain the recent species as distinct from fossil taxa for the time being. Additional studies are no doubt necessary to reach a consensus on this possibly contentious issue.

Other excluded species

***Oliva elongata* Fischer von Waldheim, 1807 (Fig. 11) [no type locality].** This species has been regarded as a junior synonym of *Agaronia gibbosa* by Sterba (2003, 2004), a probable senior synonym of *Agaronia nebulosa* (= *Agaronia gibbosa*) by Ivanov *et al.* (1993), and interpreted to be a tall-spined form of *Agaronia gibbosa* by Robin (2008) and Lhaumet (2009). However the lectotype specimen selected by Ivanov & Kantor (1991; see also Ivanov *et al.*, 1993) does not match *Agaronia*

gibbosa nor any of the Sundaic *Agaronia*. Instead, it is most probably synonymous with the West African *Agaronia acuminata* (Lamarck, 1811). It also bears resemblance to *Agaronia biraghii* Bernard & Nicolay, 1984. The status of *Oliva elongata* Fischer von Waldheim, 1807, will require further research beyond the scope of the present study.

***Oliva luteola* Lamarck, 1811 [no type locality].** A species inquirenda. Duclos (1840) regards this species to be a variety of *Agaronia subulata*, which we were unable to verify. No type material was located in the Lamarck collection in the MHNG (E. Tardy in litt. Dec.2016). Lamarck (1811) refers to several figures which may not be conspecific (see Gualtieri, 1742: pl. 24, fig. A; and Martini, 1773: pl. 40, fig. 554), and with uncertainty to Chemnitz (1788: pl. 147, fig. 1378) which is probably not an *Agaronia*. We consider this species unidentifiable from the original description and cited illustrations.

***Oliva plicaria* Lamarck, 1811 [Bordeaux, France].** This species was erroneously listed by Sanpanich & Duangdee (2013 [as *Agaronia plicaria*]) from the Gulf of Thailand and the opportunity is here taken to clarify that the record in Thailand is in fact an *Oliva* species, either *Oliva oliva* or *Oliva inspidula* (K. Sanpanich pers. comm., Dec.2016). There is hitherto no reliable record of *Agaronia* in the Gulf of Thailand.

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