NATURE IN SINGAPORE 2013 **6**: 247–256
Date of Publication: 25 October 2013

SINGAPORE MOLLUSCA: 2. THE FAMILY TRAPEZIDAE WITH A NEW RECORD OF *GLOSSOCARDIA OBESA* (BIVALVIA: VENEROIDA: ARCTICOIDEA)

Siong Kiat Tan[*] and **Martyn E. Y Low**
Raffles Museum of Biodiversity Research, National University of Singapore
6 Science Drive 2, Singapore 117546, Republic of Singapore
([*]Corresponding author: dbstsk@nus.edu.sg)

ABSTRACT. — The family Trapezidae is reviewed in the second of a series of group-by-group treatments of the molluscs of Singapore. The family is represented in Singapore waters by *Coralliophaga coralliophaga*, *Neotrapezium sublaevigatum*, and *Glossocardia obesa*. The last-named is a first record of this species from Singapore and is based on two specimens from Pulau Jong in the Singapore Straits.

KEY WORDS. — Mollusca, Trapezidae, *Coralliophaga*, *Glossocardia*, *Neotrapezium*, taxonomy, new record, Singapore

INTRODUCTION

In the second part of a series of group-by-group treatments of the molluscs found in the Republic of Singapore (see S. K. Tan & Low, 2013), the family Trapezidae Lamy, 1920, is reviewed.

The Trapezidae is a very small family of bivalves with only a dozen recognised species assigned to five genera (Huber, 2010). The shells are generally whitish, elongately modioliform or subquadrate in shape, with anteriorly situated umbones. Members are usually found nestling in crevices or holes, singly or in small groups (Fig. 1; Morton, 1979, 1982; Oliver, 1992).

Fig. 1. Four individuals of *Neotrapezium sublaevigatum* (Lamarck, 1819), byssally attached on the underside of a rock of a seawall at Pulau Semakau (see Fig. 2 for location). (Photograph by: S. K. Tan).

Herein, we report on the trapezids from Singapore with descriptions and notes on their taxonomy, nomenclature, and local distribution. Details of records in the literature, and other notes of interest are also included. Three species of trapezids, namely *Coralliophaga coralliophaga* (Gmelin, 1791), *Neotrapezium sublaevigatum* (Lamarck, 1819), and *Glossocardia obesa* (Reeve, 1843), are now known from Singapore territorial waters. *Glossocardia obesa* is a new record for Singapore.

MATERIAL AND METHODS

Records were collated from the available literature, and geographically relevant material in collections was examined. Primary synonyms and records pertaining to Singapore are listed. Abbreviations of the collections from which specimens were examined in the course of this study are: ZRC = Zoological Reference Collection of the Raffles Museum of Biodiversity Research, National University of Singapore (NUS); and TSK = collection of the first author. Measurements are given in the form of shell height (SH) × shell length (SL). Shell height is defined as the distance from the highest part of the dorsal side to the lowest part of the basal edge, and shell length is the perpendicular distance between the anterior and posterior ends. All measurements are in millimetres (mm).

SYSTEMATIC ACCOUNTS

FAMILY TRAPEZIDAE LAMY, 1920

Trapeziidae Lamy, 1920: 259 (type genus *Trapezium* Megerle von Mühlfeld, 1811).

***Remarks*.** — The family-name Trapeziidae has been proposed twice. Miers (1886: 163) proposed the family-group name based on *Trapezia* Latreille, 1828. Lamy (1920: 259) also proposed the name based on *Trapezium* Megerle von Mühlfeld, 1811. The International Commission on Zoological Nomenclature ruled in Opinion 1615 (ICZN, 1990: 229) that the family-group name based on *Trapezium* Megerle von Mühlfeld, 1811, is to be emended to Trapezidae to remove this homonymy.

Genus *Coralliophaga* Blainville, 1824

Coralliophaga Blainville, 1824: 560 (type species *Coralliophaga carditoidea* Blainville, 1824, by monotypy; gender feminine).

Coralliophaga coralliophaga (Gmelin, 1791)
(Figs. 2, 3, 4D–F)

Chama coralliophaga Gmelin, 1791: 3305 (type locality: none).

Singapore records:
? *Cypricardia* sp. – Traill, 1847: 239.
Coralliophaga coralliophaga – Chuang, 1973: 198. — Chou et al., 1994: 78. — S. K. Tan & Woo, 2010: 16. — S. K. Tan & Yeo, 2010: 291 (Pulau Semakau).

***Material examined*.** — **Singapore**: Pulau Hantu (ZRC.MOL.5632), 1 Jun.2013; Pulau Jong (ZRC.MOL.5630), 28 May 2013; Pulau Kusu (ZRC.MOL.5631, ZRC.MOL.5633), 24 May 2013, 31 May 2013.

***Distribution in Singapore*.** — See Fig. 2.

***Habitat*.** — In empty burrows of boring bivalves (e.g., *Lithophaga* species and *Gastrochaena* species), typically in dead coral, and occasionally embedded in crevices (Morton, 1982; Oliver, 1992).

***Diagnosis*.** — The following diagnosis is based on specimens from Singapore and Lamprell & Whitehead (1992). Shell thin and translucent, moderately inflated, elongate or subquadrate in shape, to more than 40 mm in shell length; sculpture of inconspicuous fine radial lines which are obsolete anteriorly and posteriorly; usually with a few lamellose concentric ridges particularly distinct at the postero-ventral edges. Shell white externally and internally, pallial sinus shallow.

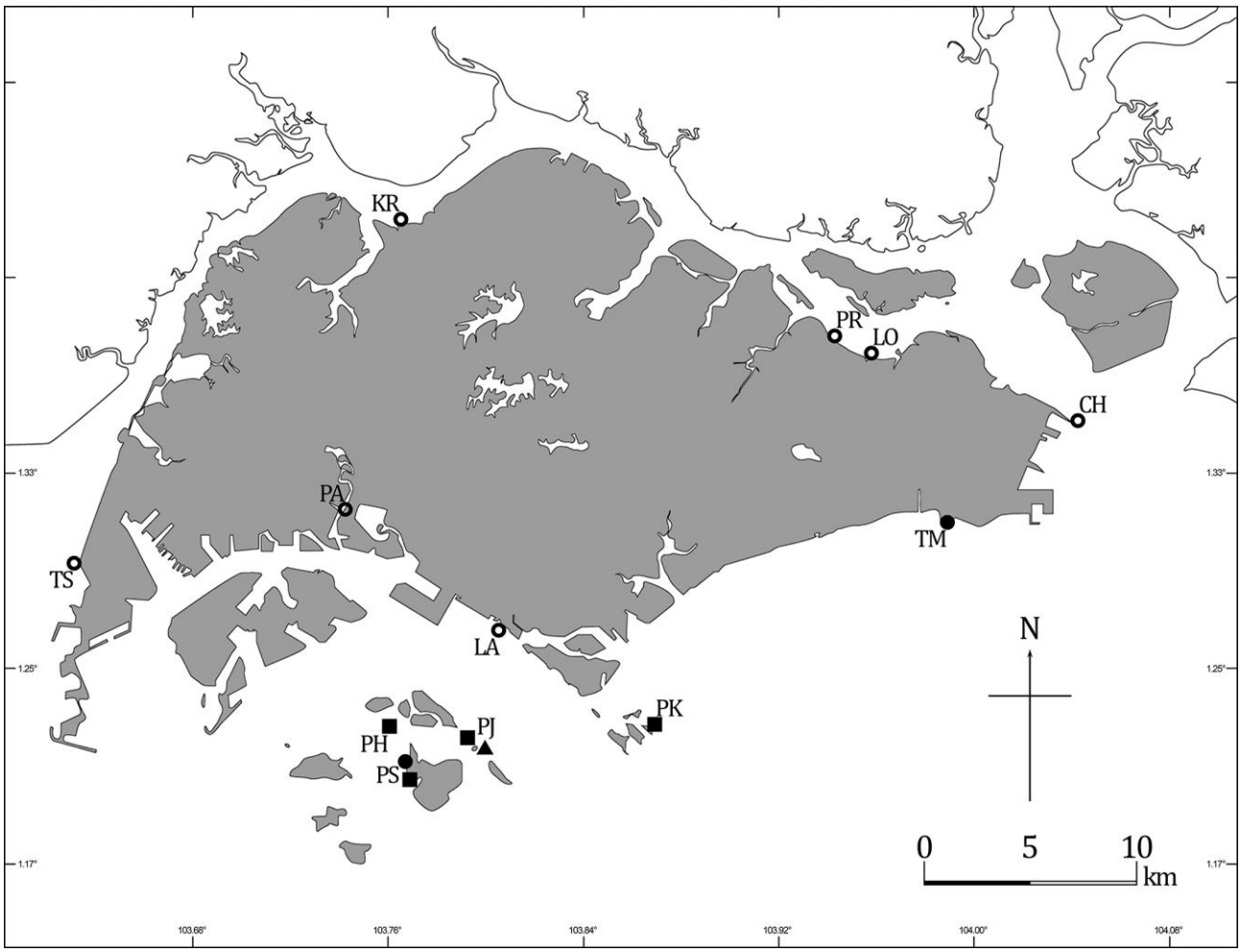

Fig. 2. Distribution records of the family Trapezidae Lamy, 1920, in Singapore: ■, *Coralliophaga coralliophaga* (Gmelin, 1791); ▲, *Glossocardia obesa* (Reeve, 1843); ●, *Neotrapezium sublaevigatum* (Lamarck, 1819). The solid symbols represent records based on material examined, while open symbols represent records from both published literature and unpublished data. Abbreviations used: CH, Changi; LO, Loyang; PA, Pandan; PH, Pulau Hantu; PJ, Pulau Jong; PK. Pulau Kusu; PR, Pasir Ris; PS, Pulau Semakau; TM, Tanah Merah Ferry Terminal; TS, Tuas South.

Remarks. — Shells of this species are highly variable in outline and sculpture, and may sometimes become distorted due to the shapes of the cavity the animals inhabit (see Fig. 3A, B). Nevertheless the shell sculpture, hinge teeth, and pallial line remain diagnostic. Interesting aspects of its biology were provided by Morton (1982), who also confirmed that it is a highly specialised nestler and not a borer as suggested by some earlier reports. Solem (1954: 77) provided a list of synonyms of this species, some of which were based on different forms.

The venerid clam *Irus irus* (Linnaeus, 1758) is often found nesting in crevices and may be confused with *Coralliophaga coralliophaga* due to similarities in general shell shape, sculpture of fine radial lines, and concentric lamellose ridges (see Fig. 4). The shell of the former is however, thicker and more solid, with more pronounced radial lines, and a distinctly deep pallial sinus (see Fig. 4B, C).

Specimens identified as *Coralliophaga coralliophaga* were reported from Sungei Buloh and Kranji by Sachidhanandam & Chou (1996) and Morris & R. D. Purchon (1981; see also R. D. Purchon & D. E. A. Purchon, 1981), respectively. Based on the locality and information provided we consider it very likely that their specimens have been confused with *Irus irus* and these records have been omitted. Furthermore, the material examined by Sachidhanandam & Chou (1996) in the ZRC (ZRC 1993.2520, ZRC 1993.1248, 1993.2326–2366) could not be located and may have been misplaced. *Irus irus* is found in the Johor Strait, and is commonly encountered in mangroves and muddy conditions. Conversely, *Coralliophaga coralliophaga* has not been reported from similar habitat conditions thus far.

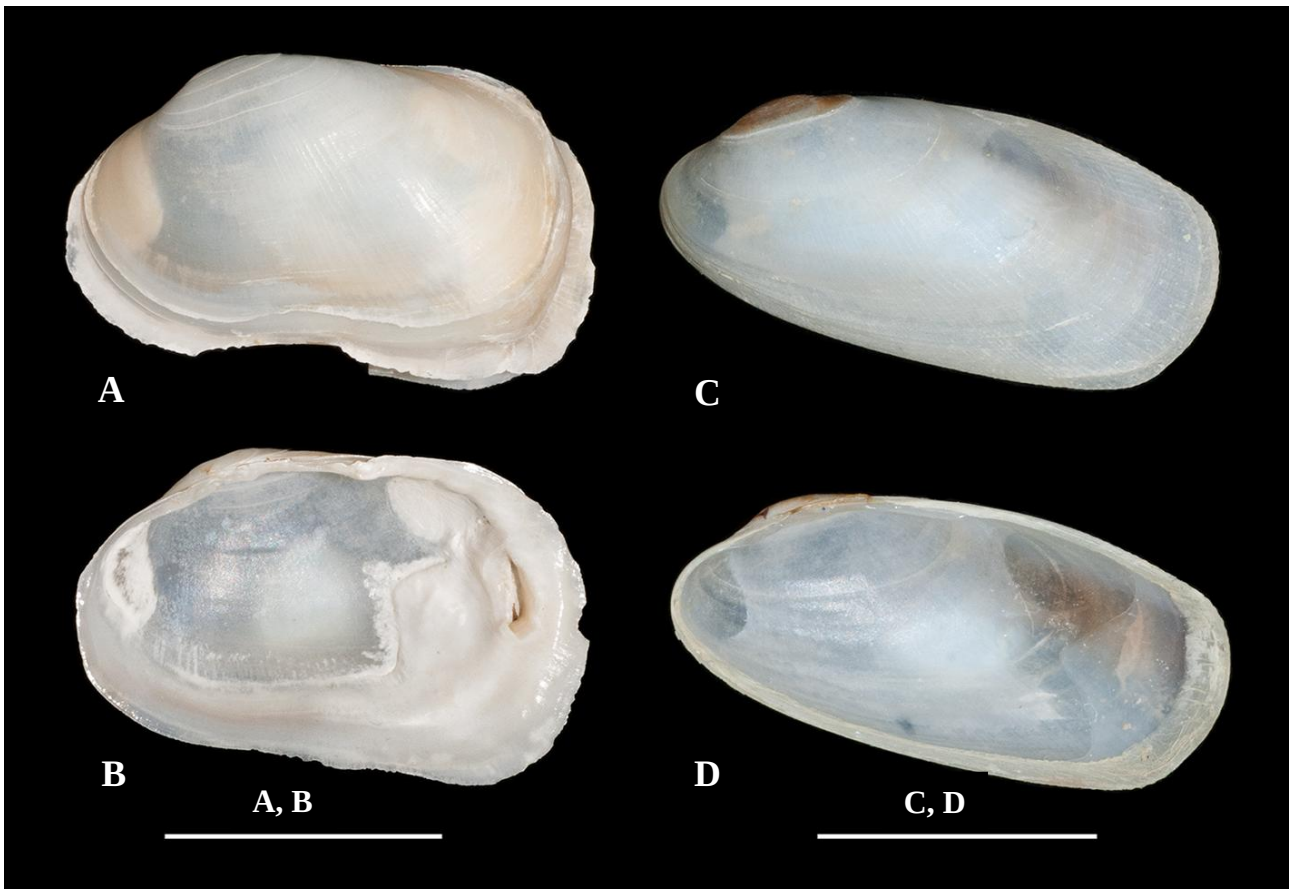

Fig. 3. *Coralliophaga coralliophaga* (Gmelin, 1791), from Singapore showing variations in shell form: A, B, Pulau Kusu (SH 13.3 × SL 18.3 mm; ZRC.MOL.5631); C, D, Pulau Hantu (SH 9.4 × SL 20.2 mm; ZRC.MOL.5632). Scale bars = 10 mm. (Photographs by: S. K. Tan).

Genus *Glossocardia* Stoliczka, 1870

Glossocardia Stoliczka, 1870: 189 (type species *Cypricardia obesa* Reeve, 1843, by original designation; gender feminine).

Glossocardia obesa (Reeve, 1843)

(Figs. 2, 5)

Cypricardia obesa Reeve, 1843: *Cypricardia* pl. 2, fig. 10, caption to figure (type locality: none).

***Material examined*.** — **Singapore**: Pulau Jong (ZRC.MOL.5617), 15 Sep.2012.

***Distribution in Singapore*.** — See Fig. 2.

***Habitat*.** — At depths of 9–55 m, infaunal or nestling in coral crevices (Paulay, 1987; Lamprell & Whitehead, 1992; Matsukuma & Habe, 1995).

***Diagnosis*.** — The following diagnosis is based on specimens from Singapore and Lamprell & Whitehead (1992). Shell solid, inflated, subquadrate with distinct posterior ridge, to more than 60 mm in shell length; sculpture of fine concentric lines. Shell exterior dirty white, with a small black spot under the umbones; interior white or tinted yellow, pallial line indiscernible.

***Remarks*.** — The specimens examined confirm the presence, and represent the first record, of this species in Singapore. This species is quite easily recognised by the characteristically inflated and box-like shell, and rather prominent hinge structure. Shell form and surface sculpture appear to be quite regular without remarkable variation although slight differences of the outline have been noticed for specimens originating from different localities (Hayami & Kase, 1993).

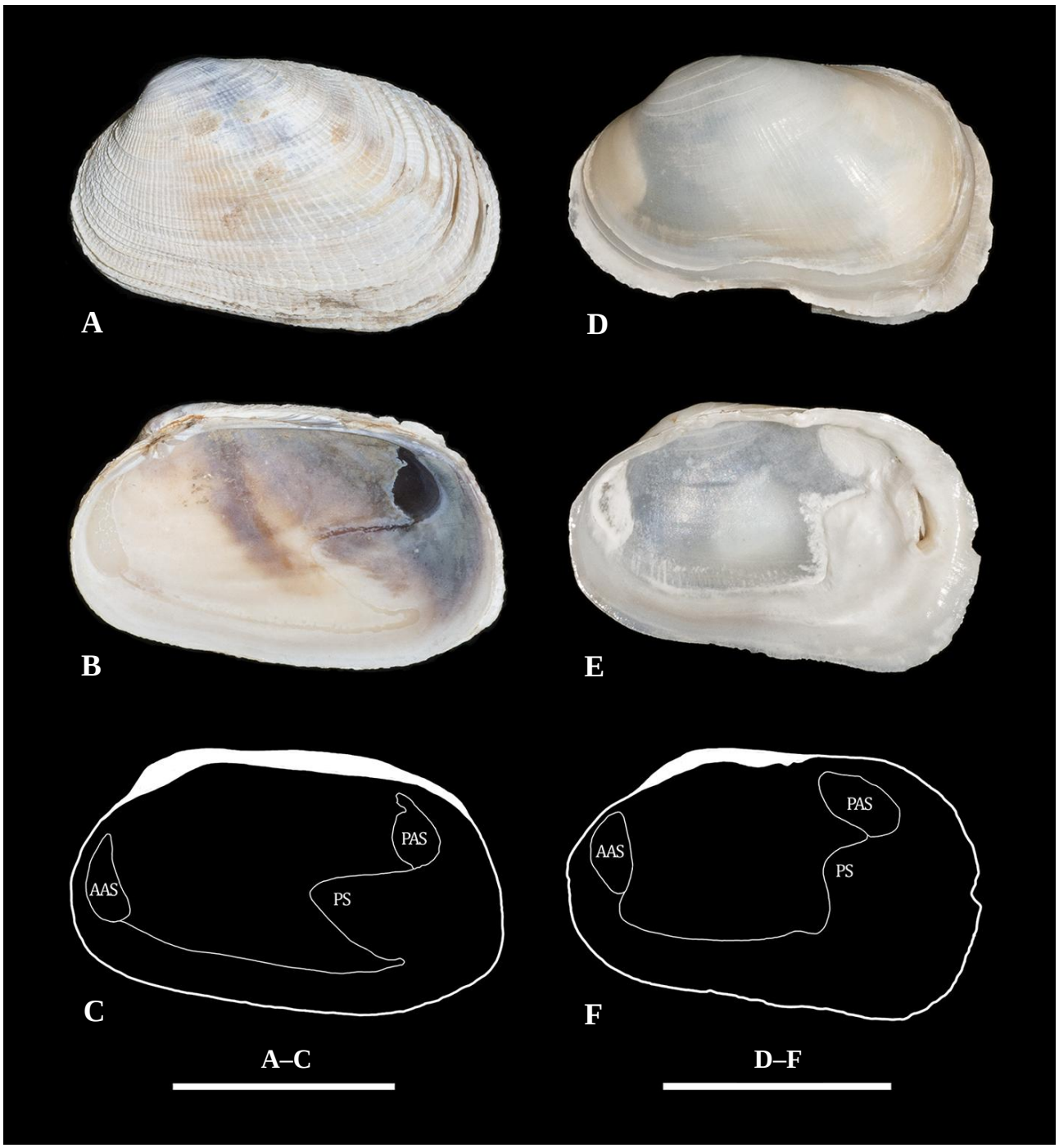

Fig. 4. A comparison of the venerid clam *Irus irus* (Linnaeus, 1758), that may be confused with *Coralliophaga coralliophaga* (Gmelin, 1791), due to similarities in shell shape and sculpture: A–C, *Irus irus* (Linnaeus, 1758) Kranji Dam (SH 12.0 × SL 19.7 mm; ZRC.MOL.5637); D–F, *Coralliophaga coralliophaga* (Gmelin, 1791; same specimen figured in Fig. 3A, B). The external views of both species (A, D) show the similarity in shell shape and sculpture. The internal views (B, C, and D, F) clearly show the differences between the two species, especially the pallial sinus (PS) which is distinctly deeper in *Irus irus* (C), than in *Coralliophaga coralliophaga* (F). The line drawings (C, F) illustrate the pallial sinuses (PS) and the anterior and posterior adductor muscle scars (AAS and PAS, respectively). Scale bars = 10 mm. (Photographs by: S. K. Tan).

The first description of *Cypricardia obesa* was published in the first volume of Conchologia Iconica (Reeve, 1843: *Cypricardia* p. 2, fig. 10, caption to figure), which from the dates printed on unnumbered plate caption was published in Sep.1843. A description of *Cypricardia obesa* also appeared in the volume of the Proceedings of the Zoological Society of London with the year "1843" on the title-page (Reeve, 1844a). This volume, however, was only published in Jun.1844 (see Duncan, 1937: 80). Solem (1954: 73, 74) and Hayami & Kase (1993: 48) provided a list of synonyms of this species.

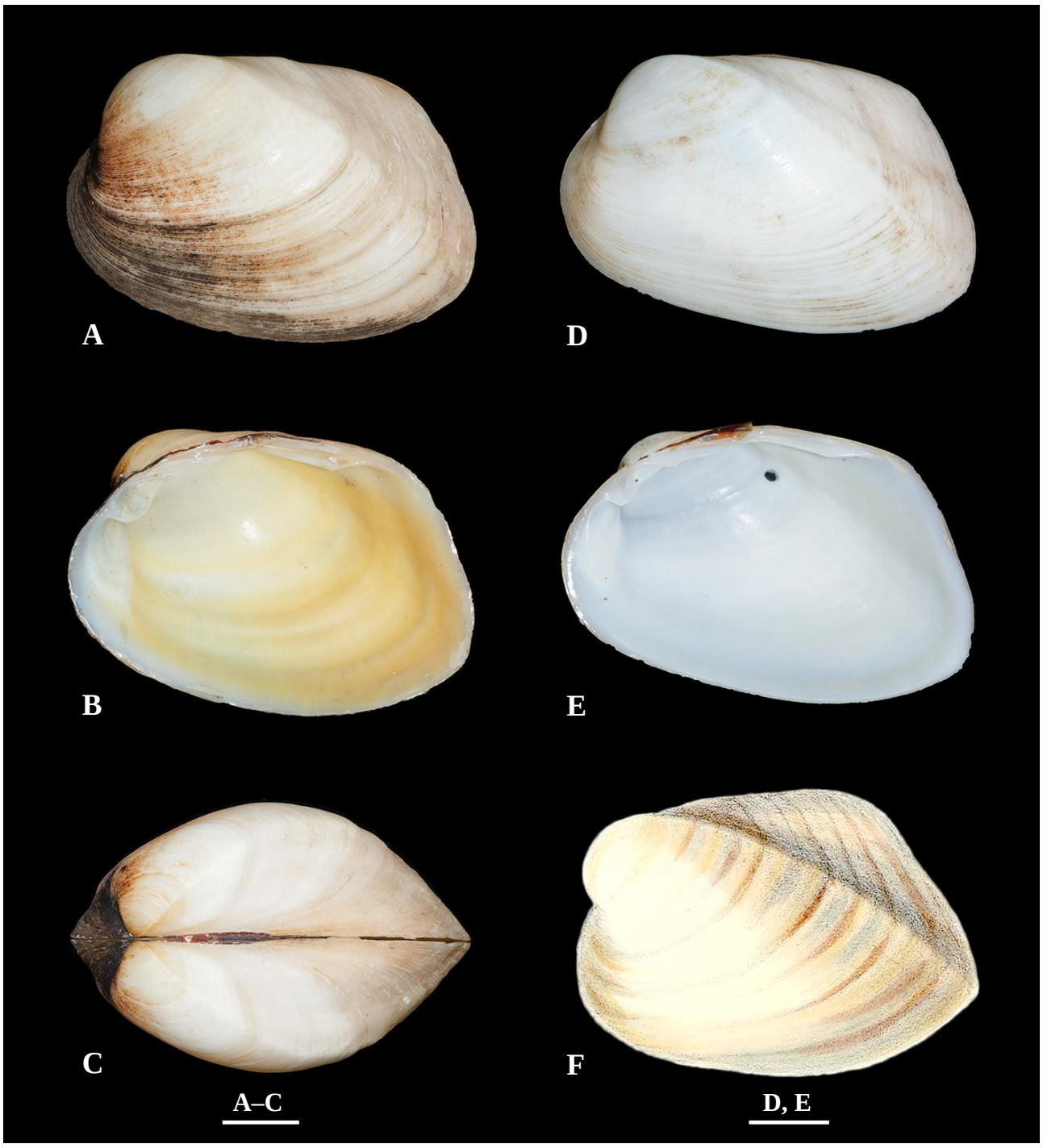

Fig. 5. *Glossocardia obesa* (Reeve, 1843), from Singapore: A–E, Pulau Jong (ZRC.MOL.5617; A–C, SH 42.3 × SL 53.6 mm; D, E, SH 39.2 × SL 51.9 mm); F, holotype figure of *Cypricardia obesa* (SH 44.5 × SL 54.0) reproduced from Reeve (1843: *Cypricardia* pl. 2, fig. 10). The measurements of the holotype of *Glossocardia obesa* are based on Solem (1954: pl. 2, figs. 11, 12). Scale bars = 10 mm. (Photographs by: S. K. Tan).

This species is distributed from the Red Sea and Kenya in the west, and to Okinawa, Japan, and the Society Island in the east (Solem, 1954; Paulay, 1987; Matsukama & Habe, 1995; Huber, 2010), but appears to be uncommon in most parts of its range. In relation to Singapore, the closest previous known record of this species was Bali, Indonesia (Dharma, 2005).

Little is known about the biology of *Glossocardia obesa*, which is apparently rarely found alive (Solem, 1954; Paulay, 1987; Hayami & Kase, 1993). The examined specimens from Singapore were found as fresh dead articulate shells on dead coral substrate on the fore reef. Incidentally, both specimens have bore holes indicating predation by muricids. Paulay (1987) suggests an infaunal lifestyle, but based on observations of the habitat from which the specimens from Singapore are collected (C. H. Toh, pers. comm.), they are probably nestlers of coral crevices as noted by Lamprell & Whitehead (1992). Although regarded as a deep water species (Solem, 1954; Matsukama & Habe, 1995), Lamprell &

Whitehead (1992) mentioned that it is found up to depths of 15 m. The specimens from Singapore were collected at a depth of 9 m, evidently showing that *Glossocardia obesa* is not restricted to deep water.

Genus *Neotrapezium* Habe, 1951

Neotrapezium Habe, 1951: 119 (type species *Cardita sublaevigata* Lamarck, 1819, by original designation; gender neuter).

Remarks. — *Neotrapezium* Habe, 1951, is herein treated as a full genus following Huber (2010: 708) and Coan et al. (2000: 332).

Neotrapezium sublaevigatum (Lamarck, 1819)

(Figs. 1, 2, 6)

Cardita sublaevigatum Lamarck, 1819: 26 (type locality: not stated).
Cypricardia vellicata Reeve, 1843: *Cypricardia* pl. 2, fig. 7, caption to figure (type locality: "Calbyog, Island of Samar, Philippines").

Singapore records:
? *Cypricardia* sp. – Traill, 1847: 239.
Trapezium vellicatum – Berry, 1964: 92 (Pandan Forest Reserve [first record]). – Chuang, 1973: 198.
Neotrapezium sublaevigatum – Morris & R. D. Purchon, 1981: 326 (Kranji; Labrador [see R. D. Purchon & D. E. A. Purchon, 1981: 298]).
Trapezium vellicatum – Chou et al., 1994: 78.
Trapezium sublaevigatum – K. S. Tan & Chou, 2000: 149. — S. K. Tan & Woo, 2010: 16. — S. K. Tan & Yeo, 2010: 291 (Pulau Semakau). — Wang et al., 2011: 487.

Material examined. — **Singapore**: Pulau Semakau: (ZRC.MOL.5622) 7 Feb.2009, (ZRC.MOL.5618) 2 May 2010; Tanah Merah Ferry Terminal (TSK 23002), 3 Mar.1999.

Distribution in Singapore. — See Fig. 2.

Habitat. — Byssally attached, usually to the undersides of rocks and boulders sheltered from strong wave action, and nestling in crevices and amongst clumps of oysters (Morton, 1979; K. S. Tan & Chou, 2000; Wang et. al., 2011; Fig. 1), as well as occasionally in burrows of boring bivalves in coral rocks in sheltered areas (K. S. Tan pers. obs.).

Diagnosis. — The following diagnosis is based on specimens from Singapore and Lamprell & Whitehead (1992). Shell rather thin but solid, usually quite compressed, subquadrate to elongately oblong in shape, to more than 50 mm in shell length, ventral margin often sunken in outline; sculpture of irregular concentric growth lines and ridges. Shell exterior dirty-white, all white or with some brown, either at the umbones or as radial bands or lines at the posterior side; interior white, pallial sinus shallow.

Remarks. — Shells of this species can be highly variable in shape and form. Individuals nestled in constrained places may become distorted to fit the shape of the cavity of the substrate. Nevertheless the shell characteristics remain generally recognisable. Solem (1954: 71, 72) provided a list of synonyms of this species, while Morton (1979) contributed interesting aspects of its biology and functional morphology.

DISCUSSION

Two unnamed species of *Cypricardia* Lamarck, 1819 [= *Trapezium* sensu lato] from Singapore and its vicinity were listed by Traill (1847: 239). Although the records are herein listed provisionally under the two most commonly seen species in Singapore, we still regard the two records as unconfirmed since the identities and actual number of species remains indeterminate.

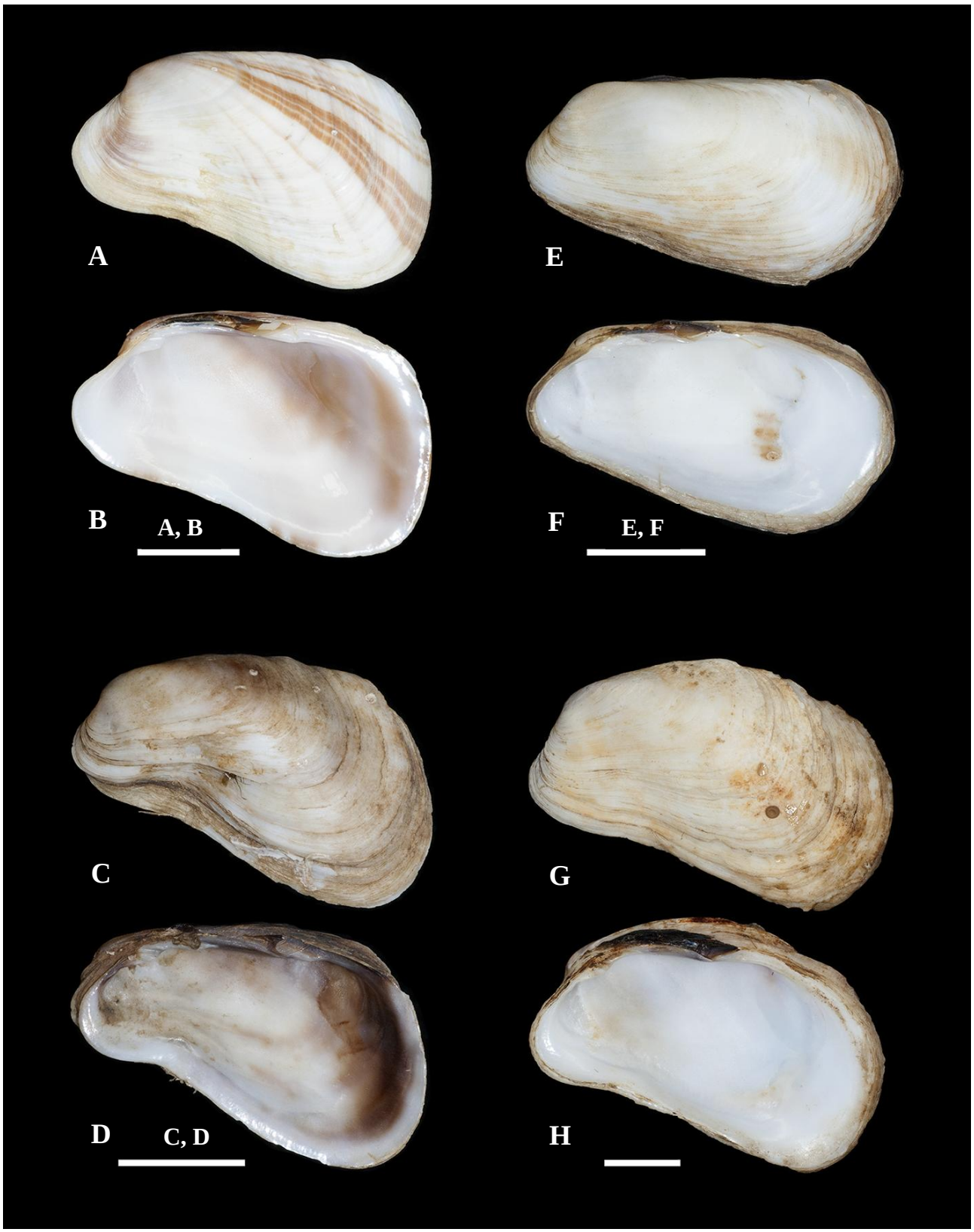

Fig. 6. *Neotrapezium sublaevigatum* (Lamarck, 1819), from Singapore showing variations in shell colouration and form: A, B, Tanah Merah Ferry Terminal (SH 24.7 × SL 35.2 mm; TSK 23002); C–H, Pulau Semakau (ZRC.MOL.5618): C, D, SH 20.5 × SL 28.6 mm; E, F, SH 17.6 × SL 31.3 mm; G, H, SH 35.9 × SL 46.5 mm. Scale bars = 10 mm. (Photographs by: S. K. Tan).

ACKNOWLEDGEMENTS

The material examined for this study was significantly supplemented by specimens collected during the recent Singapore Strait Biodiversity Workshop, which made up a significant part of the material examined for this study. The workshop was organised by the National Parks Board and National University of Singapore, and conducted as part of the Comprehensive Marine Biodiversity Survey (CMBS), which was supported by contributions from Shell Eastern Petroleum, Hong Kong and Shanghai Banking Cooperation 'Care for Nature' Trust Fund, Asia-Pacific Breweries, and the Air Liquide Group. The specimens of *Glossocardia obesa* were collected by Chay Hoon Toh, who also provided interesting observations.

LITERATURE CITED

Berry, A. J., 1964. Faunal zonation in mangrove swamps. *Bulletin of the National Museum, Singapore*, **32**: 90–98. [Imprint is 1963, but published Apr.1964, see Low & S. H. Tan (2009: 287)].

Blainville, H. M. D. de, 1824. Coralliophage. *Coralliophaga*. In: Cuvier, F. (ed.), *Dictionnaire des sciences naturelles, dans lequel on traite méthodiquement des différens êtres de la nature, considérés soit en eux-mèmes, d'après l'état actuel de nos connoissances, soit relativement a l'utilité qu'en peuvent retirer la médecine, l'agriculture, le commerce et les arts. Suivi d'une biographie des plus célèbres naturalistes. Ouvrage destine aux médicins, aux agriculteurs, aux commecans, aux artists, aux manufacturiers, et à tous ceux qui ont intérêt à connoître les productions de la nature, leurs caractères génériques et spécifiques, leur lieu natal, leurs propriétés et leurs usages. Par plusieurs Professeurs du Jardin du Roi, et des principals Écoles de Paris. Tome trente-deuxième*. F. G. Levrault, Strasbourg et Paris, and Normant, Paris. P. 343.

Bouchet, P. & J.-P. Rocroi, 2010. Nomenclator of bivalve families. With a classification of bivalve families by Rüdiger Bieler, Joseph G. Carter and Eugene V. Coan. *Malacologia*, **52**: 1–184.

Chou, L. M., P. K. L. Ng & K. K. P. Lim, 1994. Animalia. In: Wee, Y. C. & P. K. L. Ng (eds.), *A First Look at Biodiversity in Singapore*. National Council on the Environment, Singapore. Pp. 70–106.

Chuang, S. H., 1973. Sea shells. In: Chuang, S. H. (ed.), *Animal Life and Nature in Singapore*. Singapore University Press, Singapore. Pp. 175–201.

Coan, E. V., P. Valentich-Scott & F. R. Bernard, 2000. *Bivalve Seashells of Western North America. Marine Bivalve Mollusks from Arctic Alaska to Baja California. Santa Barbara Museum of Natural History Monographs, 2, Studies in Biodiversity 2*. Santa Barbara Museum of Natural History, Santa Barbara. viii + 764 pp.

Dharma, B., 2005. *Recent & Fossil Indonesian Shells*. Conchbooks, Hackenheim. 424 pp.

Duncan, F. M., 1937. On the dates of publication of the Society's 'Proceedings,' 1859–1926. With an appendix containing the dates of publication of 'Proceedings,' 1830–1858, compiled by the late F. H. Waterhouse, and of the 'Transactions,' 1833–1869, by the late Henry Peavot, originally published in P. Z. S. 1893, 1913. *Proceedings of the Zoological Society of London*, ser. A (General and Experimental), **1937**: 71–84.

Evenhuis, N. L., 2003a. Dating and publication of the Encyclopédie Méthodique (1782–1832), with special reference to the parts of the Histoire Naturelle and details on the Histoire Naturelle des Insectes. *Zootaxa*, **166**: 1–48.

Evenhuis, N. L., 2003b. Publication and dating of the journals forming the Annals and Magazine of Natural History and the Journal of Natural History. *Zootaxa*, **385**: 1–68. [Additional errata at: http://www.mapress.com/zootaxa/corrigenda/zt385correction.pdf.].

Gmelin, J. F., 1791. *Caroli a Linné Systema naturae per regna tria naturae. Edition decima tertia. Tom. I. Pars VI*. Lipsiae. 3021–3910 pp.

Habe, T., 1951–1953. *Genera of Japanese Shells. Pelecypoda and Scaphopoda*. Kairui-Bunken-Kankokai, Tokyo and Kyoto. v + 326 pp. [Published in parts: 1951 (no. 1, pp. 1–96), 1951 (no. 2, pp. 97–186), 1952 (no. 3, pp. 187–278), 1953 (no. 4, pp. 281–326)].

Hayami, I. & T. Kase, 1993. Submarine cave Bivalvia from the Ryukyu Islands: Systematics and evolutionary significance. *Bulletin of the University Museum, University of Tokyo*, **35**: 1–133.

Huber, M., 2010. *Compendium of Bivalves. A Full-Color Guide to 3,300 of the World's Marine Bivalves. A Status on Bivalvia After 250 Years of Research*. Conchbooks, Hackenheim. 901 pp., CD-ROM.

ICZN (International Commission on Zoological Nomenclature), 1990. Opinion 1615. Trapeziidae Miers, 1886 (Crustacea, Decapoda) and Trapeziidae Lamy, 1920 (Mollusca, Bivalvia): homonymy removed. *Bulletin of Zoological Nomenclature*, **47**: 228–230.

Lamarck, J. B. P. A., 1819. *Histoire naturelle des animaux sans vertèbres, présentant les caractères généraux et particuliers de ces animaux, leur distribution, leurs classes, leurs familles, leurs genres, et la citation des principales espèces qui s'y rapportent; précédée d'une Introduction offrant la détermination des caractères essentiels de l'Animal, sa distinction du végétal et des autres corps naturels; enfin, l'exposition des principes fondamentaux de la Zoologie. Tome sixième. 1re, partie*. L'Auteur, Paris. vi + 343 pp.

Lamprell, K. & T. Whitehead, 1992. *Bivalves of Australia. Volume 1*. Crawford House Press, Bathurst, New South Wales. 182 pp.

Lamy, E., 1920. Révision des Cypricardiacea et des Isocardiacea vivants du Muséum d'Histoire naturelle de Paris. *Journal de Conchyliologie*, **64**: 259–307.

Latreille, P. A. (1825–1828) Trapézie, *Trapezia*. p. 695. In: Latreille, P. A., Le Peletier, A.-L.-M., Serville, J.-G.-A. & Guérin, F.-E., *Encyclopédie méthodique. Histoire naturelle. Entomologie, ou histoire naturelle des crustacés, des arachnides et des insects. Tome deuxième*. Mme Veuve Agasse, Paris. [6] + 832 pp. [Published 1 Oct.1825 (part 1, pp. 1–344), and 13 Dec.1828 (part 2, 345–8332), see Evenhuis (2003a: 36)].

Linnaeus, C., 1758. *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Tomus I. Editio decima, reformata*. Laurentii Salvii, Holmiae [= Stockholm], 823 pp.

Low, M. E. Y. & Tan, S. H., 2009. Dates of publication of the Bulletin of the Raffles Museum and Bulletin of the National Museum, predecessors to the Raffles Bulletin of Zoology. *Raffles Bulletin of Zoology, Supplement*, **22**: 283–294.

Matsukuma, A. & T. Habe, 1995. Systematic revision of living species of *Meiocardia*, Glossidae and *Glossocardia*, Trapezidae (Bivalvia). In: Bouchet, P. (ed.), Résultats des Campagnes MUSORSTOM, volume 14. *Mémoires du Muséum national d'Histoire naturelle*, **167**: 75–106.

Megerle von Mühlfeld, J. K., 1811. Entwurf eines neuen System's der Schalthiergehäuse. Erste Antheilung. Die Muscheln. *Der Gesellschaft Naturforschender Freunde zu Berlin Magazin für die neuesten Entdeckungen in der gesammten Naturkunde*, **5**: 38–72, pl. 3.

Miers, E. J., 1886. Report on the Brachyura collected by H.M.S. *Challenger* during the years 1873–1876. In: Wyville Thomson, C. & Murray, J. (eds.), *Report on the Scientific Results of the Voyage of H.M.S.* Challenger *During the Years 1873–1876 Under the Command of Captain George S. Nares, R.N., F.R.S. and the Late Captain Frank Tourle Thomson, R.N. Prepared Under the Superintendence of the Late Sir C. Wyville Thomson, Knt., F.R.S. &c. Regius Professor of Natural History in the University of Edinburgh, Director of the Civilian Scientific Staff on Board and Now of John Murray, LL.D., Ph.D., &c. One of the Naturalists of the Expedition. Zoology—Volume XVII. Part XLIX*. Order of Her Majesty's Government, London, Edinburgh and Dublin. l + 362 pp., 29 pls.

Morris, S. & R. D. Purchon, 1981. The marine shelled Mollusca of West Malaysia and Singapore. Part 3, Bivalvia. *Journal of Molluscan Studies*, **47**: 322–327.

Morton, B., 1979. Some aspects of the biology and functional morphology of *Trapezium* (*Neotrapezium*) *sublaevigatum* (Lamarck) (Bivalvia: Articacea). *Pacific Science*, **33**: 177–194.

Morton, B., 1982. Some aspects of the biology and functional morphology of *Coralliophaga (Coralliophaga) coralliophaga* (Gmelin 1791) (Bivalvia: Arcticacea): A coral associated nestler in Hong Kong. In: Morton, B. (ed.), *The Malacofauna of Hong Kong and Southern China*. Hong Kong University Press, Hong Kong. Pp. 311–330.

Oliver, P. G. 1992. *Bivalved Seashells of the Red Sea*. Verlag Christa Hemmen, Wiesbaden & The National Museum of Wales, Cardiff. 330 pp., 46 pls.

Paulay, G., 1987. Biology of Cook Islands' bivalves, part I. Heterodont families. *Atoll Research Bulletin*, **298**: 1–31.

Purchon R. D. & D. E. A. Purchon, 1981. The marine shelled Mollusca of West Malaysia and Singapore—Part 1. General introduction and an account of the collecting stations. *Journal of Molluscan Studies*, **47**: 290–312.

Reeve, L. A., 1843. Monograph of the genus *Cypricardia*. *Conchologia iconica: or, Illustrations of the Shells of Molluscous Animals*, **1**: [1–4], *Cypricardia* pls. 1–2. [Published Sep.1843 (date as printed on unnumbered captions pages to the genus *Cypricardia*)].

Reeve, L. A., 1844a. Descriptions of new species of shells figured in the 'Conchologia iconica'. *Proceedings of the Zoological Society of London*, **1843**: 168–197. [Imprint is 1843, but published Jun.1844, see Duncan (1937: 80); reprinted as Reeve (1844b)].

Reeve, L. A., 1844b. Descriptions of new species of shells figured in the 'Conchologia iconica'. *Annals and Magazine of Natural History*, **14**: 168–197. [Published 1 Sep.1844, see Evenhuis (2003: 16); reprint of Reeve (1844a)].

Sachidhanandam, U. & L. M. Chou, 1996. A generic account of marine soft-bottom benthic bivalves of Singapore. *Raffles Bulletin of Zoology*, **44**: 509–530.

Solem, G. A., 1954. Living species of the pelecypod family Trapeziidae. *Proceedings of the Malacological Society of London*, **31**: 64–84, pls. 5–7.

Stoliczka, F., 1870. Cretaceous fauna of Southern India. Volume. 3. The Pelecypoda, with a review of all known genera of this class, fossil and recent. *Palaeontologia Indica, Being Figures and Descriptions of the Organic Remains Procured During the Progress of the Geological Survey of India*, ser. 6, **3**(1–4): i–xxii, 1–8, 8α, 8β, 8δ, 9–222, pls. 1–12.

Tan, K. S. & L. M. Chou, 2000. *A Guide to Common Seashells of Singapore*. Singapore Science Centre, Singapore. 168 pp.

Tan, S. K. & M. E. Y. Low, 2013. Singapore Mollusca: 1. The family Angariidae Gray, 1857 (Gastropoda: Vetigastropoda: Angarioidea). *Nature in Singapore*, **6**: 239–246.

Tan, S. K. & H. P. M. Woo, 2010. *A Preliminary Checklist of the Molluscs of Singapore*. Raffles Museum of Biodiversity Research, National University of Singapore, Singapore. 78 pp. Uploaded 2 Jun.2010. http://rmbr.nus.edu.sg/raffles_museum_pub/preliminary_checklist_molluscs_singapore.pdf. (Accessed 9 Oct.2013)

Tan, S. K. & R. K. H. Yeo, 2010. The intertidal molluscs of Pulau Semakau: Preliminary results of "Project Semakau". *Nature in Singapore*, **3**: 287–296.

Traill, W., 1847. A few remarks on conchology and malacology: Comprising brief notices of some of the more remarkable 'Testacea' in Singapore and its neighbourhood; with an appended catalogue of Singapore shells arranged in conformity with 'Lamarck's System'. *Journal of the Indian Archipelago and Eastern Asia*, **1**: 225–241.

Wang, L. K., S. K. Tan, R. K. H. Yeo & H. P. M. Woo, 2011. Trapezium clams: Family Trapezidae. In: Ng, P. K. L., R. T. Corlett & H. T. W. Tan (eds.), *Singapore Biodiversity: An Encyclopedia of Natural Environment and Sustainable Development.* Editions Didier Millet, Singapore. P. 487.