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Nassarius siquijorensis (A. Adams, 1852) and N. crenelliferus (A. Adams, 1852), two similar and often misidentified species (Gastropoda: Nassariidae)

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Abstract

In 1984 W.O. Cernohorsky reviewed the Indo-West Pacific species of Nassariidae. He revised Nassarius siquijorensis (A. Adams, 1852) and among the many synonyms listed were N. crenelliferus (A. Adams, 1852) and N. cingendus (Marrat, 1880). In this paper *N. crenelliferus* is considered to be a valid species and N. cingendus a synonym of this species, not a synonym of N. siquijorensis. Nassarius siquijorensis remains a valid species and its type location is designated.

Key words. Taxonomy, synonymy, Indo-West Pacific, type locality designation.

Introduction

The current systematics, as represented in MolluscaBase (2022), is largely based on Cernohorsky (1984), but many species have been added since (e.g., Galindo et al., 2017). Ease of access to the early literature (e.g., Biodiversity Heritage Library; https://www.biodiversitylibrary.org) and high-resolution images of type specimens through digital media (e.g., Mollusca Types in Great Britain; https:// gbmolluscatypes.ac.uk) have facilitated further revisionary studies. These have shown much confusion in current literature and erroneous synonymization in the past. This paper is an attempt to rationalise errors concerning Nassarius siquijorensis (A. Adams, 1852) as treated by Cernohorsky (1984). This paper proposes that Nassarius crenelliferus (A. Adams, 1852) is taken out of synonymy and treats N. cingendus (Marrat, 1880), also considered a synonym of N. siquijorensis by Cernohorsky (1984), as a synonym of N. crenelliferus.

Abbreviations

CG	Carles Gili collection, Barcelona, Spain
HD	Henk Dekker collection, Winkel, the Netherlands
HK	Hugo H. Kool collection, Dieren, the Netherlands
ICZN	International Commission on Zoological
	Nomenclature
NML	National Museums Liverpool, World Museum, UK
MHNG	Muséum d'Histoire naturelle, Geneva, Switzerland
NHMUK	Natural History Museum, London, UK
[]	number of specimens

Systematics

Family Nassariidae Iredale, 1916 (1835)

Genus Nassarius Duméril, 1805

Type species. Buccinum arcularia Linnaeus, 1758, by original designation.

Nassarius siquijorensis (A. Adams, 1852)

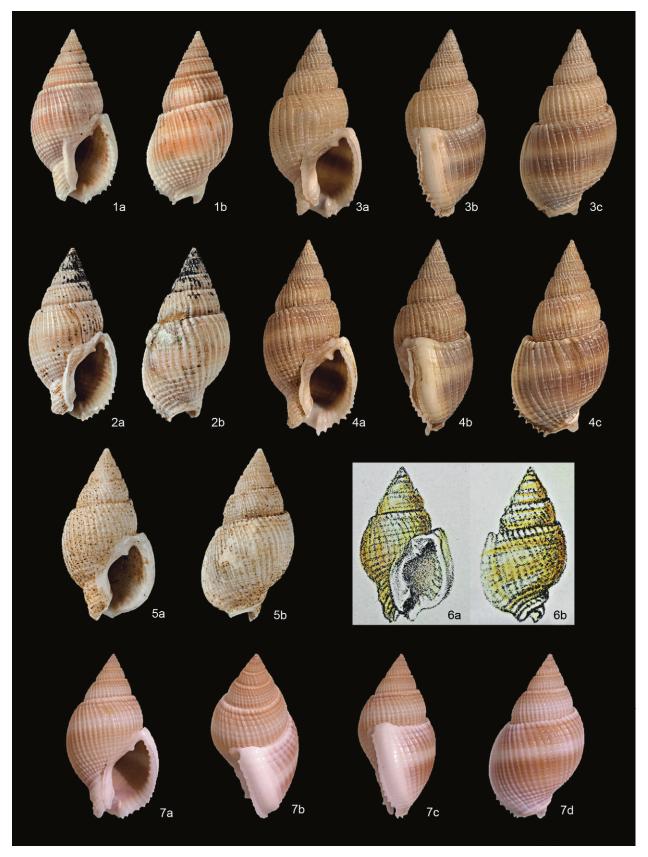
Figures 1-4

Nassa siquijorensis A. Adams, 1852: 97. Nassa siquijorensis—Reeve, 1853: pl. 8 fig. 53a, b. Nassa siquijorensis—Tryon, 1882: 252, pl. 9 fig. 72. Nassarius (Zeuxis) siquijorensis-Knudsen, 1997: 367, figs 5a-c. Nassarius (Zeuxis) siquijorensis-Cernohorsky, 1984 (in part): 134, pl. 25 fig. 12 (lectotype).

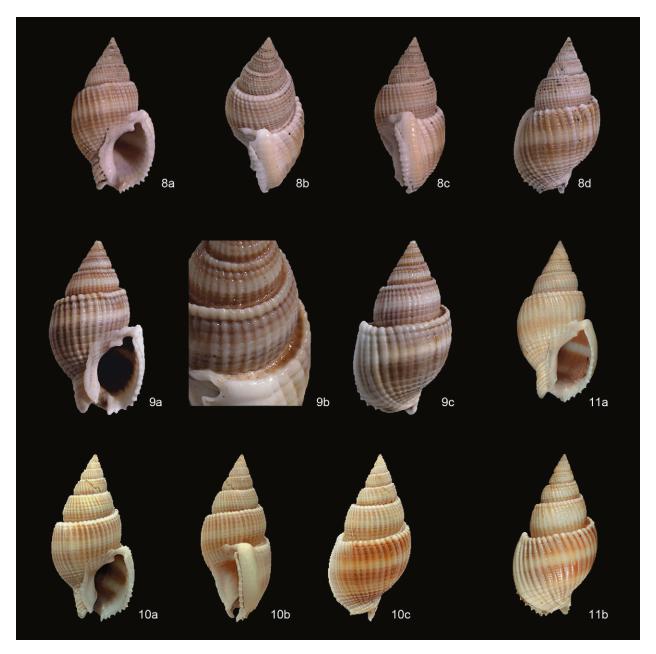
Nassarius siquijorensis—Kaicher, 1985: card 4198 (lectotype). Nassarius siquijorensis—Zou et al., 2012: 5, fig. 2.

Nassarius siquijorensis—Pu et al., 2017: fig. 2.

Type material. Lectotype, NHMUK 1973118/1, designated by Cernohorsky (1984: 135, pl. 25 fig. 12), length 24.0 mm and width 11.6 mm (Fig. 1) and two paralectotypes.



Figures 1–4. *Nassarius siquijorensis* (A. Adams, 1852) and *N. crenelliferus* (A. Adams, 1852). **1–4.** *N. siquijorensis*. **1a, b.** Lectotype, Siquijor Island, Philippines, length 24.0 mm, width 11.6 mm, NHMUK 1973118/1. **2a, b.** Paralectotype, Siquijor Island, Philippines, length 21.6 mm, NHMUK 1973119/2. **3a–c.** Calituban Island, Philippines, 26.0 mm, CG 1196-N. **4a–c.** Hong Kong, China, 31.2 mm, CG 1170-N. **5–7.** *N. crenelliferus*. **5a, b.** Lectotype, locality unknown, NHMUK 197329, length 19.3 mm, width 10.3 mm. **6a, b.** Plate 8 figs 49a, b from Reeve (1853). **7a–d** Gulf of Thailand, Thailand, fishermen, 26.0 mm, HK 318.01.



Figures 8–11. *Nassarius crenelliferus* (A. Adams, 1852) and synonym *Nassa cingenda* Marrat, 1880. **8–10.** *N. crenelliferus.* **8a–d.** South China Sea, Vietnam, trawled, length 25.7 mm, HK 318.08. **9a–c.** Sumatra, Indonesia, length 23.4 mm, CG 842-N. **10a–c.** South China Sea, off Guandong Province China, 32.2 mm, HK 318.23. **11a, b.** *Nassa cingenda*, lectotype, locality unknown, length 30.0 mm, width 15.5 mm, NML LIVCM.12.8.1880-693 (from https://gbmolluscatypes.ac.uk/specimens/604).

Type locality. Philippines, Siquijor Island.

Description. Shell elongate-ovate, solid. Protoconch unknown. Teleoconch of around 7 convex whorls, spire pointed, suture shouldered or channelled and crenulated; diameter of body whorl representing around 50% of total height. Numerous fine, close-set axial ribs, very variable in number, 31–45 on penultimate and 29–40 on last whorl, ribs may become obsolete towards outer lip. Narrow spiral cords, separated by narrow and shallow grooves, cutting axial ribs deepest on basal part of shell, resulting in a granulose surface, number of spiral cords variable, 8–11

on penultimate and 15–22 on last whorl. Aperture ovalelongate, outer lip with varix, whole lip edge with 16 or 17 denticles, spiny anteriorly; outer lip inside with 14–16 lirate denticles not extending deeply into aperture; columellar callus posteriorly thin, anteriorly elevated, ending with an acute tip; columella smooth or with some slight tubercles, in some specimens somewhat concave; parietal denticle strong, anal canal deep. Long and straight siphonal canal with 5 or 6 external cords.

Colour in fresh specimens: whitish to brown, last whorl with 2 darker bands, strongest at the dorsal side; outer lip

and columella whitish, inside aperture light brown, outside banding visible.

Size: 24 mm (lectotype) to 35 mm. Operculum unknown. Material studied. Philippines: Calituban Island, CG 1196-N [5]; Mindoro, CG 2468-N [1]. China: Hong Kong, 19-40 m, CG 1170-N [18]; Hong Kong, Tsin Sui Wan (Repulse Bay), HK 506.57 [1].

Distribution. Nassarius siquijorensis was thought to be a species with a wide distribution in the Indo-West Pacific (Cernohorsky, 1984: 135). However, our revision shows that several papers mentioning this species (see Discussion) have confused this species with other species of Nassarius. Our findings suggest that the geographical distribution of this species is much more restricted than considered previously. Recent specimens are only known from the central and southern Philippines, the region of the type locality, and are also found in the western South China Sea. Zou et al. (2012) sequenced 22 species of Nassarius, one of which is figured as N. siquijorensis (Zou et al., 2012: fig. 2) from Zhanjiang, Guangdong, China (Zou et al., 2012: table S1.doc). Although more slender than the lectotype, it has a strong similarity to it. The shell figured by Pu et al. (2017: fig. 2) is also very similar and considered conspecific. Our material from Hong Kong, from where it was reported by Pu et al. (2017: 6, table 1), confirms the presence of this species in China. This means that there seems to be a gap in the occurrence of N. siquijorensis between the two geographical regions. Some literature citations of the species in China seas are based on misidentifications (see Discussion). In other papers there is no figure presented, making it difficult to assess their determinations (see Discussion).

Discussion. There is large confusion about the identity of *Nassarius siquijorensis*, as concluded from the following papers where this name used is in our opinion in error for other species. Citations in papers without images have not been evaluated here.

Nassarius siquijorensis has been confused with:

- N. euglyptus (G.B. Sowerby III, 1914) by Kira (1962: pl. 29, fig. 16), Habe (1964: pl. 31, fig. 24), Springsteen & Leobrera (1986: pl. 42, fig. 6 right), Tuschiya in Okutani (2000: pl. 225, fig. 35), Min (2004: 245, fig. 669), and Dharma (2005: pl. 28, fig. 14a, b).
- N. scalaris (A. Adams, 1852) by Cernohorsky (1978: pl. 27, fig. 9) and Robin (2008: pl. 237, fig. 6).
- *N. steindachneri* (Sturany, 1900) by Singer & Mienis (1997: fig. 16).
- *N. coriolis* Kool, 2009 by Martin in Poppe (2008: pl. 355, fig. 13).
- N. canaliculatus (Lamarck, 1822) by Dharma (1988: pl. 32, fig. 1).

According to Cernohorsky (1984), two synonyms of *N. siquijorensis* are *Nassa crenellifera* A. Adams, 1852 and *Nassa cingenda* Marrat, 1880. The difference between them and *N. siquijorensis* is discussed below. Another synonym mentioned by Cernohorsky (1984), *Nassarius hirasei*

Kuroda & Habe, 1952, has already been separated as valid species by, for example, Pu et al. (2017: fig. 2) and Tsuchiya (2017: 914, pl. 202 fig. 14).

Nassarius crenelliferus (A. Adams, 1852)

Figures 5-11

Nassa crenellifera A. Adams, 1852: 98.

Nassa crenellifera-Reeve, 1853: pl. 8 fig. 49a, b.

Nassa cingenda Marrat, 1880: 102.

Nassa crenellifera—Tryon, 1882: 252, pl. 9 fig. 75.

Nassa crenellifera—Tomlin, 1932: 42.

Nassarius (Zeuxis) siquijorensis—Cernohorsky, 1984 (in part): 134, pl. 25 figs 13, 14 [lectotypes of Nassa crenellifera and Nassa cingenda, respectively].

Nassarius siquijorensis—Ma, 2004: 98, pl. 59 fig. E (not Nassa siquijorensis A. Adams, 1852).

Nassarius siquijorensis—Dharma, 2005: 106, pl. 237 fig. 14a-c (not Nassa siquijorensis A. Adams, 1852)

Nassarius siquijorensis—Kool, 2007: 91, figs 18–20 (not Nassa siquijorensis A. Adams, 1852)

Type material. *Nassa crenellifera* A. Adams, 1852, holotype, NHMUK 197329, length 19.3 mm, width 10.3 mm (Fig. 5a, b), a monotype according to Tomlin (1932: 42).

Nassa cingenda Marrat, 1880, lectotype designation Cernohorsky (1984: 135) by inference of holotype, NML LIVCM.12.8.1880-693, length 30.0 mm, width 15.5 mm (Fig. 11a, b).

Type localities. The original type locality of both *Nassa* crenellifera and *N. cingenda* are unknown. We designate the Gulf of Thailand as the type locality of *N. crenellifera*, from where many specimens have been studied.

Description. Protoconch conical, multispiral, 134-2 smooth whorls. Teleoconch 6½ to exceptionally 8 more or less convex whorls, regularly ribbed from post nuclear to penultimate whorl, last whorl ribbed or almost smooth. Number of axial ribs variable, on penultimate whorl 25-39 ribs, on last whorl 30-40 ribs, in some specimens ribs become less strong or even fade out. Spiral grooves more or less deep, over-riding axial ribs, delimiting narrow cords 6-11 on penultimate whorl and 13-21 on last whorl, last 5 or 6 basal grooves broader and deeper with granulose cords. Suture variable from shouldered to deeply canaliculated, crenulate. Siphonal fasciole with 6 or 7 cords. Aperture oval, outer lip variced, but with a thin, denticulated edge, denticles becoming stronger anteriorly, with 11-17 short lirae inside. Columellar callosity somewhat laminate anteriorly, becoming thinner on parietal wall, ending with an acute tip; columella with some weak pleats, parietal denticle strong. Anal canal usually slightly rounded, siphonal canal wide.

Most specimens yellowish, some darker to brown, all with two dark bands on each whorl, varix uniformly white. Inside with a similar colouration as the outside, but lighter and with outside bands well visible. Length 18–34 mm.

The large degree of variation in shape and sculpture makes it difficult to define *N. crenelliferus* succinctly. Shells from Vietnam and China tend to become slenderer and more elongate than specimens from, for instance, Thailand. The shouldered or more or less canaliculated suture confers a different shell profile and aperture shape, but as there is a continuum between the two extremes, we consider all forms to represent a single species.

Material studied. Thailand, Gulf of Thailand: Ban Hua Hin, fishermen, HK 318.01 [15], HK 318.20 [14], HK 318.21 [2], beach, HK 318.07 [1], HK 318.13 [2]; Pattani area by fishermen, HK 318.12 [6]; Ban Pak Nam Sakom 06°57'00"N 100°49'36"E, local fishery, HK 318.16 [2] HD 1790 [19]; Laem Tachi, dredgings around and off the peninsula, 3-5 m, HK 318.18 [3]; Pattaya, CG 2191-N [1]; Pattani area, local fishery, HD 1310 [13]; Ko Samui, HD 2678 [1]; Ban Pak Nam Sakom, near Leila Resort, HD 11828 [1]; Saiburi, HD 4105 [1]; Laem Tachi, Ban Dato, HD 1247 [1]; Ban Sai Khao (NW Songkhla), HD 1121 [2]; Songhkla, Samila Beach, HD 2257 [3]; Trat Province, Ko Chang, HD 2796 [2]. Vietnam: Province Binh Dinh, Qui Bhob, 10-15 m in mud and sand, HK 318.02 [1]; South China Sea, HK 318.08 [1]; Nha Trang, 20-40 m, CG 2357-N [3], HD 21706 [2]. China: Hong Kong, Tsin Sui Wan, HK 318.03 [1]; Hong Kong, HK 318.04 [3], HK 318.05 [2], HK 318.21 [2]; China, HD 45201 [7]; China, HD 38483 [1]; East China Sea, CG 1521-N [2]; South China Sea, HD 21027 [1]. Singapore: Changi Point Beach, HK 318.09 [1], East Coast Park [318.10 [1]. Malaysia: Kuala Terengganu, Pasir Batu Buruk, HK 318.11 [5], Pahang, Beserah, beach, HK 318.19 [8]; Sabah, Patai Tanjung Aru, 05°57′22″N 116°02′37″E, beach, HK 318.14 [2]; 30-40 km N of Kota Kinabalu, 06°09'15"N 116°09'52"E, HK 318.15 [1]. Indonesia: Sumatra, CG 842-N [1]; Bangka, Soengeilat, HK 318.06 [1]; West Java, Pralabuan Ratu, HD 45915 [4]. Taiwan: CG 190-N [2].

Distribution. China to eastern Thailand, Malaysia, and Indonesia.

Discussion. Nassarius crenelliferus has been a somewhat enigmatic species known only from the holotype. One year after its description by Adams (1852), Reeve (1853) figured the type specimen (Fig. 6). Tryon (1882) considered this species erroneously conspecific with N. scalaris while Tomlin (1932) and Cernohorsky (1984) identified it as N. siquijorensis. From the study of a great number of specimens in question from the Western Pacific, we conclude that there are two species: *N. siquijorensis* from the Philippines and China and N. crenelliferus from the Western Pacific. We also conclude that Nassa cingenda Marrat, 1880 is a junior synonym of N. crenelliferus. The holotype of N. crenelliferus (Fig. 5) has a shouldered suture while the lectotype of N. cingendus (Fig. 11) has a canaliculated suture but, as has been pointed out above, there exists a continuous series of specimens between shouldered and canaliculated forms.

On one of the labels, in Tomlin's handwriting, with the lectotype of *Nassa cingenda* is stated: "= *crenulata* Brug.". This refers to Tomlin (1940: 35), where he considered the

monotype of *Nassa cingenda* "a very ordinary *crenulata* Brug.". Cernohorsky (1984: 214) mentioned among the dubious Indo-Pacific species of Nassariinae that *Buccinum crenulatum* Bruguière, 1789 "is conveniently disposed of as a primary homonym of *Buccinum crenulatum* Linnaeus, 1758, a species in the family Terebridae".

Differences between Nassarius siquijorensis and N. crenelliferus

Reeve (1853) considered *Nassarius siquijorensis* "closely allied to *N. crenelliferus* in form, sculpture and painting, though apparently distinct". Cernohorsky (1984: 136) saw the differences in the prominence of the axial ribs of *N. siquijorensis* all the way to the back of the outer lip and in the finer and more numerous axial ribs of the "form" *N. crenelliferus*. There are more differences: *N. siquijorensis* has shallow spiral grooves whereas in *N. crenelliferus* they are deeper, cutting the axial ribs more constantly. *Nassarius siquijorensis* has a more solid shell and is usually larger in size.

Genetic studies

Zou et al. (2012) and Pu et al. (2017) included N. siquijorensis in their genetic studies. Zou et al. studied three specimens and conducted phylogenetic analysis for COI, 16S rDNA, and ITS-1 (2012: figs 2, 4, 5). For all three loci they found a monophyletic N. siquijorensis, but this could be expected because of the few specimens sequenced. Pu et al. (2017: figs 2, 4) extended the study of Zou et al. with additional specimens (23 for N. siquijorensis) and species and produced phylogenetic trees for COI and ITS-1. The resulting COI and ITS-1 trees revealed two clades for N. siquijorensis. Looking closer at the individual specimens showed that the clades I and II of the COI locus did not contain the same specimens as clade I and II of the ITS-1 locus (Pu et al., 2017: 12). When individual specimens were sorted on locality, there was a lack of geographical pattern among the clades found. Pu et al., (2017) suggested that introgression may have occurred between two species, but it is not sufficiently shown that the clades found are two different species. More genes, or the complete mitochondrial genome, could be of help to elucidate this. Based on only one shell figured, nothing more on the shell variation can be added.

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