# Two new species of *Hecuba* Schumacher, 1817 (Bivalvia: Donacidae)

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In addition to the three extant species of *Hecuba* Schumacher, 1817 discussed in Raven & Dekker (2022, Basteria, 86 (2): 96-113) a fourth extant species occurs in eastern Sumatra, Indonesia, herein described as *Hecuba parva* spec. nov. A fossil from the Miocene of India is herein described as *H. mukerjeei* spec. nov. The type species of *Hecuba* is corrected to *Venus scortum* Linnaeus, 1758. A correction is made regarding the reference to Rumphius in Raven & Dekker (2022).

Key words: Donacidae, *Hecuba*, India, Indonesia, new species.

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## INTRODUCTION

Raven & Dekker (2022) clarified that *Donax scortum* (Linnaeus, 1758) and *Donax pubescens* Linnaeus, 1758 are both valid species that should be placed in the genus *Hecuba* Schumacher, 1817. The first species occurs from Iran to Sumatra (Indonesia), the latter in eastern Indonesia and Papua New Guinea. A smaller third species occurring in western Indonesia, from Sumatra to Bali, was introduced as *Hecuba reticulata* Raven & H. Dekker, 2022. Fossils are only known from the latter species, and are restricted to the Pleistocene. David Jablonski (University of Chicago) alerted the author to the existence of two papers describing rare fossils from the Miocene of Myanmar and India, attributed to *Hecuba*. These, and some small shells from eastern Sumatra, Indonesia that bear great similarity to one of these fossils are subject of this paper.

## MATERIAL AND METHODS

Malacological collections and literature examined. — A sample from eastern Sumatra on which the description of *Hecuba parva* spec. nov. is based was collected by Bavius Gras (Leeuwarden, The Netherlands); two specimens were deposited in Naturalis. Michel (2013) sampled the seas around eastern and southern Sumatra, but no additional material was found by him, possibly because his samples were from further offshore.

For the fossil material a review was made of the relevant literature and data available on the internet, including photographs of available type material. Attempts to locate the specimens described in the literature and to acquire additional specimens and/or information did not succeed. In view of the importance of the new data it was decided to describe the new taxa, despite the scarcity of material. Abbreviations of the collections: BG = Bavius Gras, Leeuwarden, The Netherlands; GSI = Geological Survey of India, Indian Museum, Kolkota, India; Naturalis = Naturalis Biodiversity Center, Leiden, The Netherlands; RMNH = Rijksmuseum van Natuurlijke Historie, Leiden, now part of Naturalis.

Methods. — The terminology used is defined in Raven & Dekker (2022: fig. 1). Measurements were made using a digital calliper (L = length, H = height). In the lists of material the following abbreviation is used: leg. = legit.

## SYSTEMATIC RESULTS

### Superfamily Tellinoidea Blainville, 1814
### Family Donacidae Fleming, 1828

#### Genus *Hecuba* Schumacher, 1817

Type species (by subsequent designation of Herrmannsen, 1847: 504): *Venus scortum* Linnaeus, 1758 (cited in the synonymy of *Hecuba lamellaris* Schumacher, 1817). Schumacher (1817: 157) included *Hecuba lamellaris* Schumacher, 1817 and *Hecuba rosea* Schumacher, 1817 in his new genus, and placed the Linnean species *Venus scortum* as a synonym under *Hecuba lamellaris*. By doing so, Schumacher originally included three nominal spe-

cies, and all three are eligible as type species (ICZN, 1999: Article 69.2 "An originally included nominal species is eligible for subsequent fixation as type species even if it ….. had been included in another such taxon"). The subsequent designation of *Hecuba lamellaris* by Raven & Dekker (2022: 97) is therefore invalid.

Definition (amended from Raven & Dekker, 2022 to fit the two additional species). — Medium to large donacids, triangular to cuneate, longer than high, weakly to strongly carinate, posterior area flat, sculpture of radial riblets, crossed by commarginal ribs, some of which form lamellae. Right valve with small triangular cardinal tooth, bifid anterior and posterior lateral teeth with grove and ridge along anterior dorsal margin. Left valve with bifid triangular cardinal tooth and short posterior and short to long posterior lateral tooth. Ligament positioned just behind the umbones.

### ***Hecuba parva* spec. nov.**

Figs 1-2

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Holotype. — Leg. BG (right valve, L 24.3 mm, H 15.8 mm, RMNH.MOL.354405; Fig. 1).

Paratypes. — From type locality, leg. BG. Paratype 1: left valve L 15.3 mm, H 11.1 mm, RMNH.MOL.354406. Paratypes 2 (Fig. 2) and 3, BG 5871.

Type locality. — Pantai Selamat Baru, Bengkalis Island, Riau province (Strait of Malacca), Sumatra, Indonesia.

Etymology. — Latin: *parva* = small, related to the much smaller size than other extant species of *Hecuba*.

Diagnosis. — Small elongate triangular *Hecuba* species with straight ventral margin, fine reticulate sculpture, with every 3rd or 4th commarginal riblet forming low lamellae, hinge with narrow laterals, short anterior lateral and much longer posterior lateral.

Description. — Small (to 24 mm in length), elongate triangular, outline rounded, umbo rounded, umbonal angle of ~105°). Umbo more or less in the middle, anterior dorsal slope straight, anterior extreme broadly rounded, ventral margin straight or very weakly convex, posterior margin rather straight, posterior area rounded, posterior carina broadly rounded, posterior extreme rounded. Surface with closely spaced rounded commarginal riblets, with every 3rd or 4th forming low lamellae. Fine radial riblets in between, creating a reticulate pattern. Towards the anterior and posterior most radial ribs become stronger. On the posterior part the radial ribs are wider spaced and in the zone adjoining the carina the commarginal riblets are concave, creating a slightly crenulated edge. On the posterior area the commarginal riblets are straight. Pallial sinus just reaches the middle of the shell. Ventral margin weakly crenulated inside. Right valve with small triangular cardinal tooth and short, bifid anterior and posterior lateral teeth with groove and ridge along anterior dorsal margin. The anterior lateral is much shorter than the posterior lateral; both are much narrower than in the other extant *Hecuba* species. Left valve with bifid triangular cardinal tooth, short anterior and much longer posterior lateral. Ligament positioned just behind the umbo. External colour dirty white with some pale purple near the umbo; inside purplish in the centre, fading to white. Periostracum brownish-grey.

Remarks. — *Hecuba parva* spec. nov. is much smaller than the other extant *Hecuba* species, and differs from all *Hecuba* species in not having a sharp carina with scales or spines, and in having a straight ventral edge. It thus expands the variation within the genus. The species is closest to juveniles of *Hecuba scortum* (Fig. 3) and *H. reticulata* Raven & H. Dekker, 2022 (Fig. 4) from which it differs in outline, being more elongate with straight ventral edge, lacking the pointed posterior end and having a diffuse, rounded carina. The commarginal riblets are more numerous, with every 3rd or 4th forming lamellae extending all over the shell, whereas in juvenile *H. scortum* every second forms lamellae, that are lower and most of which do not continue over the anterior part. *Hecuba parva* spec. nov. is very different from juvenile *H. pubescens* (Linnaeus, 1758) which has pointed anterior and posterior ends, a sharp carina with marked spines, most commarginal riblets fading in the middle of the shell, with the others forming marked lamellae.

The valves were collected weeks after a storm blew material high up. It is assumed they originate from shallow water. It is unknown whether the largest specimen found represents and adult or whether the species can reach a larger size.

Distribution. — The species is only known from the type locality. The area is influenced by the runoff of many rivers and streams and therefore characterised by estuaries, mangroves and tidal flats, with muddy sediment and a fauna comprising few species (Michel, 2013; Michel et al., 2015). It lies within the distribution area of *Hecuba scortum*.

### ***Hecuba mukerjeei* spec. nov.**

Fig. 5

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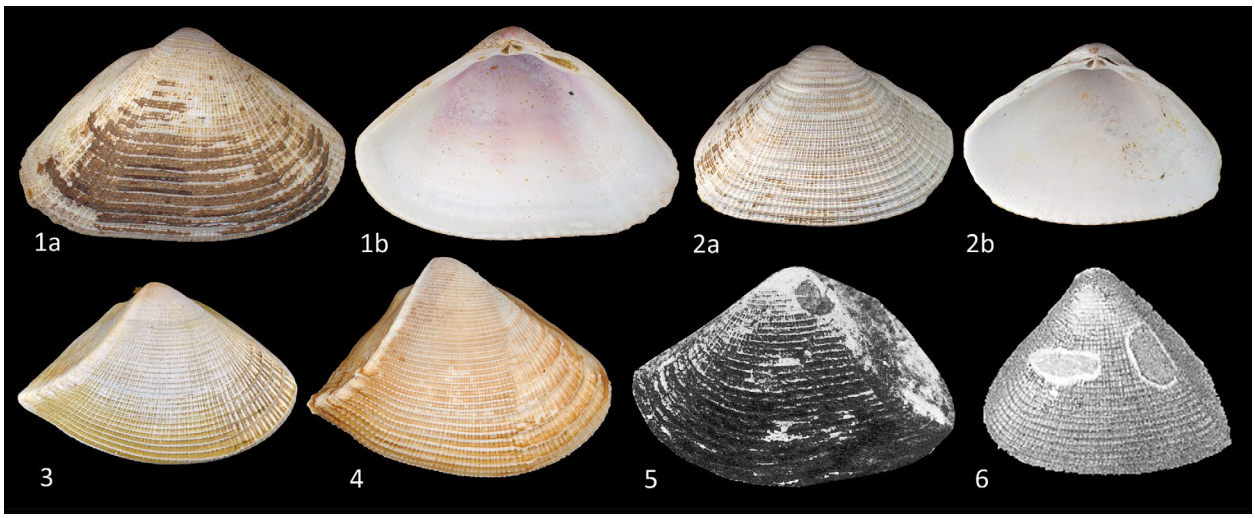
*Donax* (*Hecuba*) *protoflexuosa* (Noetling, 1901) var. — Mukerjee, 1939: 12-13, pl. 1 fig. 21.

*Donax* (*Hecuba*) spec. — Lyngdoh et al., 1999: 59.

Holotype. — Left valve, inside not visible (L 19.5 mm, H 13.5 mm, GSI, type no. 16375; Fig. 5).




**Figs 1-5.** *Hecuba* specimens. **Figs 1-2.** *Hecuba parva* spec. nov., Pantai Selamat Baru, Bengkalis Island, Riau province, Sumatra, Indonesia, leg. BG. **1.** Holotype (L 24.3 mm, H 15.8 mm; RMNH.MOL.354405). **2.** Paratype 2 (L 18.7 mm, H 13.1; RMNH.MOL.354406). **Fig. 3.** *Hecuba scortum* (Linnaeus, 1758), juvenile, Madras, Tamil Nadu, India, leg. R. Winckworth (L 30.3 mm, H 19.5 mm; ZMA.MOLL.434948). **Fig. 4.** *Hecuba reticulata* Raven & H. Dekker, 2022, juvenile, Jakarta Bay, Jakarta, Indonesia, leg. Laboratorium Onderzoek der Zee (L 33.5 mm, H 23.7 mm; ZMA.MOLL.434952). **Fig. 5.** *Hecuba mukerjeei* spec. nov., holotype, GSI, type nr. 16375, near the banks of the Sumeswari river, 1.5 miles SW of Bagmara, Garo Hills, Meghalaya, easternmost India, Bagmara Formation, Miocene (L 19.5 mm, H 13.5 mm; from Mukerjee, 1939: pl. 1 fig. 21). **Fig. 6.** *Venus protoflexuosa* Noetling, 1901, holotype, Thayetmyo, Minbo, Myanmar, zone of *Pholas orientalis*, Miocene (L 15.0 mm, H 12.7 mm; from Noetling, 1901: pl. 12 fig. 6a).

Stratum typicum. — Bagmara Formation, *Ostrea latimarginata* Zone, *Anadara submultiformis-Turritella marica baluchistanensis* Subzone (Lyngdoh et al., 1999).

Type locality. — Near the banks of the Sumeswari river, 1.5 miles SW of Bagmara (lat. 25° 11'; long. 90° 40'), Garo Hills, Meghalaya, easternmost India.

Age. — Early Miocene, Aquitanian-Burdigalian.

Material examined. – Single valve of which only the outside is exposed.

Etymology. — Named after the author of the paper describing the fauna of the Garo Hills, Meghalaya, India.

Diagnosis. — Small cuneate *Hecuba* species with pointed anterior end and rounded posterior with sharp carina and wide, flat posterior area, fine reticulate sculpture with every 2nd commarginal riblet forming low lamellae.

Description. — Small (L 19.5 mm), cuneate, outline rounded, umbo sharp, umbonal angle of ~100°). Umbo slightly posterior of the middle, anterior dorsal slope straight, anterior extreme broadly rounded, ventral margin convex, posterior margin straight, posterior area flat, wide, posterior carina sharp, posterior extreme slightly angular. Surface with closely spaced rounded commarginal riblets, with every 2nd forming low lamellae, which are slightly scaly on the carina. Fine radial riblets in between, creating a reticulate pattern. The radial riblets become weaker towards the posterior. Posterior area almost smooth, with only very thin concentric ribs.

Remarks. — Only the outer left valve is available, but based on the combination of outline and typical sculpture the species can confidently be placed in *Hecuba*. It is unknown whether the specimen represents and adult or can reach a larger size. *Hecuba parva* spec. nov. differs mainly in having a more rounded carina and having commarginal lamellae every 3rd to 4th riblet. Juvenile specimens of *Hecuba scortum* differ mainly in having a much narrower posterior area, whereas only some of the commarginal riblets continue to the anterior.

In outline the shell is similar to some species of *Hemidonax* Mörch, 1871, but it differs in the more pointed anterior end and the completely different sculpture of fine radial riblets and commarginal riblets of which every other forms a lamella (vs. broad rounded ribs without commarginal sculpture).

Mukerjee (1939) considered the shell similar enough to *Venus protoflexuosa* Noetling, 1901 (Fig. 6) to treat it as a variety of that species, but placed it in a different family and genus, as *Donax (Hecuba)*. Both fossils have a very different outline, with Noetling's species being much more triangular, and Mukerjee's specimen more elongate, and both are certainly not conspecific. *Venus protoflexuosa* could be a venerid, as interpreted by Noetling, but information on the hinge is required to confirm this. Its sculpture is described as: *"The surface is covered with numerous fine, radiating ribs, which are flat and separated by linear interstices; these*

*are crossed by sharp, raised, equidistant concentric ribs, which are separated by broad interstices, thus producing a decussate ornamentation.*" Such sculpture is seen both in venerids and *Hecuba*, but thus far all *Hecuba* species have only some of the commarginal ribs forming lamellae. More material of Noetling's species is required for a proper classification.

Lyngdoh et al. (1999) included Mukerjee's species in open nomenclature as *Donax* (*Hecuba*) spec. but did not give a specific reason for this. They also did not indicate whether they found additional specimens. Their material has been deposited at the Palaeontology Museum of the Department of Geology, Pachhunga University College, North-Eastern Hill University, Mizoram, India.

Distribution. – Only known from the Garo Hills, Meghalaya, India.

## DISCUSSION

Within the genus *Hecuba* now five species are known. The extinct *H. mukerjeei* spec. nov. has a sharp carina as in extant species *H. scortum, H. pubescens* and *H. reticulata*, but in size and outline it is more similar to *H. parva* spec. nov. Currently, Sumatra clearly is the hot spot for *Hecuba*, with three of the four extant species, albeit *H. reticulata* occurs along the Indian Ocean coast and *H. scortum* and *H. parva* spec. nov. along the muddy eastern coast.

Fossils are scant, with *H. reticulata* being known from the Pleistocene of Sumatra and Java in Indonesia and *H. mukerjeei* spec. nov. from the Miocene of India. As the Donacidae originated during the Early Cretaceous (the oldest species is *Protodonax minutissumus* (Whitfield, 1891) from the Abieh Formation in Lebanon (Vokes, 1945)) it is well possible that further research delivers even older specimens of the genus *Hecuba,* and it is hoped that the formal description of this fossil stimulates such research.

### Correction regarding the reference to Rumphius in Raven & Dekker (2022: 103)

In the chresonymy of *Hecuba pubescens* the following is stated:

"Chama favus" (description)—Rumphius, 1705: 140, pl. 42 (in some editions pl. 43) fig. F, which he calls Wafelijzer = waffle iron (Ambon).

Jeroen Goud (Naturalis) noted that confusion occurs with both the 1705 and 1741 editions of this work, as the engraver swapped the plate numbers of plates 42 (xlii, folio 140) and 43 (xliii, folio 138), albeit the plates are bound in the correct order. In the text the plate numbers are given at the start of each chapter. In his English translation of the book, Beekman (1999) put the plates in the right order, but kept the wrong numbering on each. He did not give the plate numbers at the start of each chapter and put no figure numbers in the margin. In the caption of the plates he swapped the plate-numbers. Now the text was further away from the figures. Raven & Dekker (2022) thus used the wrong description, and therefore the wrong Dutch name. The correct passage in Rumphius (1705: 132, species vii, pl. 43 fig. F) is:

vii Quadrans, 't Quadrantje heeft de gedaante, als of men een kaasken, 't welk smalle kanten heeft, en in de midden buikig is, in vier stukken gesneden hadde, weshalven de afgesneden zyde plat is, en een langwerpig hert vertoont, desselfs randen zyn eenigzins getand, doorgaans muisverwig of donkergrauw, en een weinig gestreept.

Men vind ze zeer weinig, en meest op de buiten Eilanden van Amboina.

Translated:

*VII. Quadrans, the Little Quadrant has a shape as if one had cut a small cheese, with narrow sides and bellied in the centre, into four pieces, so that the side that had been cut off is flat, and shows an elongated heart, and its edges are slightly toothed, usually the colour of a mouse or a dark grey, and somewhat striped. One finds them rarely, and then mostly on Amboina's outer islands.* (translation from Beekman, 1999: 86, adapted to UK English).

The Dutch name therefore is Quadrantje, not Wafelijzer.

## ACKNOWLEDGEMENTS

Bavius Gras provided access to specimens in his private collection and donated type material to Naturalis. Julien Michel (Akkodis Deutschland, Germany) made a special effort to locate the samples collected for his master's thesis. David Jablonski (University of Chicago) aided with information regarding the fossils from Myanmar and India. Jeroen Goud (Naturalis) alerted the author to an error in the reference to Rumphius' work and checked the section after the correction was made. Ruud Bank noted the nomenclatural rule that validated Hermannnsen's designation of the type species of *Hecuba*. Henk Dekker and an anonymous reviewer are thanked for their constructive comments on an earlier version.

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