

**Notes on the systematics, morphology and biostratigraphy  
of fossil holoplanktonic Mollusca, 23<sup>1</sup>.  
A new pteropod, *Tibiella watupuruensis* spec. nov.  
(Thecosomata, Creseidae), from Eocene (early Bartonian)  
rocks of the Nanggulan Formation, Java (Indonesia)**

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13

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The pteropod species *Tibiella watupuruensis* spec. nov., closely related to *T. texana* Collins, 1934, hitherto exclusively known from the Eocene (Lutetian) of the southern United States, is introduced from the Eocene (Bartonian) of the Nanggulan Formation, Java, Indonesia.

Key words: Gastropoda, Thecosomata, Creseidae, systematics, new species, Eocene.

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INTRODUCTION  
(by W. Renema and F.P. Wesselingh)

The pteropods discussed in the present paper were collected from a sieving residue of rocks exposed along the Kali

Watupuru, Nanggulan, near Yogyakarta (Java, Indonesia), coordinates 07° 43' 51.7" S, 110° 11' 45" E). At the time of collecting (August 2006) water level in the river was extremely low and an almost complete section of the Nanggulan Formation was exposed, starting with the lignite at the base. We stopped sampling at the *Discocyclus* beds, comparable with the 'middle unit' of Lelono (2000), and Kali Songgo Member of Kadar (1986). The lithology is dominated by alternations of calcareous sandstone, siltstone and mudstone in 0.4-1.2 m thick beds, with some coarse-grained sandstone intercalations at the base of the section. Macrofossils, including molluscs (e.g. Martin, 1914, 1931), large benthic foraminifera (Martin, 1880) and corals occur in low abundances over the entire section. The Nanggulan Formation is interpreted as a transgressive sequence, passing from a coastal plain upward through shallow marine into deep marine (Lelono, 2000).

<sup>1</sup> For nr 22 in this series see Basteria 76: 15.

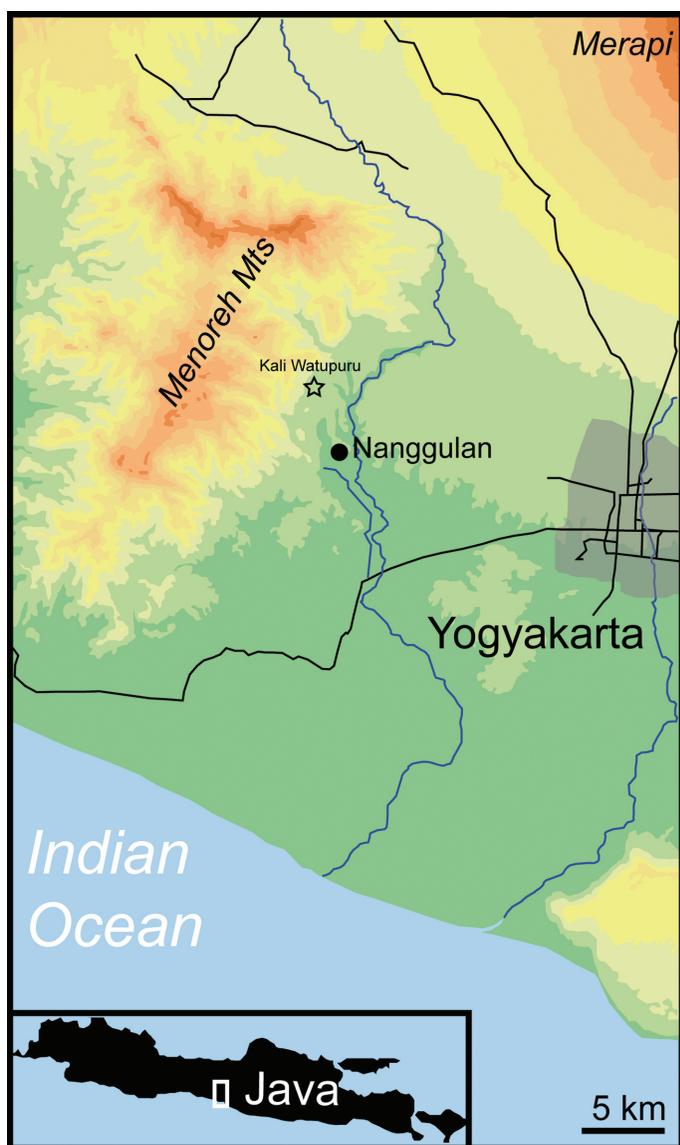


Fig. 1. Location of the Kali Watupuru section, Java, Indonesia.

The interval sampled here reaches from coastal to some 100 m water depth, based on the occurrence of the symbiont bearing foraminifer *Nummulites djokdjokartae* (Martin, 1881) in the lower part of the section, and abundant occurrence of large *Discocyclina* spec. at the top.

MATERIAL AND AGE  
(by W. Renema and F.P. Wesselingh)

The Nanggulan Formation is middle-late Eocene in age. Our sample 06KW04B was taken from the interval corresponding with the upper part of the Kali Watupuru section measured by Lelono (2000). That author interpreted this part of the section as around the middle-late Eocene boundary. Planktonic foraminifera indicate that the entire Kali Watupuru section correlates with P12-14 (P. Lunt, pers. com.) (c. 38-43 Ma), approximately equivalent with top NN16-lower NN17 of the nannoplankton biozonation. The abundant occurrence of large *Discocyclina* is associated with the Ta-Tb transition, correlated with the middle Bartonian (Lunt & Allan, 2004; Renema, 2007). This datum plane is found above the sample under investigation. In conclusion, the age of the sample investigated here is early Bartonian (roughly c. 38-40 Ma).

Samples are housed in the fossil holoplanktonic mollusc collection of the Naturalis Biodiversity Center, Leiden, The Netherlands (RGM registration numbers).

SYSTEMATICS  
(by A.W. Janssen)

Clade Thecosomata de Blainville, 1824  
Superfamily Cavolinioidea Gray, 1850?  
Family Creseidae Rampal, 1973

Note. – Creseidae have traditionally been included in the superfamily Cavolinioidea, but recent molecular work (Jennings et al., 2010) has demonstrated a close relationship between some Creseidae and Limacinidae, which led Bouchet (2012) to include the Creseidae in the Limacinoidea in the WoRMS website. Although surprising at first glance because of large differences in shell morphology (sinistral spiral in Limacinidae and conical to bilaterally symmetrical in Creseidae) there are also indications for this development from the fossil record by a gradual despiralisation of limacinid species leading to creseids during the Eocene (Janssen & Peijnenburg, in press, fig. 8).

*Tibiella* Meyer, 1884

Type species: *Tibiella marshi* Meyer, 1884 (by monotypy) (Eocene).

*Tibiella watupuruensis* Janssen spec. nov. (Fig. 2a-b)

Type material. – Holotype; RGM 776 834 (Fig. 2a-b).

Paratypes from the type locality; RGM 776 835/7; RGM 776 836/4; RGM 776 837/1.

Type locality. – Sample O6KW04B, outcrop along the Kali Watupuru, Nanggulan, near Yogyakarta, Java (Indonesia), coordinates 07° 43' 51.7" S, 110° 11' 45" E.

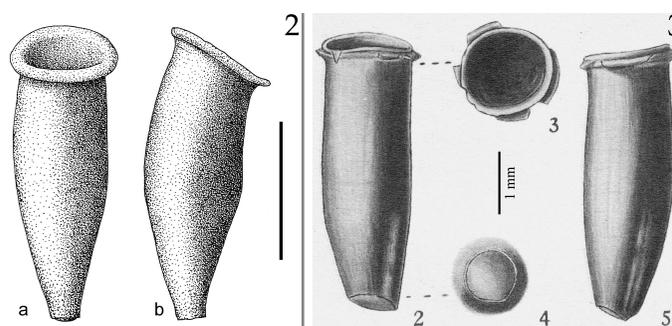
Stratum typicum. – Nanggulan Formation, upper part of Kali Songgo Member (Eocene, early Bartonian; Planktonic Foraminifera Zone P12-14).

Etymology. – The new species is named after the type locality.

Description. – The shell (holotype: H = 2.16, W = 0.88 mm) is tubiform, very slightly curved dorso-ventrally, with a circular transverse section all over its height. At mid height the shell is inflated, somewhat stronger so at its ventral side (lateral view). The adapical shell part is regularly conical and abruptly truncated by shedding of an as yet unknown larval shell. The opening is closed by a faintly convex septum, damaged in all available specimens. The shell surface is smooth, some specimens are a bit shiny and in these very fine growth lines are visible at those places where the light reflects on the shell's surface. The aperture is reinforced by a solid flange, coinciding with the actual apertural margin, circular in adapical view, situated at an oblique angle with respect to the shell's long axis and in that way amplifying a slight dorso-ventral curvature, its higher side interpreted as dorsal.

Discussion. – The present new species was the only holoplanktonic mollusc species found in the sample. It shows a striking resemblance with a species described from the middle Eocene (Lutetian, Weches Formation, NP 15a) of the southern United States, viz. *Tibiella texana* Collins (1934: 227, pl. 14 figs 2-5, as '*Tibiella*' *texana*) (Fig. 3). There are, however, some apparent differences between the Indonesian specimens when compared to the ones from Texas, as described and illustrated by Collins and subsequently by Hodgkinson et al. (1992: 35, pl. 13, figs 4-8).

The Indonesian specimens reach hardly half the shell height (holotype = 2.16 mm) of the American shells (holotype of *T. texana*, H = 4.5 mm, Collins, 1934; topotype H = 3.9 mm, Hodgkinson et al., 1992). They are less slender because of a



**Figs 2, 3.** *Tibiella* species. **2a-b**, *Tibiella watupuruensis* spec. nov., holotype; a. frontal, b. right lateral views. RGM 776 834 (camera lucida drawings). Bar 1 mm. **3**, Original illustrations of the holotype of *Tibiella texana* Collins, 1934 (after Collins, 1934: pl. 14 figs 2-5). 1 mm bar added.

somewhat more swollen ventral side (lateral view, Fig. 1b), with a more conical adapical shell part and therefore a septum with relatively much smaller diameter. The more obliquely positioned apertural flange is not sharp, as in the holotype and additional specimens of *T. texana* from Texas, but perfectly rounded and massive, coinciding with the actual apertural margin, whereas in most of the American specimens the flange is situated closely below the margin.

As was already suggested by Meyer (1884: 110) for *Tibiella marshi* Meyer, 1884, Collins (1934) compared *Tibiella texana* with Recent cuvierinids, namely *Cuvierina columnella* (Rang, 1827) as also in that species the larval shell is shed and the resulting gap is closed with a septum. This was subsequently accepted by Hodgkinson et al. (1992), who included the genus *Tibiella*, together with *Bucanoides* Hodgkinson, in Hodgkinson et al., 1992, and *Loxobidens* Hodgkinson, in Hodgkinson et al., 1992, in the subfamily Cuvierininae. Janssen (2005: 28), however, transferred these genera to the Creseidae in which group early shell shedding and subsequent closure with a septum are also known (*Euchilotheca*) and in which apertural flanges occur frequently, whereas these are unknown among the Cuvierinidae.

Other species of *Tibiella* are also, and so far exclusively, described from the southern United States. *Tibiella annulata* Garvie, in Hodgkinson et al., 1992, from the Viesca Member,

Weches Formation, Texas, is also of Lutetian age. *Tibiella marshi* Meyer, 1884, was introduced from the Bartonian Gosport Sand in Alabama. From the same rocks Hodgkinson et al. (1992: 34, pl. 12 figs 9, 10) recorded specimens identified with the same name that, however, differ somewhat from the type specimen, but the authors gave arguments to consider them to belong to the same species. A specimen closely resembling Hodgkinson et al.'s illustrations was recently recovered from the Bartonian of Bende Ameki (Nigeria, RGM collection, unpublished). *Tibiella reflexa* Hodgkinson, in Hodgkinson et al., 1992, is a species only known from fragments, recorded from the Bartonian Stone City Formation, Texas. All of these taxa differ significantly from the present new species, that appears to be a further development of *T. texana*. Its occurrence at 'the other side of the globe' once more indicates how little is known about the palaeobiogeography of holoplanktonic molluscs.

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