

Species of *Ditropopsis* E. A. Smith, 1897 (Mollusca: Architaenioglossa: Cyclophoridae) from Biak Island, the Papuan Region

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Abstract

Ditropopsis (s. str.) *aenigmatica* (van Benthem Jutting, 1963) is redescribed and *D.* (s. str.) *sodalis* sp. nov. is described from Biak Island in Cenderawasih Bay, New Guinea. Supplemented key to Papuan *Ditropopsis* is given.

Zusammenfassung

Ditropopsis (s. str.) *aenigmatica* (van Benthem Jutting, 1963) wird wiederbeschrieben und *D.* (s. str.) *sodalis* sp. nov. wird von der Insel Biak aus der Cenderawasih Bay (Neuguinea) als neu für die Wissenschaft beschrieben und abgebildet. Ein Bestimmungsschlüssel der papuanischen Arten der Gattung *Ditropopsis* wird beigefügt.

Key words: Gastropoda, *Ditropopsis*, Biak, new species, key

Introduction

The Papuan species of the genus *Ditropopsis* E.A. Smith, 1897 were revised recently (GREKE 2011, 2014) and one more species was described since the revision (GREKE 2017). Twenty-eight species (26 named, and 2 not yet named, because of insufficient material) have been reported from New Guinea, its adjacent islands, and the Moluccas until now. One additional species discovered on Biak Island (Cenderawasih Bay or Shouten islands) in 2018, is described, illustrated and keyed below. *Ditropopsis* (s. str.) *aenigmatica* is redescribed.

Materials and methods

Specimens were sampled by hand in rainforest leaf litter and preserved in 99% ethanol. For morphological studies, a Leica S6D binocular stereomicroscope with attached external Canon EOS 77D SLR camera was used. Multiple photographs were taken at different focal planes

and reassembled using CombineZP software. The holotype of the new species is deposited at the Naturkundemuseum Erfurt (NME), Germany. Type specimens were provided with additional black-framed printed red paper labels ‘Holotypus’ or ‘Paratypus’.

For the definition of geographical area (the Papuan Region), please see GREKE (2011).

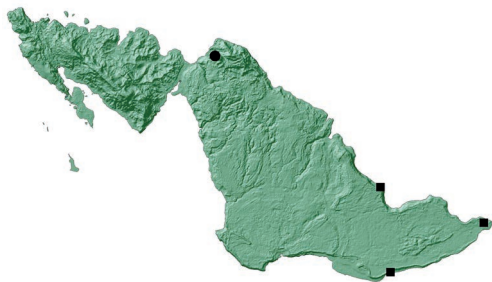
Descriptions

***Ditropopsis* (s. str.) *sodalis* sp. nov.** (Figures 1–6, map1) <http://zoobank.org/E7B5DC68-17D6-4641-B8F5-307B09945E29>

Holotype: INDONESIA E, Papua Prov., Cenderawasih Bay, Biak Is. N, Biak ~59.4 km NNW, 0°43'23"S, 135°48'13"E, ~460 m, 22.III.2018, primary lowland rainforest on limestone cliffs, leg. D.Telnov [NME].

Paratype: same data as holotype [1 juvenile shell, collection K.Greke].

Description: Shell shiny, semitransparent, pale brown. Measurements, holotype: adult shell diameter 3.7 mm, height 3 mm. Shell shape low conical, with 2 apical whorls detached from the spire. Whorls about 4, the one and half embryonic whorls are smooth, subglobose, strongly tilted obliquely relative to the axis of coiling (Figs 1–2). Shell with four strong carinae: the upper carina situated at some distance from the suture, the next two are peripheral (upper and lower), the fourth is basal. The distance between both peripheral carinae is twice the distance between the upper and upper peripheral ones. Shell coarsely radially striate, including the upper carina (Figs 4–5). Spiral striae are more distinct on the base of shell, where sculpture consists of irregular rectangular cells. Suture rather deep, area between suture and upper carina coarsely radially striate, without spiral striations. A gap is present between the suture and lower peripheral carina (the carina not touching the suture; Fig. 1). Umbilicus is open, approximately 1/3 of



Map 1. Map of Biak and Supiori islands with distribution records of *Ditropopsis* species. Circle: *Ditropopsis* (s. str.) *sodalis* sp. nov.; Squares: *Ditropopsis* (s. str.) *aenigmatica*. Prepared with ArcGIS 10.3.

the shell diameter. Aperture circular, vaguely channelled at the lower peripheral carina and rather strongly so at the upper and basal ones. Peristome irregularly triangular, double; all its margins are thickened. The operculum dark brown, derivative, the outer surface constructed of numerous circular calcareous layers (Fig. 6).

Differential diagnosis: *D. sodalis* sp. nov. most closely resembles *D. aenigmatica* (van Benthem Jutting, 1963) which is widespread on Biak Island. The new species differs specifically in absence of umbilical carinae, generally much stronger spiral, as well as radial striations, and in broader base of shell. The upper carina situated at constant distance from the suture and does not enter it. Also see key to species.

Ecology: This species inhabits primary lowland rainforest and was sampled at about 460 m elevation in thin layer of very wet leaf litter on pure karst hills. All of soil and most of leaf litter accumulate in deep cavities between karst formations. These cavities are narrow, deep, and inaccessible, preventing further sampling (D. TELNOV, personal communication).

Distribution: Northern part of Biak Island, Cenderawasih Bay Islands, Indonesian New Guinea.

Derivatio nominis: Named from the Latin “sodalis” [companion, fellow, comrade] to reflect its similarity with *D. aenigmatica*, the second congener from Biak Island.

***Ditropopsis* (s. str.) *aenigmatica* (van Benthem Jutting, 1963)** (Figures 7–18, map 1)

Holotype: RIJKSMUSEUM VAN NATUURLIJKE HISTORIE LEIDEN [printed] *Ditropis aenigmatica* v.B.Jutting holotype Afd.Mariniers – Nieuw Guinea,

c.d. – Reg. No. 1071. New. Nieuw Guinea. Biak. Mangbos. 1953. [handwritten] [this specimen provided with an additional circular red label with no text] [Naturalis Biodiversity Centre, Leiden].

Paratype: RIJKSMUSEUM VAN NATUURLIJKE HISTORIE LEIDEN [printed] *Ditropis aenigmatica* v.B.Jutting paratype Afd.Mariniers – Nieuw Guinea, c.d. – Reg. No. 1071. New. Nieuw Guinea. Biak. Mangbos. 1953. [handwritten] [this specimen provided with an additional circular blue label with no text] [Naturalis Biodiversity Centre, Leiden].

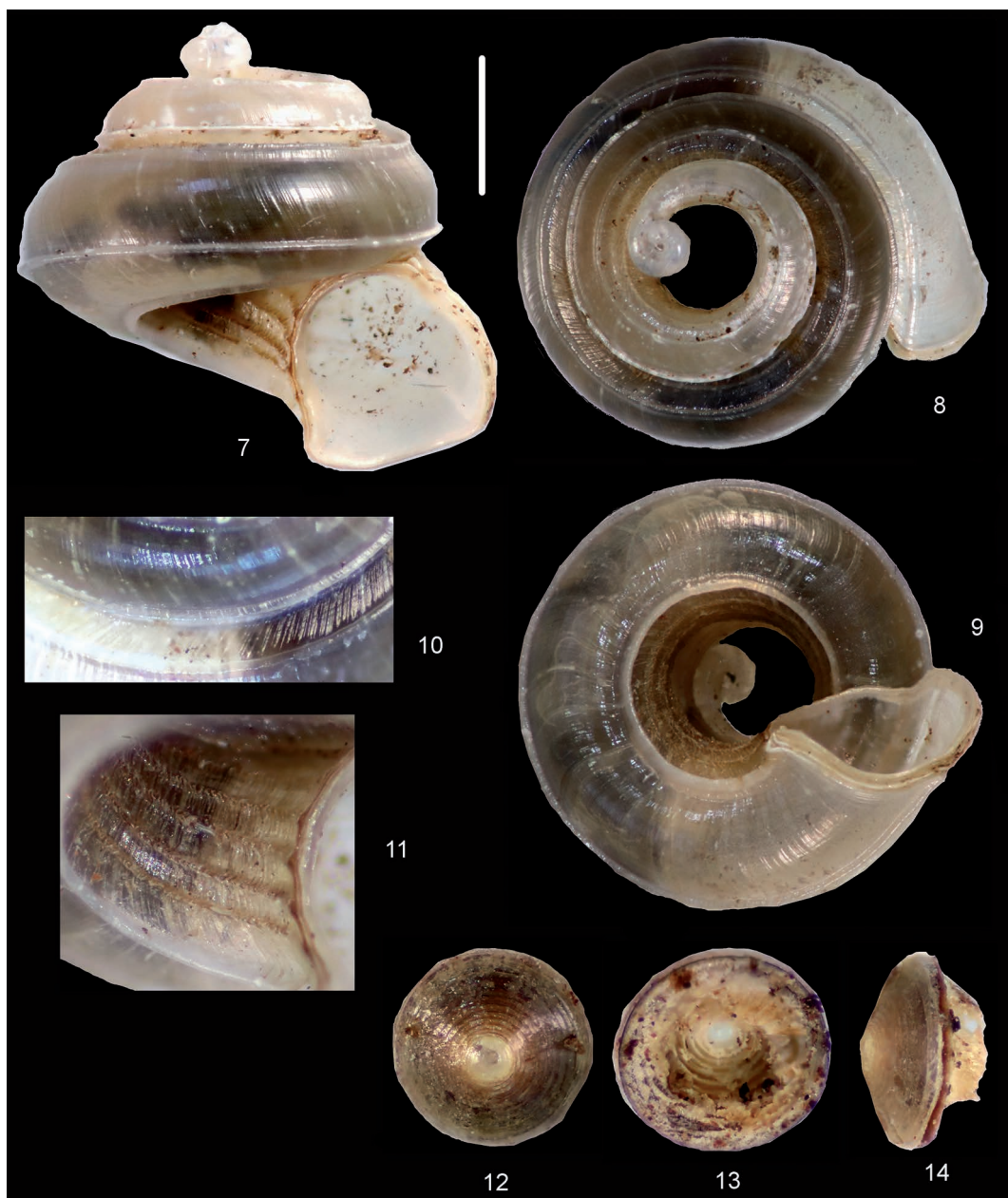
Additional material: INDONESIA E, Papua Prov., Cenderawasih Bay, Biak Is., Biak ~11 km E, at Biak Bird park, 01°10'39"S, 136°10'33"E, 40–70 m, 21.III.2018, primary lowland rainforest on limestone, leg. D. Telnov [6 specimens in coll. K. Greķe, Rīga]; INDONESIA E, Papua Prov., Cenderawasih Bay, Biak Is. E, Biak ~34 km ENE, 01°04'50"S, 136°22'08"E, 10–15 m, 22.III.2018, primary lowland rainforest, leg. D.Telnov [5 specimens in coll. K.Greķe, Rīga].

Redescription: Shell shiny, transparent, pale brown. Measurements, selected adult specimens from S Biak, Biak Bird park surroundings: shell diameter 3.1–3.4 mm, height 2.65–3 mm; selected adult specimens from E Biak: shell diameter 3.1–3.3 mm, height 2.8–3 mm. Shell shape conical, with less than 1½ apical whorl detached from the spire. Whorls about 4, the embryonic whorl is smooth, subglobose, slightly tilted obliquely with regard to the axis of coiling (Figs 7–8). Four strong and acute carinae on the shell: the first extremely close to suture, in some places enters it, the second carina situated at some distance from the suture, the third is peripheral, the fourth, basal, surrounds the umbilicus. Shell densely radially striate, including the upper carina, spiral striae are very delicate (Figs 7–9 & 11). There are 4–6 acute umbilical carinae (Fig. 10). Intervening spaces between umbilical carinae are densely and coarsely radially striate (Fig. 10). Suture deep. Umbilicus is wide, approximately ½ of the shell diameter. Aperture circular, indistinctly channelled at the peripheral and basal carinae. Peristome of irregular form with almost straight basal margin, double, all margins slightly thickened. The operculum dark brown, the outer surface formed from numerous circular calcareous layers (Figs 12–14).

Ecology: This species inhabits wet leaf litter of old-growth secondary and primary lowland rainforests



Figures 1–6. *Ditropopsis* (s. str.) *sodalis* sp. nov., holotype. **1–3:** Adult shell, different views; **4:** Spiral and radial striations of the shell (upper side of the body whorl); **5:** ditto, shell base; **6:** operculum, outer surface as visible through the aperture. Scale bar for figures 1–3: 1.0 mm.



Figures 7–14. *Ditropopsis* (s. str.) *aenigmatica* (van Benthem Jutting, 1963), specimen from E Biak. **7–9:** Adult shell, different views; **10:** Spiral and radial striations of the shell (upper side, penultimate and body whorls); **11:** Umbilical channel with 5 spiral carinae; **12:** operculum, inner surface; **13:** ditto, outer surface; **14:** ditto, lateral view. Scale bar for figures 7–9: 1.0 mm.

(original data), dead shells of type specimens were found in mangroves (van Benthem Jutting 1963). This species is reported from just above sea level up to 70 m elevation. Specimens observed on undersides of fallen

leaves of various size, not building large aggregations and mostly sampled one-by-one (D. Telnov, personal communication).

Distribution: Biak Island except the north, Cenderawasih Bay Islands, Indonesian New Guinea.

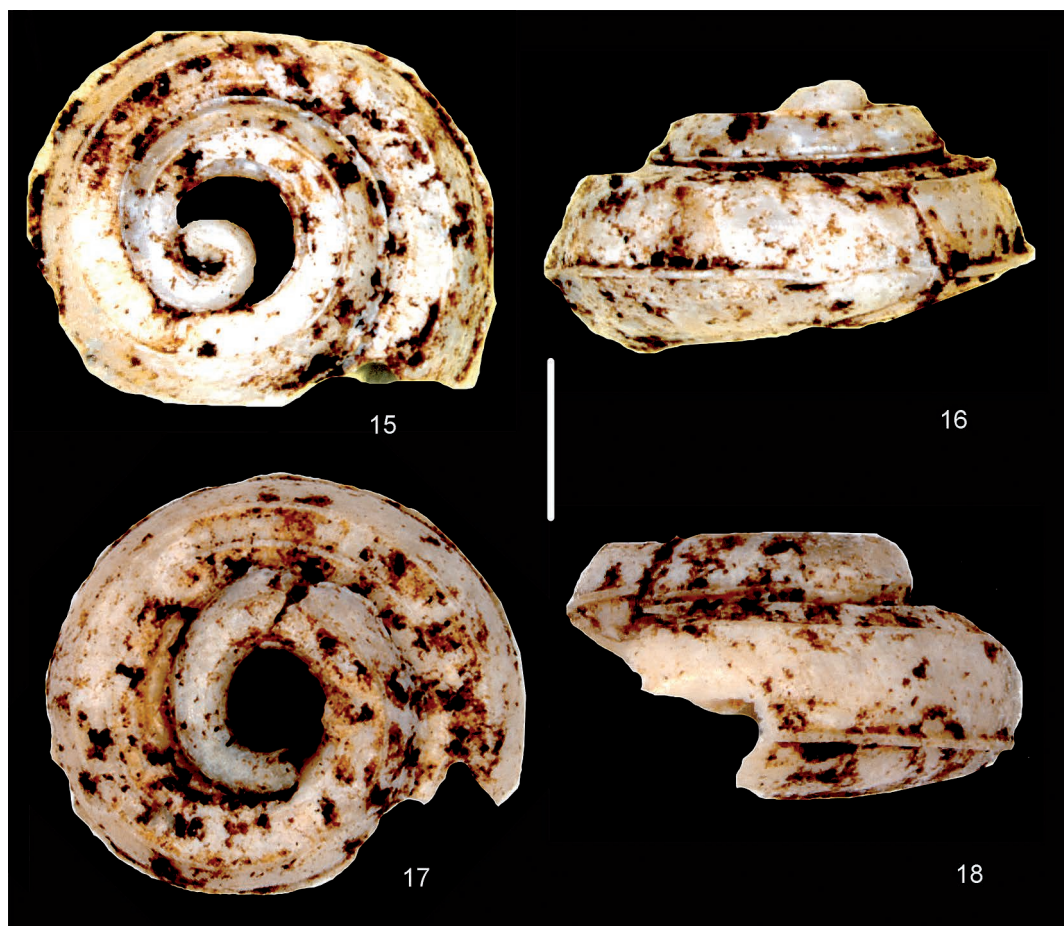
Updated key to *Ditropopsis* s. str. from the Papuan Region

This is an updated key provided earlier by GREKE (2014, 2017). It incorporates the new species and significant changes for *D. (s. str.) aenigmatica*.

- 1 Shell external carinae with dense irregular brush shaped microscopic processes *D. ciliata* Greke, 2017
- External carinae simple, without processes 2
- 2 Shell cornucopia-like with whorls (except 1½–2 embryonic ones) more or less distinctly free 3 (*mirabilis* group)
- Shell not cornucopia-like, whorls connected one with another along suture (in certain species a gap is present between the embryonic whorls and the rest of spire) 5
- 3 Shell high conical, pitch angle of the body whorl about 30°; non-embryonic whorls with 3 external spiral carinae; operculum externally with median tubular process which is glabrous *D. mirabilis* Greke, 2011
- Shell low conical, pitch angle of the body whorl much less than 30°, whorls often subparallel; non-embryonic whorls with 3–4 external spiral carinae; operculum externally with median tubular process, which is pubescent or glabrous 4
- 4 Shell whorls with totally 4, rarely 3 external spiral carinae; operculum externally with bristles of long hairs covering the median tubular process externally *D. bironi* (Soós, 1911)
- Shell whorls with 3 external spiral carinae; operculum not pubescent externally [I had no opportunity to study operculum of this species, this characters is based on the original description] *D. spiralis* (O. Boettger, 1891)
- 5 Shell apical whorls partly detached from the spire (a gap is present between the apical whorls and the rest of spire) 6
- Shell apical whorls are not detached from the spire (there is no gap between the apical whorls and the rest of spire) 16
- 6 One of three largest species in the region (about 5.4 x 5.5 mm); shell high conical, has three external carinae: two are continuous, third is presented on the first three whorls, but reduced to a mark on all forthcoming whorls; operculum simple, white and not nacreous externally *D. pyramis* Greke, 2014
- Shell smaller (except *D. magna*), shape broader; other characters are different 7
- 7 Umbilicus is wide, approximately ½ the shell diameter; shell transparent and almost colourless and with delicate radial striations; whorls 4; shell with 2 or 3 external and 4 umbilical carinae *D. ingenua* (O. Boettger, 1891)
- Umbilicus narrower than ½ the shell diameter (if umbilicus is as wide as ½ the shell diameter, than shell surface distinctly radially striate; shell with more than 4 whorls 8
- 8 One of three largest species in the region (3.5–4.8 diameter x 4.8–6.8 mm height); shell low conical, with three external carinae: two continuous, third disappear on the last whorl; operculum simple, white nacreous externally *D. magna* Greke, 2014
- Shell generally smaller; number of external carinae various; operculum derivative or simple, not white nacreous externally 9
- 9 Shell with more than 2 umbilical carinae (number of carinae can vary) 10
- Umbilical carinae not present or there is only one umbilical carina 13
- 10 External carinae not equally strong and not very prominent; upper carina radially striate 11
- Two external carinae very strong and prominent; upper carina not radially striate 12 (*telnovi* group)
- 11 Shell rather high conical, with opaque surface, densely reticulate by strong and dense radial and spiral striae; 4 umbilical carinae present *D. heterospirifera* (van Benthem Jutting, 1958)

- Shell significantly less high, with smooth surface; radial striations dense and strong, spiral striations delicate; 4–6 umbilical carinae present *D. aenigmatica* (van Benthem Jutting, 1963)
- 12 Shell smooth, with extraordinary wide (~0.3 mm) waved 3 external carinae and 2 inconspicuous umbilical carinae; upper side of the shell with delicate spiral striations; umbilical surface reticulated; umbilicus is 1/4 of the shell diameter *D. telnovi* Greke, 2014
- Shell smooth, with 3 external and 3 inconspicuous umbilical carinae; shell sculpture coarse; spiral striations lacking on the upper side of the shell; umbilical surface without reticulation; umbilicus is more than 1/3 of the shell diameter *D. waigeensis* Greke, 2014
- 13 First external carina is located near the suture; the area between the first external carina and the suture is densely radially striate, striation continues over this carina (Fig. 4); the gap is present between suture and the first carina (the carina is not touching the suture) *D. sodalis* sp. nov.
- There is no external carina near the suture 14
- 14 Shell additionally to 2 peripheral carinae has an inconspicuous intermediate (third) carina on the upper side of early whorls about half distance between suture and the upper peripheral carina (consider plate 9 fig. 1 & plate 11 fig. 2 in Greke 2011); this intermediate carina becomes weak and disappear on the ultimate whorls; of two peripheral carinae, the lower one is much stronger than the upper 15 (*fultoni* group)
- Shell with two almost equally strong peripheral carinae, without trace of intermediate carina *D. majalibit* Greke, 2014
- 15 Shell without umbilical carinae; operculum simple discoidal *D. fultoni* E.A. Smith, 1897
- Shell with one umbilical carina; operculum derivative (e.g. with calcareous rings, median or lateral protrudings on the outer surface), with a median tubular process on the outer surface *D. tritonensis* Greke, 2011
- 16 Shell high conical, higher than wide; umbilicus very narrow (less than 1/7 of the shell diameter); shell with two weak external carinae (sutural and basal) *D. alta* Greke, 2014
- Shell shape less high; umbilicus comparatively wider 17
- 17 Shell conical or low conical (not discoid) with up to 3 external carinae; external surface of operculum with margins parallel, not converging towards the centre *D. perlucidula* Greke, 2011
- Shell conical or low conical (not discoid) with up to 3 external carinae; external surface of operculum with margins not converging toward the centre 18
- 18 One of three largest species in the region (3.4 x 6.1 mm); shell low conical, has two external carinae; whorls weakly convex *D. monticola* Greke, 2014
- Shell smaller; other features are different 19
- 19 Shell bi-coloured, depressed and low conical, has 2 external and single umbilical carina; umbilicus wide (more than 1/3 of the shell diameter) *D. papuana* E. A. Smith, 1897
- Shell unicolorous, shape various, from low conical to conical; has up to 3 external, and no umbilical carinae; umbilicus variable 20
- 20 Shell depressed, low conical, with bulging apical whorls and 2–3 external carinae 21 (*moellendorffi* group)
- Shell not depressed; whorls convex; apex different; 1–2 external carinae 22
- 21 Shell with 3 external carinae; operculum simple *D. moellendorffi* (O. Boettger, 1891)
- Shell with 2 external carinae; operculum derivative, with very short and broad process (which is trapezoidal in lateral view) *D. halmaherica* Greke, 2014
- 22 Shell low conical; peristome almost circular 23 (*benthemjuttingi* group)
- Shell conical; peristome triangular or quadrangular 24 (*tamarau* group)
- 23 Shell smooth, radial striations dense but delicate; one wide and spirally striated external carina, which starts on the 2nd whorl; umbilical channel without spiral striations; carina is partly detached from the suture (in lateral view); whorls 5 *D. benthemjuttingi* Greke, 2011
- Shell smooth, radial striations dense but delicate; the only external carina starts on the 3rd whorl; umbilical channel without spiral striations; carina is attached to the suture (in lateral view); whorls 4 *D. wallacei* Greke, 2014

- Shell dull, reticulated with rough radial and spiral striations; shell with two external carinae; umbilical channel with dense and prominent spiral striations; carina is attached to the suture (in lateral view); whorls 5 *D. obiensis* Greke, 2011
- 24 Shell with two external carinae *D. tamarau* Greke, 2014
- Shell with single external carina 25
- 25 Shell smaller (height 2.6–2.8 mm, diameter 3.2–3.5 mm), surface shiny; external carina comparatively narrower; operculum brown internally *D. unicarinata* Greke, 2014
- Shell larger (height 3.3 mm, diameter 4.2 mm), dull; external carina comparatively wider; operculum pale internally *D. pallidioperculata* Greke, 2014



Figures 15–18. *Ditiopopsis* (s. str.) *aenigmatica* (van Benthem Jutting, 1963). 15–16: Holotype, different views; 17–18: Paratype, different views (photo courtesy: Naturalis Biodiversity Centre, Leiden). Scale bar: 1.0 mm.

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