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## ***Enigmata foveata*, a new species from Madagascar** (Coleoptera: Hydrophiloidea)

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### **Abstract**

A new hydrophilid species, *Enigmata foveata*, is described from Madagascar, and its relationship to *Enigmata brunnea* HANSEN, 1999 is discussed.

**Key words:** Coleoptera, Hydrophilidae, *Enigmata*, taxonomy, new species, Afrotropical Region, Madagascar.

### **Introduction**

HANSEN (1999) established the genus *Enigmata* based on a single female specimen of *E. brunnea* HANSEN, 1999 from eastern Madagascar. Based on several similarities, which he did not specify in detail at that time, HANSEN (1999) assigned the new genus to the tribe Anacaenini discussing the differences and similarities with the other hitherto known genera *Notohydrus* BALFOUR-BROWNE, 1939, *Crenitis* BEDEL, 1881, *Paracymus* THOMSON, 1867, *Anacaena* THOMSON, 1859, *Phelea* HANSEN, 1999, and *Grodum* HANSEN, 1999. HANSEN (1999) justified the generic rank with several peculiarities of the mentum, prementum, metaventrite, sutural stria, and pubescence on the tarsi, without considering affinities with other representatives of Anacaenini. He did not discuss the possibility that *Enigmata brunnea* may be a specialised species of *Anacaena* with conspicuous autapomorphies. In 1993, 55 specimens of a new hydrophilid species similar to *Enigmata brunnea* were collected in eastern Madagascar, not far from the type locality of the latter. The specimens share the above mentioned peculiarities of *Enigmata* and were therefore assigned to this genus.

In this contribution the new species is described and the relationship to *Enigmata brunnea* is discussed. Whether the generic rank of *Enigmata* is justified, i.e. the monophyly of *Anacaena* without *Enigmata* (and possibly other genera), will be clarified in a future study in a broader phylogenetic context.

### **Material and methods**

The specimens were compared with the type specimen of *E. brunnea*. They were examined using a binocular Leica MZ 12.5 with diffuse and focused light sources. Mouthparts, thoracic structures and male genitalia of *E. foveata* were dissected, macerated and cleared in concentrated lactic acid and examined several hours later with a light microscope Olympus BX 41. Measurements were taken using a micrometric eyepiece, and ink drawings were made with a drawing tube. The morphological terminology is based on KOMAREK (2004).

## Abbreviations:

|      |                                                                |
|------|----------------------------------------------------------------|
| AEZS | A.E.Z. Short Collection, Ithaca, New York (U.S.A.)             |
| BMH  | Bishop Museum, Honolulu, Hawaii (U.S.A.)                       |
| ISNB | Institut National des Sciences Naturelles, Bruxelles (Belgium) |
| NHM  | The Natural History Museum, London (U.K.)                      |
| NMW  | Naturhistorisches Museum Wien (Austria)                        |
| ZMUC | Zoological Museum Copenhagen (Denmark)                         |

*Enigmata foveata* sp.n.

TYPE LOCALITY: Eastern Madagascar, Ranomafana National Park.

TYPE MATERIAL: **Holotype** ♂ (NMW): "Madagascar est, 1100-1200 m, P.N. Ranomafana \ Vohiparara, 21. – 24. 1.1993 / G. Dunay & J. Janák leg.". **Paratypes**: 43 exs. (NMW, AEZS, ISNB, NHM, ZMUC): same data as holotype; 9 exs. (NMW): "Madagascar est, 1100-1200 m, P.N. Ranomafana \ Vohiparara, 21. – 24. 1.1993 / J. Janák leg.".

DIFFERENTIAL DIAGNOSIS (Figs. 2–5): *E. foveata* is distinctly smaller (*E. brunnea* is 3.9 mm long); the maxillary palpomere 2 is comparatively wider and slightly flattened basally in *E. brunnea*, without basal cavity; palpomere 4 is longer (compared with palpomere 3), almost straight, and parallel-sided; the anapleural sutures dividing the mesoventrite from the anepisterna are present and complete in *E. brunnea*; an irregular punctation between the serial elytral punctures is present in *E. brunnea*, but absent in *E. foveata*. A slight callosity on shoulder regions is present in *E. foveata* in contrast to *E. brunnea*.

DESCRIPTION: Total length 2.1–2.3 mm; total width 1.2 mm; E.I. (elytral index = relation of median length to greatest width of elytra in dorsal view): 1.25. Habitus oblong oval, with greatest width in midlength; elytra about 3.5 times as long as pronotum in dorsal view; parallel-sided for a short distance in midlength.

Head (Figs. 2, 6–8): Frons very dark brown to almost black; labrum and clypeus slightly brighter, especially towards lateral margin. Irregular punctures fine and deep, widely separated, slightly denser towards clypeal margins, without setae; one series of very fine, densely arranged punctures present along inner margin of eyes. Interstices shiny, without microsculpture. Eyes slightly constricted anteriorly by clypeal extension and posteriorly by temporal extension; dorsal portion slightly larger than ventral portion. Interocular distance 4.2 times as large as horizontal diameter of dorsal portion of one eye. Clypeus comparatively short in longitudinal diameter, not excised anteriorly, without discernible angles between lateral and anterior portion. Frontoclypeal suture very indistinct or not recognisable. Antennae eight-segmented; antennomeres 1–5 yellow; pedicellus twice as long as wide; segment 3 elongated, about as long as segment 4 and cupula together. Antennal club 2.3 times as long as wide, with almost spherical apical segment. Mandible with angular lateral margin, with a very shallow dent between basal and apical portion; apex bifid; mesal margin with a proximal row of dense brush-like setae and a distal fringe of long soft hairs; retinaculum absent. Maxillary palpi moderately stout; palpomere 2 conspicuously inflated, almost angulate mesally, with a distinct cavity at mesal base; palpomere 3 asymmetrical, with concave mesal and convex lateral edge; palpomere 4 moderately elongated, with slightly convex lateral and mesal edges; apical edge oblique oval. Palpomeres uniformly yellow, without infuscation. Temporal regions, mentum, gula, submentum, cardo, and stipes brown, prementum and labial palpi somewhat lighter. Mentum ca. 1.5 times as wide as long, rather flat, anteriorly slightly flexed dorsad; sparse, rather strong and long setae, irregularly distributed; weakly impressed microstructure mainly present on anterior portion; circular structures (possibly glands) irregularly distributed below cuticle; lateral margins without setae, straight, with distinct anterior angles; anterior margin triangularly projecting. Submentum with

indistinct pubescence similar to temporal regions. Prementum with very large, oval, lateral sclerites, set with a very dense fringe of long fine setae. Labial palpi slender; third palpomere slightly longer than second.

Thorax (Figs. 1, 4): Pronotum dark brown, with indistinctly demarcated brighter margins. Punctuation very fine, widely spaced, slightly coarser and denser towards lateral margins; “systematic punctures” absent; interstices smooth, shiny, without microsculpture. Lateral margins with a distinct fine bead, weakly convex, with more pronounced posterior angles and rounded anterior angles. Posterior margin not bisinuate. Transverse fold absent. Prosternum and hypomeron light brown, slightly bulged, very slightly projecting towards gula mesally. Procoxal fissure narrow. Procoxal bridge weakly excised; margin without strengthening ridge. Hypomeral process very short, acutely pointed. Profurca very weakly developed as a short narrow stalk with an unpigmented apical knob. Scutellar shield almost equilateral, dark brown, smooth and finely punctured. Elytra not explanate and without impressions; with a slight callosity on shoulder regions; with distinct anterior and lateral bead. Colouration of elytra dark brown, with very indistinct brighter areas in some individuals. Elytral punctures fine, but distinctly coarser than on head and pronotum, equidistant, with subserial arrangement. Setae absent. Interstices without microsculpture. Sharply impressed sutural stria very fine and fading anteriorly towards scutellar shield, but present in almost total length of elytra. Mesoventrite slightly bulged, without posteromesal protuberance. Anapleural sutures indistinct, S-shaped; distinct “wings” formed by posterior sections (mesocoxal lobes) conceal the trochantin; anterior sections almost parallel-sided, present in posterior portion only; mesoventrite fused with anepisterna anteriorly. Anepisternum glabrous, with reticulate microsculpture, with very short oblique ridge antero-laterally. Pseudepipleura and epipleura vertical. Epipleura, meso- and metaventrite uniformly brown. Mesofurca arising separately from coxal wall, without connecting ridge, weakly developed as short, narrow, almost parallel branches terminating less than halfway to the pleural ridge in an unpigmented, weakly sclerotized knob. Metaventrite bulged mesally, completely pubescent; lateral and anterior margins with a fine strengthening line, not interrupted mesally. Anepisternum about 3.5 times as long as wide. Transverse suture indistinct. Katepisternum glabrous. Metafurca unpigmented, weakly sclerotized. Metanotum very slightly sclerotised and weakly pigmented.

Legs: Coloured like ventrites. Procoxa glabrous; protrochanter pubescent. Femoral hairlines distinct. Profemur 2.4 times as long as wide, pro- and mesofemur pubescent on more than proximal half, with straight to slightly convex hairline; pubescence of metafemur pubescence confined to anterior margin and proximal portion; with concave hairline. Metatibia with short spines on lateral margin; metatibial spurs moderately strong, the longer mesal spur extending to less than halflength of tarsomere 2. Protarsus ventrally set with rather fine setae; mesotarsomere 1 with two rows of 6–7 short spines, mesotarsomeres 2–5 with fine setae, metatarsomeres with a few very long setae and a pair of terminal spines. Metatarsus shorter than metatibia; metatarsomere 2 very long, about three times as long as tarsomere 1 and about two times as long as tarsomere 5.

Abdominal ventrites dark brown, entirely covered with dense hydrofuge pubescence. Hind margin of ventrite 5 simply rounded. Ratio of median abdominal length to width of first ventrite = 0.7. Ventrite 1 slightly shorter than 2.

Aedeagus (Fig. 8): Phallobase much shorter than parameres, broadly rounded manubrium strongly flexed dorsad, not distinctly demarcated from phallobase. Parameres long, slender, with lateral margins shallowly dented, mesal margins almost straight, and the apices rounded. Median lobe shorter than parameres. Corona elongated, tube-like, embedded in a peculiar structure consisting of feather-like short fibers; basal apophyses long, with extension into phallobase, terminating in small knobs. Base of median lobe not connected with parameres.

**ETYMOLOGY:** The name of the epithet refers to the cavity on maxillary palpomere 2.

**DISCUSSION:** Many features suggest a close relationship between *E. foveata* and *E. brunnea*. The general body shape, the punctuation of the head and pronotum, and the pattern of the femoral pubescence are similar, a ridge or protuberance is absent from the prosternum and mesoventrite in both species. The separate specific rank is clearly justified by striking differences such as the body size, the shape of the maxillary palpi, the elytral punctuation, and the fact that the mesoventrite is partly fused to the anepisternum in *E. foveata*. The following characters which were assigned to the genus *Enigmata* by HANSEN (1991) are shared by *E. brunnea* and *E. foveata*: the angulate anterior projection of the mentum; the large, disc-shaped lateral sclerites of the prementum set with very fine long setae; the long sutural stria; the transverse line on the metaventricle; a very long metatarsomere 2. All these characters are not found in any potentially related species and are therefore synapomorphies of the two species.

In contrast to the monophyletic status of the two species, the relationship to other genera of Anacaenini or even species of *Anacaena* is far from sufficiently clarified. No attempts to reconstruct the phylogeny of Anacaenini with cladistic methods has been undertaken yet. Considering this, it is surprising that HANSEN (1991), who emphasized this problem himself, described several new genera, without a serious phylogenetic background. It is quite possible that genera such as e.g. *Grodum* HANSEN, 1999, *Phelea* HANSEN, 1999, *Gentilina* HEBAUER, 2003 or *Hebauerina* GENTILI, 2002 may turn out as specialised representatives of *Anacaena*, and this could also be true for *Enigmata*. That the two species are closely related with this genus is suggested by several potential synapomorphies, such as the inflated maxillary palpomere 1, the vertical epipleura, the wing-shaped mesoventrite, and the very small tarsomere 1. Some features are shared by representatives of *Anacaena* and the *Enigmata*: the presence of eight antennomeres, the absence of the transverse pronotal fold, the presence of serially arranged elytral punctures, and the weakly developed metatibial spines. The character state polarity and the phylogenetic implications of these features have to be clarified in a cladistic analysis involving a broad sample of anacaenine representatives. It is quite possible that the generic status of *Enigmata* will turn out as unjustified in a classification reflecting the true phylogeny of the Anacaenini. A phylogenetic analysis which should clarify this question is in preparation by the author.

**ECOLOGY:** The specimens were caught at black UV light, at the border of a well preserved humid mountain forest facing a wet meadow and a stream. It is not known if the species is terrestrial, riparian or aquatic. The peculiar mouth parts of *Enigmata* suggest that the feeding habits are different from other related species of Anacaenini.

**DISTRIBUTION:** Eastern Madagascar.

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### Zusammenfassung

*Enigmata foveata* sp.n. wird beschrieben und ihre Verwandtschaft mit *E. brunnea* diskutiert.

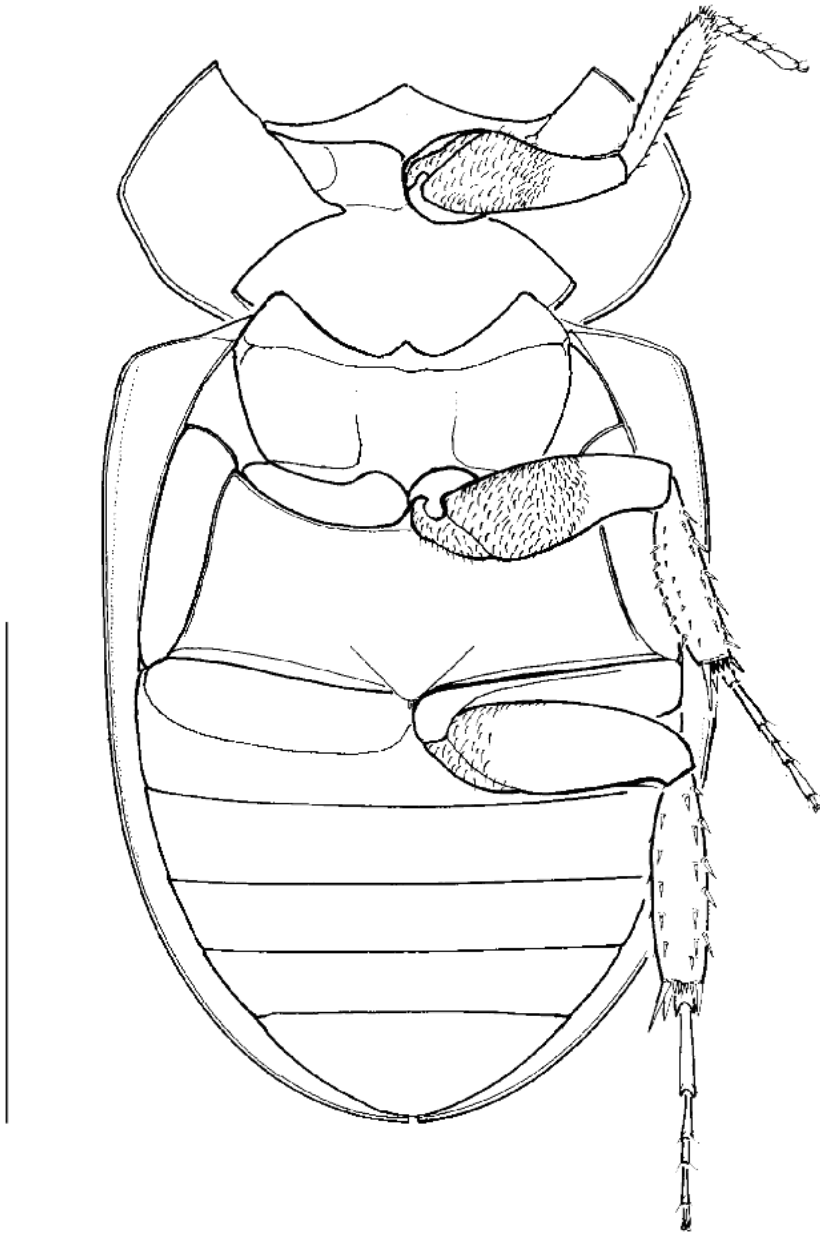
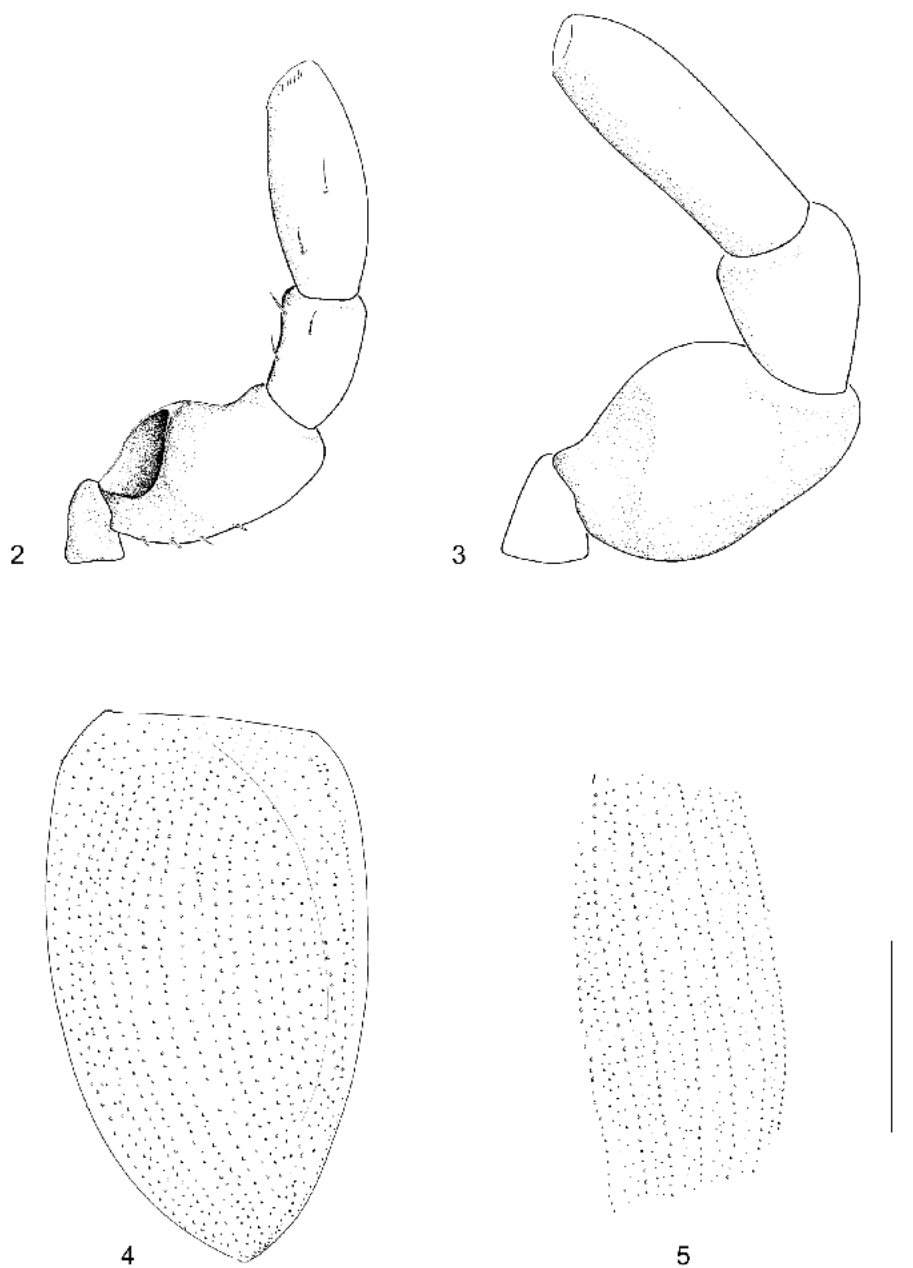
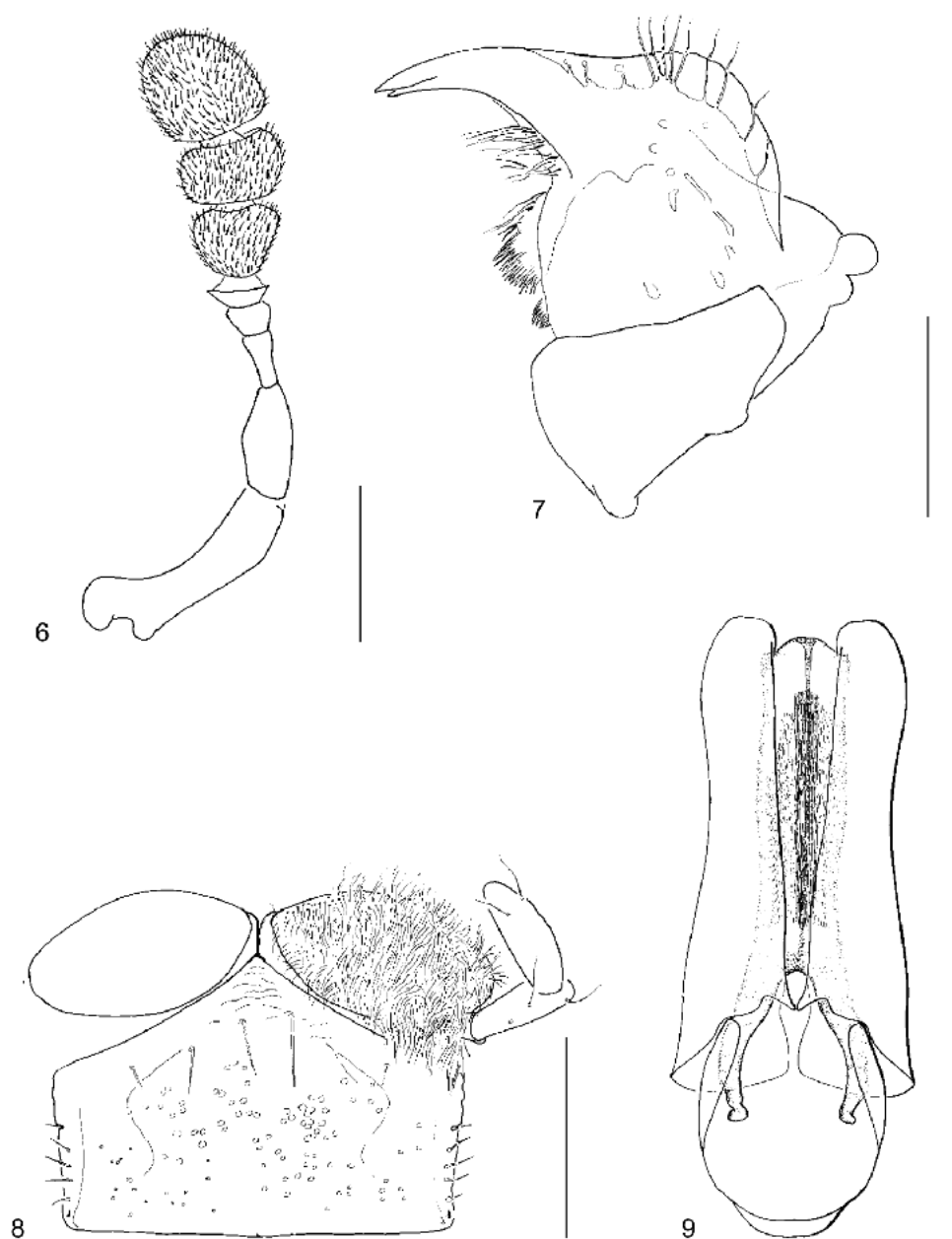


Fig. 1: Habitus of *Enigmata foveata*, ventral view (prothorax slightly flexed dorsad to show more details).  
Scale bar = 1 mm.



Figs. 2–3: Right maxillary palpomere; 2) *Enigmata foveata*, 3) *E. brunnea*.

Figs. 4–5: Elytron, serial punctures; 4) *Enigmata foveata*, 5) *E. brunnea*. Scale bars = 0.1 mm.



Figs. 6–9: *Enigmata foveata*; 6) antenna, 7) mandible, 8) mentum and prementum, 9) aedeagus. Scale bars = 0.1 mm.

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