



Rediscovery and revision of *Foenobethylus* Kieffer, 1913 (Hymenoptera, Bethyliidae)

GERGELY VÁRKONYI¹ & ANDREW POLASZEK^{2,3}

¹Kainuu Regional Environment Centre, Friendship Park Research Centre, Lentiirantie 342 B, FI-88900 Kuhmo, Finland.

E-mail: gergely.varkonyi@ymparisto.fi

²Department of Entomology and International Commission on Zoological Nomenclature, the Natural History Museum, London SW7 5BD, UK; Imperial College of Science, Technology and Medicine, London, U.K. E-mail: A.Polaszek@nhm.ac.uk

³Corresponding author

Abstract

The bethylid genus *Foenobethylus* Kieffer, 1913, unstudied for almost a century, is redescribed and assigned to the subfamily Pristocerinae based on a preliminary phylogenetic assessment. Four new species: *F. bidentatus* n. sp. (Brunei), *F. elongatus* n. sp. (Malaysia), *F. emiliacasellae* n. sp. (Thailand), and *F. thomascokeri* n. sp. (Malaysia) are described, based on males only, as females remain unrecognised in this genus. All specimens are deposited in the Department of Entomology, the Natural History Museum, London, U.K. The type species *F. gracilis* Kieffer (Philippines), although unrepresented by any traceable specimen, can be distinguished from these species based on the original description. A key to the five known species of *Foenobethylus* is provided.

Key words: Pristocerinae, *Foenobethylus*, Southeast Asia, taxonomy, phylogeny, 28S rDNA

Introduction

Described as a monotypic genus from the Philippines by J. J. Kieffer in 1913, *Foenobethylus* has remained almost completely neglected since. In the most recent revisions of world bethylid genera (Terayama 2003a, b) and in the latest catalogue of world Bethyliidae (Gordh and Móczár 1990) it was recorded as *incertae sedis*, with no affiliation to any known bethylid tribe or subfamily. One reason for the lack of data on *Foenobethylus* has undoubtedly been that the genus is known only from the male holotype of *F. gracilis* Kieffer, 1913, which has proved to be untraceable. Furthermore, as Kieffer's original description (1913) is insufficient for a modern revision of both generic and suprageneric status of the genus, authors have had to wait for the discovery of further specimens of *Foenobethylus*.

A further problem with *Foenobethylus* Kieffer is that females are unknown. The most conspicuous characters of male *Foenobethylus* are the elongated neck-like propleuron (hence the reference to *Foenus* Fabricius, 1798 = *Gasteruption* Latreille, 1796 in the name of the genus), the strikingly swollen fore femur and the moderately swollen hind femur bearing one or several spines ventrally (a single one in *F. gracilis*). As sexual dimorphism is rather strong in some bethylids – especially in some pristocerine lineages, within which, as we will demonstrate, *Foenobethylus* belongs – it is possible that females are already known to science under a different generic name. Clearly, there is a need for accumulating further, preferably molecular, evidence to clarify this issue and to resolve the exact phylogenetic status of *Foenobethylus*.

On the basis of a comprehensive morphological examination of several specimens deposited in the Natural History Museum in London we aim in the present paper to (i) assess the phylogenetic status of *Foenobeth-*

ylus Kieffer, (ii) redescribe the genus, (iii) describe four new species from tropical Asia and (iv) provide a key to the currently known species.

Materials and methods

The material here examined has been collected during expeditions to Southeast Asia in 1979–2001. All specimens are deposited in the collections of the NHM. Standard light microscopy was used for the examination of the mounted individuals. The genitalia, subgenital plate and 8th sternite of the holotypes of new species were removed, cleared, and mounted in Canada balsam on slides.

Morphological terminology follows Evans (1964) and Terayama (2003a, b). Digital photography was conducted using Synoptics Auto-Montage.

Subfamily affiliation of *Foenobethylus* Kieffer, 1913

Kieffer (1914) placed *Foenobethylus* originally within his Epyrini (=Epyrinae in the current sense), which taxonomic hypothesis does not hold in the light of present morphological evidence (see below). Although many revisions and species lists have been published since, no comprehensive phylogeny of higher taxa of world Bethylidae was published until Terayama's (2003a, b) cladistic phylogenetic analyses. Terayama (2003a, b) divides the extant Bethylidae into six subfamilies: Pristocerinae, Parapenesiinae, Epyrinae, Galodoxinae, Mesitiinae and Bethylinae. We have examined the morphological characters of *Foenobethylus* with respect to the apomorphies of the bethylid subfamilies recognised by Evans (1964) and Terayama (2003a), and summarised the morphological evidence for our new taxonomic hypothesis, according to which *Foenobethylus* Kieffer belongs to Pristocerinae.



FIGURE 1. Propleuron and pronotum of *Foenobethylus elongatus* n. sp. in dorsolateral aspect.

Terayama presents two major clades in extant Bethylidae, (Parapenesiinae + Pristocerinae) and (Bethylinae + (Epyrinae + Mesitiinae + Galodoxinae)), respectively. *Foenobethylus* does not show the single synapomorphy of the clade (Bethylinae + (Epyrinae + Mesitiinae + Galodoxinae)) – the reduced metanotum – nor that of the clade (Epyrinae + Mesitiinae + Galodoxinae) – the large pronotum-to-mesoscutum length ratio.

Moreover, *Foenobethylus* does not exhibit the apomorphies of the subfamilies Mesitiinae (i.e. strongly raised and carinate anteromedian portion of propodeum; posterolateral corners of propodeum with a strong spine; 2nd gastral tergum large) nor those of Bethylinae (cubitus attached to basal vein; strong basal notch on the anterior edge of hind wings; strongly curved tarsal claws). Galodoxinae is known from females only, hence the apomorphies of this subfamily cannot be examined in *Foenobethylus*, and finally, Epyrinae has no autapomorphies according to Terayama (2003a).

Foenobethylus shares three of the four synapomorphies given by Terayama for the clade (Parapenesiinae + Pristocerinae), in fact all of those that can be examined in the absence of females. These exclusively male characters (pronounced sexual dimorphism is present in this group) are as follows: possessing (i) an elongated anterior portion of the propleuron (Fig. 1), (ii) a small emargination or fovea on the metanotum opposite apex of scutellum (e.g. Fig. 17) and (iii) a well-developed metanotum. *Parapenesia* Kieffer, 1910 is known from South Africa only and from females only. Due to their distinct areas of distribution it is unlikely that *Foenobethylus* and *Parapenesia* would be closely related. Furthermore, DNA evidence — albeit from a single gene fragment — allies *Foenobethylus* with *Pristocera* (see below under *F. emiliacasellae*). Since *Foenobethylus* shares many morphological character states with Pristocerinae, and because we have demonstrated it does not belong to any other known bethylid subfamily, we place the genus within Pristocerinae, although we stress the need for a comprehensive phylogenetic analysis.

The phylogenetic position of *Foenobethylus* Kieffer within Pristocerinae

We used the characters given by Terayama (1996) for assessing the status of *Foenobethylus* within Pristocerinae (Table 1). Using these character states and Terayama's (1996) strict consensus cladogram of Pristocerinae it was possible to assess more accurately the phylogenetic relationships of *Foenobethylus*. *Foenobethylus* does not share the synapomorphy (44) of the basal clade ((*Dicrogenium* + *Neodicrogenium*) + *Kathepyris*) nor the unique apomorphies of the lineage (*Dicrogenium* + *Neodicrogenium*) and *Kathepyris* (12 and 20, respectively). On the other hand it shares the synapomorphy (39) with the rest of pristocerine genera. Furthermore, *Foenobethylus* does not share the apomorphy (7) of *Pristocera* but does so with the rest of Pristocerinae (37, 38, 41, the latter is a reversal from state 1 to 0). Moreover, *Foenobethylus* does not show the apomorphy (48) of *Acrepyris* but does show the synapomorphy (2, reversal from state 1 to 0) of the two main remaining lineages (((*Afgoiogfa* + *Parascleroderma*) + *Prosapanesia*) + *Diepyris*) and (*Afrodera* + *Apanesia* + (((*Protisobrachium* + *Pseudisobrachium*) + *Neoapanesia*) + (*Dissomphalus* + *Trichiscus*)) + *Caloapanesia*), respectively. *Foenobethylus* could be closely related to the first lineage, because it shares the single synapomorphy – the loss of the metacarpal vein – with it, as well as fails to possess the synapomorphy of the second lineage, i.e. the produced and more or less triangular clypeus. On the other hand, there is evidence (shared apomorphies 35, 27, 40) for the alternative hypothesis, i.e. that *Foenobethylus* would belong to the second lineage, more exactly to the clade ((*Protisobrachium* + *Pseudisobrachium*) + *Neoapanesia*). Interestingly both ((*Afgoiogfa* + *Parascleroderma*) + *Prosapanesia*) and ((*Protisobrachium* + *Pseudisobrachium*) + *Neoapanesia*) share the apomorphy of possessing three stalks at the anterior margin of the subgenital plate (40) with *Foenobethylus* (Figs. 21, 24, 27 and 30). These preliminary results of examining the phylogenetic relationships of *Foenobethylus* suggest that the genus is rather derived, but further research is needed to assess the exact position of *Foenobethylus* within Pristocerinae. Apomorphies of *Foenobethylus* that must be considered in forthcoming studies include: (i) fore femora strikingly swollen (a character that is common in bethylines but absent in the remaining pristocerine genera), (ii) hind femora moderately swollen, with one or a few spines, teeth or protuberances on their ventral surface.

TABLE 1. Character states of *Foenobethylus* Kieffer using the same characters as Terayama (1996) in his study on phylogeny of Pristocerinae (0 = plesiomorphy, 1 = apomorphy).

1[0, mandibles more or less triangular, not sickle-shaped];
2[0, basal tooth of mandibles simple, not directed inward];
3[0, anterior edge of clypeus truncate, not produced and triangular/trapezoidal];
4[0, lateral borders of anterior clypeal margin not remarkably produced];
5[0, frontal portion of head in lateral view not obliquely truncated];
6[0, antennal sockets developed];
7[0, flagellum without long erect hairs];
8[0, eyes without long erect hairs];
9[0, ocellar triangle regular, situated far from occipital border];
10[0, posterior border of head in frontal view moderately convex];
11[0, occipital carina complete];
12[0, genal area simple, without spines];
13[0, head not remarkably wider than long (but longer than wide)];
14[1, anterior portion of propleuron elongate];
15[0, acetabular carina of mesonotum present];
16[0, notauli present and distinct];
17[0, scutellar disc moderate in size, not elongate];
18[1, anteromedian part of metanotum with a small emargination or fovea];
19[1, propodeum more than 1.4 times as long as wide];
20[0, propodeum not produced dorsally];
21[0, first gastral tergite less than 1.2 times as long as wide (1.0 times)];
22[0, gaster in dorsal view slender, not oval (length-to-width ratio ca. 2.3:1)];
23[0, second gastral tergite without modifications];
24[0, posterior margin of second gastral tergite without modification];
25[0, 3 rd gastral tergite simple, without modifications];
26[0, middle tibiae without strong spines on the outer face];
27[1, middle tibial spurs of unequal length];
28[0, outer margin of forewing more or less 'dully angulated', not rounded];
29[0, costa present];
30[1, metacarpus absent (sometimes present in the extremely base)];
31[0, pterostigma present];
32[0, pterostigma not unusually large];
33[0, radial vein distinct];
34[P=polymorphic; transverse cubital vein arising from the radius present(0)/absent(1) – there is a short radícula or nodus, but no real vein, at ca. basal 1/7 th of radius];
35[1, basal vein arising far from the level of pterostigma];
36[0, transverse median vein simple, straight towards anal vein];
37[1, cubital vein not reaching wing margin];
38[1, subdiscoidal vein not reaching wing margin];
39[1, median vein of hindwing not reaching wing margin];
40[1, anterior border of subgenital plate with three stalks];
41[0, subgenital plate simple, without deep division into two parts];
42[0, lateral borders of subgenital plate straight];
43[0, posterior border of subgenital plate without a lamellar lobe];
44[0, parameres broad, without a shaft at the middle part];
45[0, parameres with a single lobe, not deeply divided into two arms];
46[0, inner lobe of parameres absent];
47[0, posterior lobe of parameres absent];
48[0, aedeagus simple, not with three sets of valves];
49[0, cuspis simple, not divided into two arms].

Redescription of *Foenobethylus* Kieffer, 1913

Description of Males.—Length of body ca. 2.5–4 mm, of fore wing ca. 2–3 mm. Body of all currently known species is more or less evenly brown-black.

Head.—Prognathous, flattened and slightly elongate, 1.1–1.4 times as long as wide (measured as the distance between front edge of clypeus and occipital carina vs. maximum width of head at the level of compound eyes), narrowing behind or almost quadrate in dorsal aspect. Eyes bare and oval, their distance to occipital carina 1.0–1.5 times the length of eye in dorsal aspect. Gena short, malar space extremely short. Hind margin of hind ocelli at a distance from occipital carina of 1–1.75 times of their maximum diameter. Ocellar triangle forms a more or less right angle at the anterior ocellus. Occipital carina complete. Clypeus apically moderately convex, medially with a strong longitudinal carina. Clypeal carina continues on the face only as a very weak and short median elevation, much weaker than the carinae above antennal toruli. Antennae with 11 flagellomeres, with short and erect setae. Length-to-width ratios of antennomeres: scape: 3.1–3.4, pedicel: 1.3–1.7, 1st flagellomere: 1.4–1.8, 5th flagellomere: 1.3–1.7. Mandibles with five teeth, the inner tooth is not turned inwards. Maxillary palps with six palpomeres, 1st–3rd short and broad, 4th usually the longest, elongated and slightly broadening towards apex, 5th and 6th elongated and more or less filiform. Labial palps with three short palpomeres.

Mesosoma.—Elongated and flattened, with a length-to-depth ratio of 3.2–3.6 and length-to-width ratio of 2.2–2.6. Propleuron elongated and exposed, hence forming a ‘neck’ as in *Gasteruption* Latreille. Pronotum elongated and narrowed anteriorly, more or less evenly triangular in dorsal view, laterally very narrow and with lateral sides broadly concave. Mesonotum with notauli strong, reaching the transverse groove in front of scutellum. Mesonotum with parapsidal lines, starting at the transverse groove and reaching ca. 2/3 of the distance to pronotum. Scutellum broad and flat. Metanotum well-developed, in the middle with an anterior emargination or shallow pit opposite of scutellum. Acetabular carina of mesoscutum well-defined. Propodeum elongate, the length-to-width ratio of the upper face (or propodeal disc) ranging from 1.1 to 1.3. Propodeal disc very weakly sculptured, at most finely coriaceous, mostly highly polished. Propodeal carinae missing or defined only in the extreme base, except for lateral and median carinae, which are complete. Propodeum with apical declivity as well as metapleura more roughly sculptured.



FIGURE 2. Fore and hind wings of *Foenobethylus emiliacasellae* n. sp.

Fore wing (Fig. 2) hyaline, with a dark brown pterostigma. Radius long, with a node or very short vestigial vein in its basal 1/7. Metacarpus extremely short or missing, if present then in the form of a tapered distal

point of the pterostigma. Basal vein meeting subcosta at a distance of well over 1.5 times its own length. Cubital (M) vein (*sensu* Evans 1964) present only in traces in the middle of the wing, not reaching basal vein nor the edge of the wing. Discoidal (Cu) vein sometimes tubular at its extreme base. Subdiscoidal (Cu₁) vein vestigial. Fore wing with costal, median and submedian cells closed. Hind wing with four distal hamuli, basal hamuli obsolescent, present only in the form of 1–3 setae longer than the normal setae of the hind wing. Anterior edge of hind wing between costella and distal hamuli slightly concave but without a notch as in Bethylinae. Legs. Fore femur greatly swollen (Fig. 3), with a length-to-width ratio of ca. 2.0–2.6. Mid and hind tibiae with apical spurs unequal in length. Tarsal claws small, evenly tapered, with a subbasal tooth. Hind trochanter with or without a ventral spine. Hind femur with or without a furrow ventrally, the ventral surface of femur with one to three spines, teeth or stubs – if the furrow is present, these protuberances and spines are distributed along its edges.

Metasoma.—Gaster flat, smooth and shiny, with seven visible terga. First gastral segment approximately as long as wide, with a short petiole. Subgenital plate: anterior edge with three stalks, distal edge emarginate, lateral borders almost straight. Male genitalia: distal part of parameres with dense hairs, broadening apically, volsella with cuspis and digitus small. Aedeagus very short and complex.

Remarks.—Kieffer's (1913) original description is based only on a single species and the description itself is by no means satisfactory. Therefore, we redescribed the genus here on the basis of four new species and the original description of *F. gracilis* Kieffer, 1913.



FIGURE 3. Head and mesosoma of *Foenobethylus emiliacasellae* n. sp., showing the greatly swollen fore femur.

Description of new species

Generic characters are not repeated below, for those see previous Section.

Foenobethylus bidentatus Várkonyi & Polaszek sp. nov.

(Figs. 4–7 and 20–22)

Material examined.—HOLOTYPE ♂: BRUNEI, Bk. Retak, 1600 m, ix. 1979, I. Gauld. Genitalia, subgenital plate and 8th sternum mounted separately in Canada balsam on a microscope slide. Holotype without gaster (destroyed during slide-mounting of genitalia).

Description of Male Holotype.—Length of body 2.8 mm.

Head.—1.13 times as long as wide, subquadrate in dorsal aspect, broadly rounded towards occipital carina. The distance from the eyes to the occipital carina equals the length of the eyes in dorsal aspect. Ocellar triangle forms a more or less right angle at the anterior ocellus. Lateral ocelli are placed slightly closer to anterior ocellus than the maximum diameter of the latter. Occipital carina at a distance from hind ocelli that is subequal to their maximum diameter. Surface of head finely coriaceous with sparse punctures. Length-to-width ratios of antennomeres: scape: 3.3, pedicel: 1.4, 1st flagellomere: 1.4, 5th flagellomere: 1.3. Terminal palpomere of maxillary palps over 4 times longer than wide.

Mesosoma.—With a length-to-depth ratio of 3.4 and length-to-width ratio of 2.2. Pronotum elongate and narrow anteriorly, with a narrow horizontal shelf protruding above base of propleuron. Length-to-width ratio of propodeal disc 1.3. Radius with a node in its basal 1/7. Metacarpus missing. Fore femur more slender than in the other species, with a length-to-width ratio of ca. 2.6. Hind trochanter without a ventral spine. Hind femur slightly flattened beneath, with two large teeth along its inner lateroventral edge.

Metasoma.—Eighth sternite with distal margin narrowly emarginate, centrally with dense setae. Subgenital plate with distal margin broadly and almost evenly emarginate, with long setae along its margin.

Male genitalia.—Distal part of parameres with long setae, central part narrow, almost stalk-like but with a dorsal swelling. Volsella with digitus small but clearly visible. Aedeagus as illustrated.

Colour.—Brown. First three antennomeres, palps, mandibles, tarsi, fore tibiae, mid and hind tibiae subbasally and apically yellow. Propodeal disc chestnut.

Etymology.—From Latin (*bis* meaning twice and *denticulus* meaning tooth). Named after the two large teeth on hind femora.

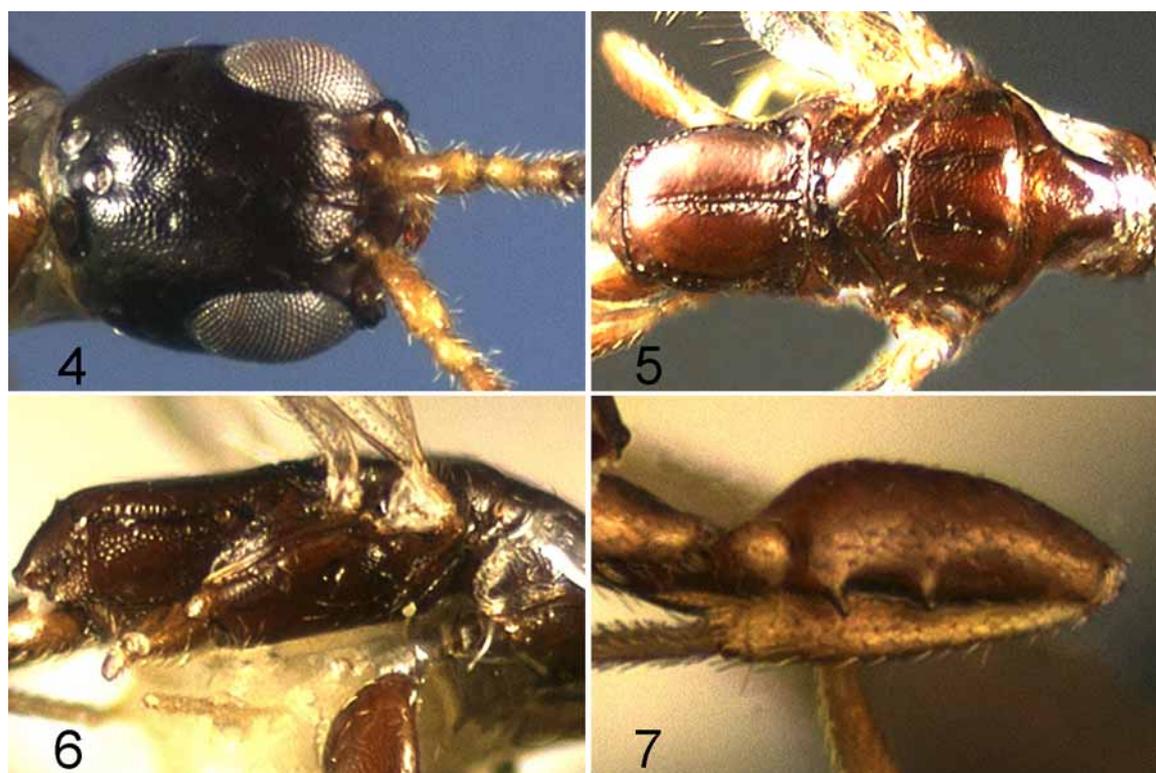


FIGURE 4–7. *Foenobethylus bidentatus* n. sp.: 4) dorsal aspect of head, 5) dorsal aspect of mesosoma, 6) lateral aspect of mesosoma, 7) ventrolateral aspect of hind trochanter and femur.

***Foenobethylus elongatus* Várkonyi & Polaszek sp. nov.**

(Figs. 1, 8–11 and 23–25)

Material examined. —HOLOTYPE ♂: MALAYSIA, Western Malaysia, Cameron Highlands, xii. 2001, Ong Pek Khoo, Malaise 1–3. Genitalia, subgenital plate and 8th sternum mounted separately in Canada balsam on a microscope slide. PARATYPES: 1 ♂ MALAYSIA, Western Malaysia, Cameron Highlands, xii. 2001, Ong Pek Khoo, Malaise 1–3; 1 ♂ MALAYSIA, Western Malaysia, Cameron Highlands, Tana Rata, 2001–2 Malaise trap, Coll. Ong Pek Khoo.

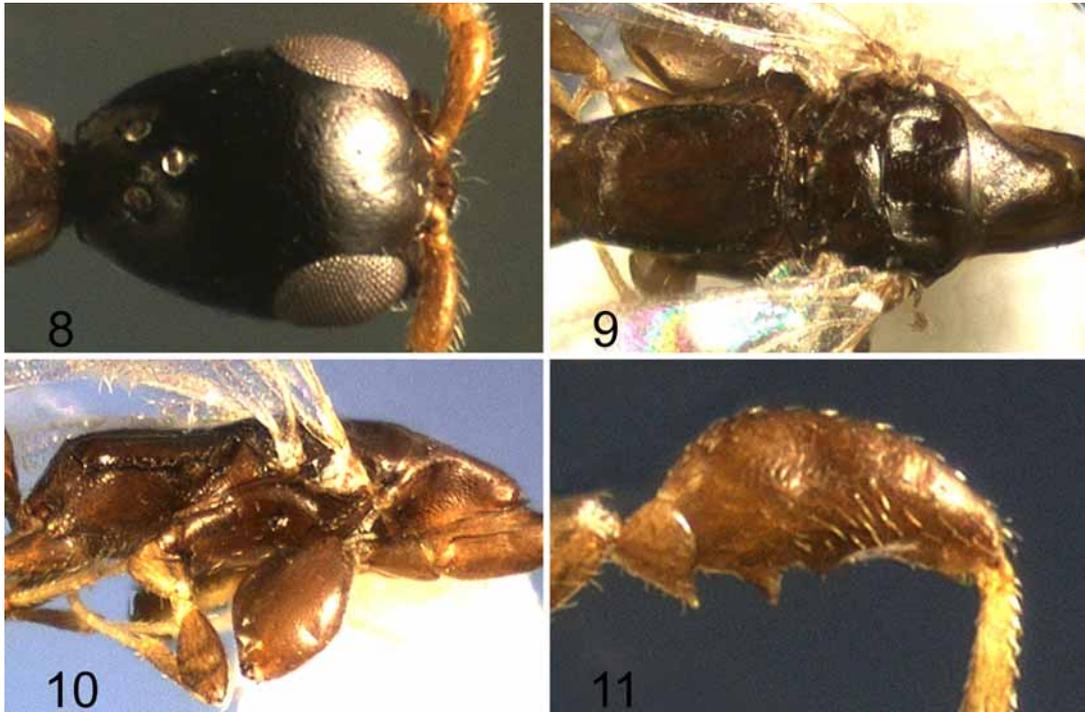


FIGURE 8–11. *Foenobethylus elongatus* n. sp.: 8) dorsal aspect of head, 9) dorsal aspect of mesosoma, 10) lateral aspect of mesosoma, 11) ventrolateral aspect of hind trochanter and femur.

Description of Male Holotype.—Length of body 2.7 mm.

Head.—1.32 times as long as wide, elongate in dorsal aspect, fairly strongly narrowing behind and evenly rounded towards occipital carina. The distance from the eyes to the occipital carina more than 1.5 times the length of the eyes in dorsal aspect. Ocellar triangle forms a slightly acute angle at the anterior ocellus. Lateral ocelli are distributed slightly closer to anterior ocellus than the maximum diameter of the latter. Occipital carina from hind ocelli at a distance of 1.75 times of the maximum diameter of the latter. Surface of head finely coriaceous with sparse punctures. Length-to-width ratios of antennomeres: scape: 3.3, pedicel: 1.7, 1st flagellomere: 1.8, 5th flagellomere: 1.7. Terminal palpomere of maxillary palps ca. 4 times longer than wide.

Mesosoma.—With a length-to-depth ratio of 3.4 and length-to-width ratio of 2.6. Pronotum elongate and narrow anteriorly, with a narrow horizontal shelf protruding above base of propleuron. Length-to-width ratio of propodeal disc 1.3. Radius with a node in its basal 1/7. Distal end of pterostigma continuing as an extremely short metacarpal vein. Fore femur greatly swollen, with a length-to-width ratio of ca. 2.0. Hind trochanter with a ventral tooth. Hind femur flattened beneath, with a basal tooth and smaller median tooth (paratypes) or swelling (holotype) on the inner edge as well as with a median swelling on the outer lateroventral edge.

Metasoma.—Eighth sternite with distal margin broadly emarginate, centrally with sparse setae. Subgenital plate with distal margin deeply emarginate, centrally narrowly with an even deeper second emargination, with setae centrally.

Male genitalia.—Distal part of parameres with long setae, central part broad. Volsella with digitus not clearly visible. Aedeagus as illustrated.

Colour.—Brown. Antennae in the basal half, palps, mandibles, tarsi, fore tibiae, mid and hind tibiae sub-basally and apically yellow.

Etymology.—From Latin (*elongatus* meaning Lengthened) Named after the elongate head and mesosoma.

***Foenobethylus emiliacasellae* Várkonyi & Polaszek sp. nov.**

(Figs. 2–3, 12–15 and 26–28)

Material examined. —HOLOTYPE ♂: THAILAND, Chiang Mai, xii.99–ii.00, R.A. Beaver, Malaise; Genitalia, subgenital plate and 8th sternum mounted separately in Canada balsam on a microscope slide. PARATYPES (6 ♂♂): THAILAND, Chiang Mai, xii.99–ii.00, R.A. Beaver, Malaise

Description of Male Holotype. —Length of body 3.1 mm.

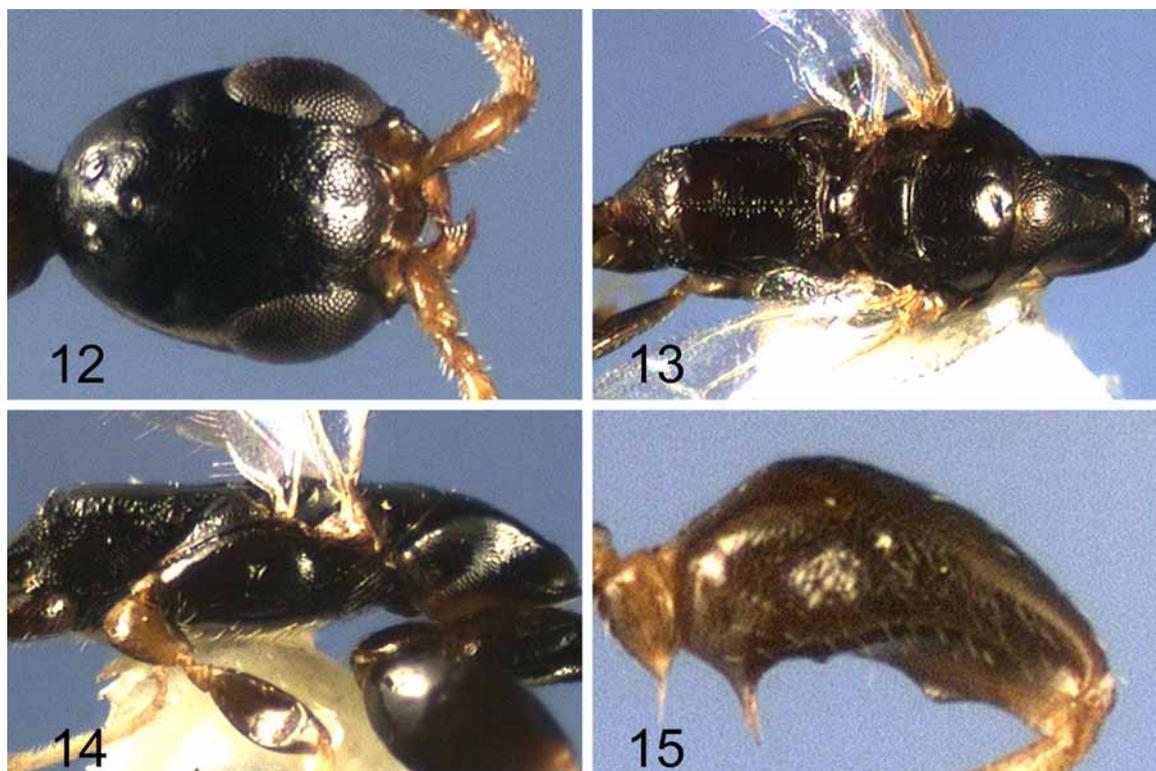


FIGURE 12–15. *Foenobethylus emiliacasellae* n. sp.: 12) dorsal aspect of head, 13) dorsal aspect of mesosoma, 14) lateral aspect of mesosoma, 15) ventrolateral aspect of hind trochanter and femur.

Head.—Up to 1.36 times as long as wide, elongated in dorsal aspect, fairly strongly narrowing behind and evenly rounded towards occipital carina. The distance from the eyes to the occipital carina ca. 1.1 times the length of the eyes in dorsal aspect. Ocellar triangle forms a right angle at the anterior ocellus. Lateral ocelli are distributed closer to anterior ocellus than the maximum diameter of the latter. Occipital carina from hind ocelli at a distance of ca. 1.5 times of the maximum diameter of the latter. Surface of head finely coriaceous with sparse punctures.

Length-to-width ratios of antennomeres: scape: 3.2, pedicel: 1.5, 1st flagellomere: 1.7, 5th flagellomere: 1.6. Terminal palpomere of maxillary palps less than 3 times longer than wide.

Mesosoma.—With a length-to-depth ratio of 3.6 and length-to-width ratio of 2.4. Pronotum elongate and narrow anteriorly, without a horizontal shelf protruding above base of propleuron – the shelf is normally developed laterally. Length-to-width ratio of propodeal disc 1.15.

Radius with or without a node in its basal 1/7. Distal end of pterostigma continuing as an extremely short metacarpal vein. Fore femur greatly swollen, with a length-to-width ratio of ca. 2.0, and with a broad and oblique inner concavity, which frequently causes rolling up the fore femur as a spiral. Hind trochanter with a long and needle-like ventral spine. Hind femur with an oblique furrow beneath, with a long basal spine on its inner edge and with a small, broad but sharp-edged median tooth on the outer lateroventral edge.

Metasoma.—Eighth sternite with distal margin broadly and fairly shallowly emarginate, with sparse setae in its distal half. Subgenital plate with distal margin deeply emarginate, centrally setose.

Male genitalia.—Rather short and broad, distal part of parameres with relatively short setae. Volsella with digitus clearly visible. Aedeagus as illustrated.

Colour.—Brown. Basal four antennomeres, palps, mandibles, tarsi, fore tibiae, mid and hind tibiae subbasally and apically yellow.

Remarks.—A ribosomal DNA sequence of just over 700 bases was obtained from the 28S D2 region of this species by Peter Mayhew and colleagues. This sequence is presented in Appendix 1. Using the “blast” option in the NCBI Genbank database revealed the most similar sequence in that database to be that of a *Pristocera* species (Bethylidae: Pristocerinae: 86% similarity), followed by that of *Cephalonomia stephanoderis* (Bethylidae: Epyrinae: 84% similarity). The Genbank accession numbers for these two sequences are EF013049.1 and AJ302937.1 respectively. These are the only bethylid sequences in Genbank, and while being by no means conclusive, this result provides some supporting evidence for *Foenobethylus* being a pristocerine.

Etymology.—Named after Emilia Casella, of Hampstead, London, U.K.

***Foenobethylus thomascokeri* Várkonyi & Polaszek sp. nov.**

(Figs. 16–19 and 29–31)

Material examined.—HOLOTYPE ♂: MALAYSIA, Pahang, Cameron Highlands, Tana Rata, Mardi Exp., 1500 m, xi.1979, I. Gauld. Genitalia, subgenital plate and 8th sternum mounted separately in Canada balsam on a microscope slide.

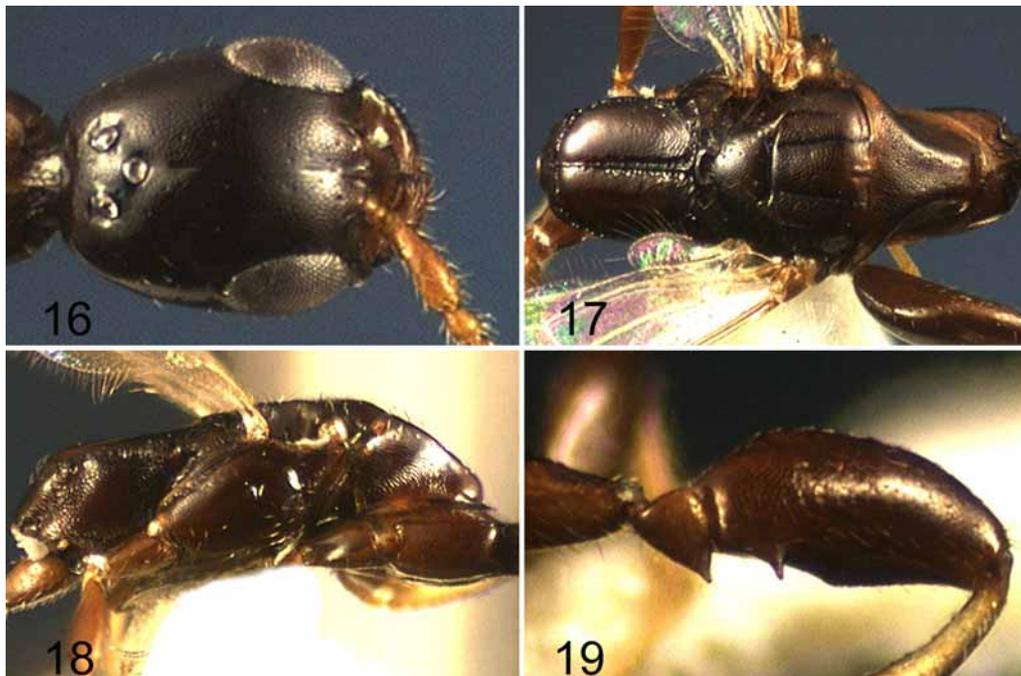


FIGURE 16–19. *Foenobethylus thomascokeri* n. sp.: 16) dorsal aspect of head, 17) dorsal aspect of mesosoma, 18) lateral aspect of mesosoma, 19) ventrolateral aspect of hind trochanter and femur.

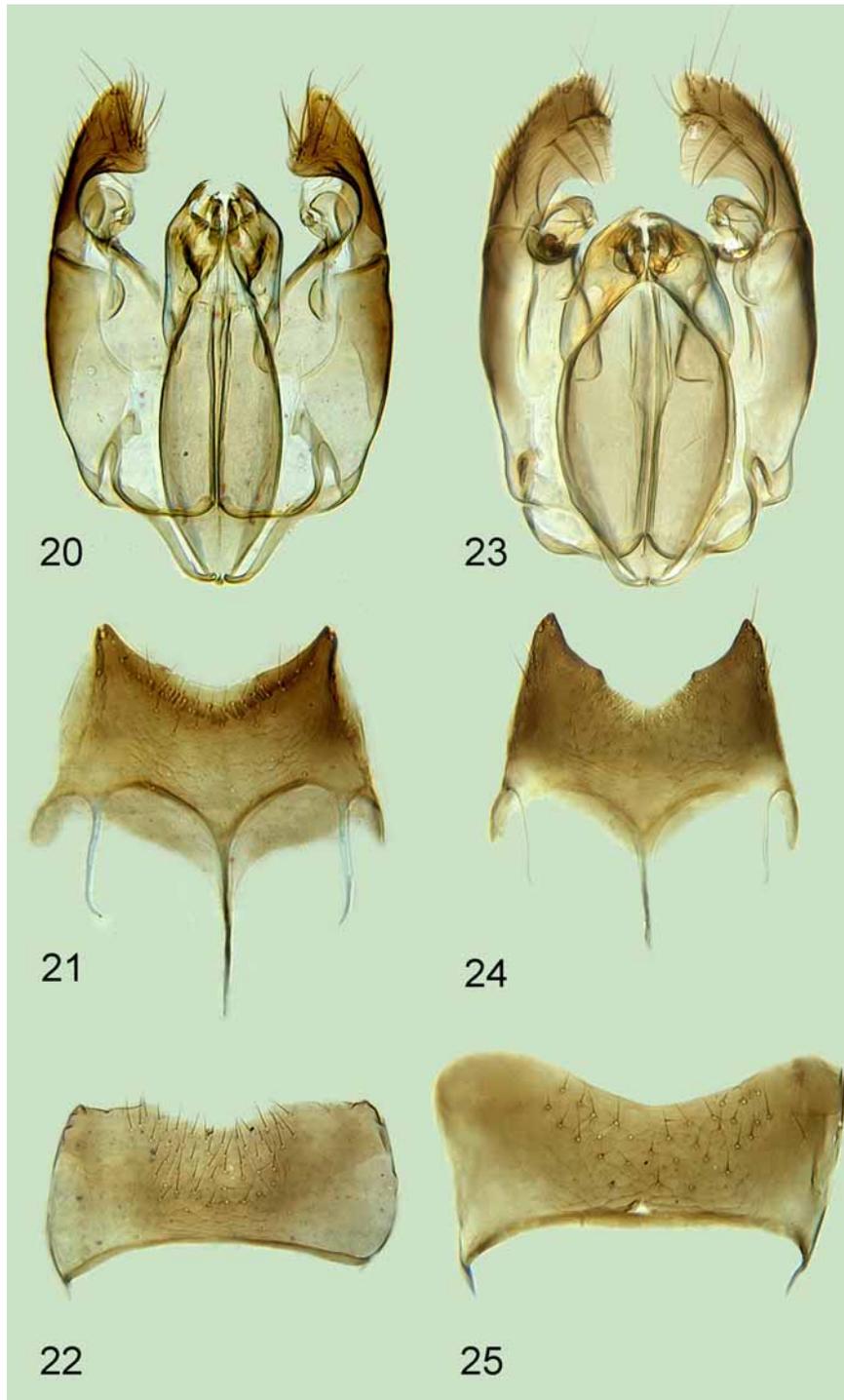


FIGURE 20–25. *Foenobethylus bidentatus* n. sp. (20–22), *F. elongatus* n. sp. (23–25), Male genitalia (20, 23), subgenital plates (21, 24) and 8th sternite (22, 25).

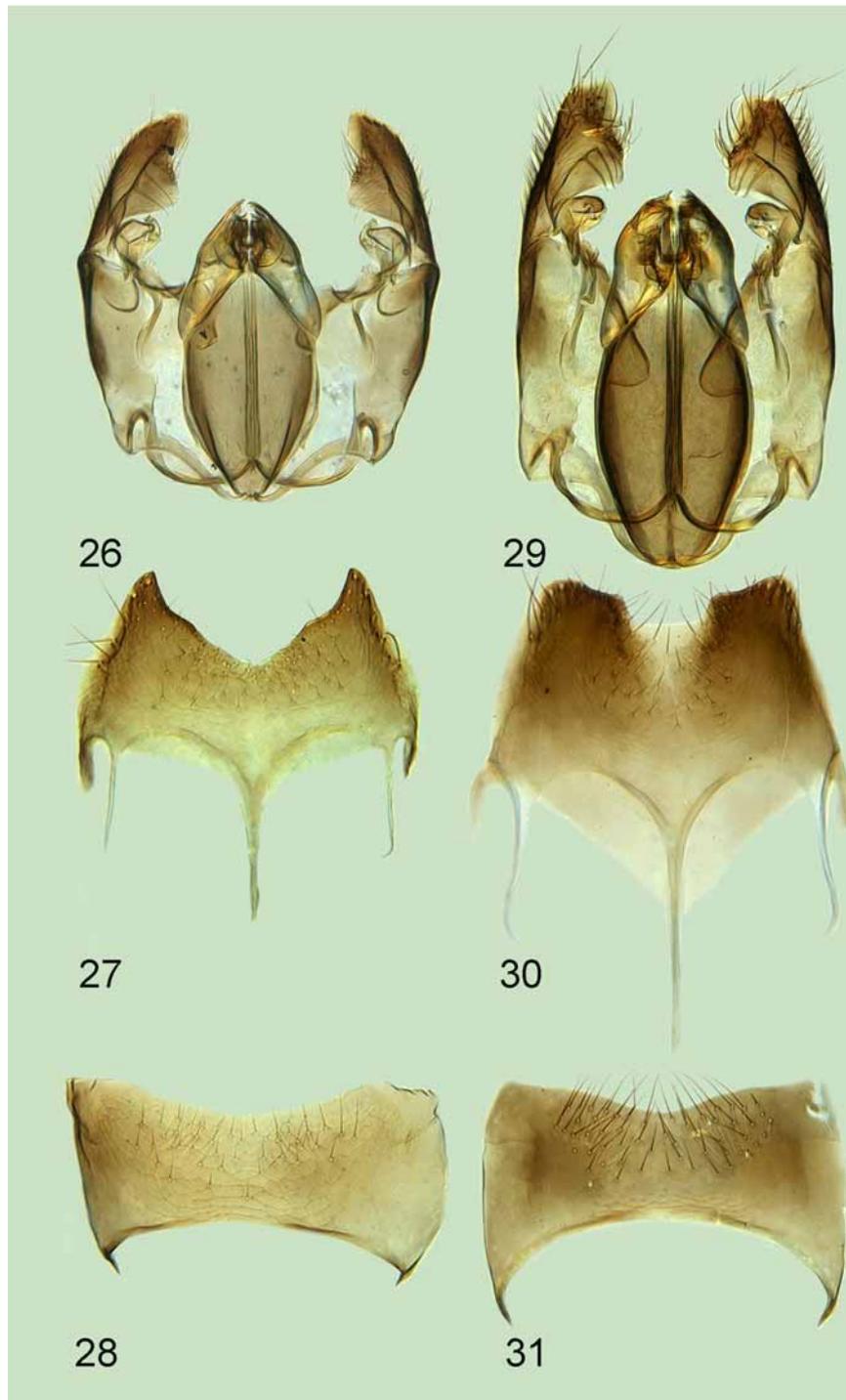


FIGURE 26–31. *F. emiliacasellae* n. sp. (26–28) and *F. thomascokeri* n. sp. (29–31): Male genitalia (26, 29), subgenital plates (27, 30) and 8th sternite (28, 31).

Description of Male Holotype.—Length of body 3.2 mm.

Head.—1.2 times as long as wide, moderately squared in dorsal aspect, weakly narrowing behind and broadly rounded towards occipital carina. The distance from the eyes to the occipital carina ca. 1.25 times the length of the eyes in dorsal aspect. Ocellar triangle forms a slightly obtuse angle at the anterior ocellus. The distance between lateral and anteriomedian ocelli is equal to the maximum diameter of the latter. Occipital carina from hind ocelli at a distance of 1.5 times of the maximum diameter of the latter. Surface of head finely coriaceous with sparse punctures.

Length-to-width ratios of antennomeres: scape: 3.1, pedicel: 1.6, 1st flagellomere: 1.7, 5th flagellomere: 1.5. Terminal palpomere of maxillary palps over 4 times longer than wide.

Mesosoma.—With a length-to-depth ratio of 3.2 and length-to-width ratio of 2.3. Pronotum elongate and narrow anteriorly, with a narrow horizontal shelf protruding above base of propleuron. Length-to-width ratio of propodeal disc 1.2. Radius with a node/vestigial vein in its basal 1/7. Metcarpus missing. Fore femur swollen, with a length-to-width ratio of ca. 2.1. Hind trochanter with a large ventral tooth. Hind femur flattened beneath, with a large basal tooth on the inner edge, a small tooth centrally and a median swelling on the outer lateroventral edge.

Metasoma.—Eighth sternite with distal margin centrally with a shallow emargination, centrally with long setae. Subgenital plate with distal margin centrally deeply emarginate, with long setae centrally and along distal margin.

Male genitalia.—Distal part of parameres densely covered with long setae. Volsellae with digitus not clearly visible. Volsellae with an additional seta just basad of cuspis. Aedeagus as illustrated.

Colour.—Brown. Basal three antennomeres, palps, mandibles, tarsi and tibiae yellow.

Etymology.—Named after Thomas Coker of Rockbridge Baths, Virginia, U.S.A.

Key to the currently known species of *Foenobethylus* Kieffer, 1913

We include *F. gracilis* in this key using only the most conspicuous character given by Kieffer (1913) in his original description. We also use the *lack* of a similarly striking character, i.e. the missing spine on the hind trochanter (in brackets), to delineate this species – although this character is not mentioned in Kieffer's description, we assume that if present it could not have been overlooked.

Males:

- 1 Hind femur with a single blunt spine ventrally slightly distal of the middle. (Hind trochanter without a ventral spine or tooth.). Philippines. *F. gracilis* Kieffer
- Hind trochanter with a ventral spine, or if without, then hind femur with two spines or teeth 2
- 2 Hind trochanter without a spine, hind femur with two large teeth (Fig 7). Fore femur moderately swollen, length-to-width ratio >2.5. Brunei. *F. bidentatus* n. sp.
- Hind trochanter with a spine or tooth. Fore femur extremely swollen, length-to-width ratio <2.1 3
- 3 Pronotum with anterior horizontal flange medially very narrow. Hind trochanter with a needle-like long spine below (Fig. 15). Hind femur with a ventral oblique furrow. Terminal palpomere of maxillary palps less than 3 times longer than wide. Thailand..... *F. emiliacasellae* n. sp.
- Pronotum with anterior horizontal flange medially as broad as laterally. Hind trochanter with a tooth or broad spine. Hind femur ventrally flattened, without an oblique furrow. Terminal palpomere of maxillary palps over 4 times longer than wide. Malaysia..... 4
- 4 Head strongly narrowing behind (Fig. 8). Propodeal disc more elongate (Fig. 9) *F. elongatus* n. sp.
- Head only slightly narrowing behind (Fig. 16). Propodeal disc less elongate (Fig. 17)
..... *F. thomascokeri* n. sp.

Acknowledgements

We are indebted to Prof. Donald Quicke, who kindly provided his Malaysian samples for our use. Specimens from Thailand were donated by Dr. Peter Mayhew, who also kindly gave permission to publish the DNA sequence. We wish to thank the Natural History Museum and the financial support of the European Union to the senior author.

References

- Evans, H.E. (1964) A synopsis of the American Bethylinidae (Hymenoptera, Aculeata). *Bulletin of the Museum of Comparative Zoology, Harvard University*, 132(1), 1–222.
- Gordh, G. & Móczár, L. (1990) A catalog of the world Bethylinidae. *Memoirs of the American Entomological Institute*, 46, 1–364.
- Kieffer, J.J. (1913) Serphides des Iles Philippines. *Insecta, Revue illustrée d'Entomologie*, 3, 253–462.
- Kieffer, J.J. (1914) *Bethylinidae. Das Tierreich, vol. 41*. R. Friedländer und Sohn, Berlin. 595 pp.
- Terayama, M. (1996) The Phylogeny of the Bethylinid Wasp Subfamily Pristocerinae (Hymenoptera, Bethylinidae). *Japanese Journal of Entomology*, 64(3), 587–601.
- Terayama, M. (2003a) Phylogenetic Systematics of the Family Bethylinidae (Insecta: Hymenoptera) Part I. Higher classification. *The Academic Reports of the Faculty of Engineering of Tokyo Polytechnic University*, 26(1), 1–15.
- Terayama, M. (2003b) Phylogenetic Systematics of the Family Bethylinidae (Insecta: Hymenoptera) Part II. Keys to subfamilies, tribes and genera in the world. *The Academic Reports of the Faculty of Engineering of Tokyo Polytechnic University*, 26(1), 16–29.

Appendix 1. 28S D2 rDNA sequence of *Foenobethylus emiliacasellae* n. sp.

```
AAAGATCGAATGGGGAGATTCATCGTCAGCGGC-GTTGGCCTCACGAT-GGCTCGTGATGTCGCG-----  
GGACTTCGGTCT-----CGGTGGCACGCGGTCTGTCGCGT-----TACGTCC-  
GACGTCGTCGGCGTGCACTTCTCCCTAGTAGAACGTCGCGACCCGTTGGGTGCCGATCT-ACGGCCCGG-  
GTGGGCGTCTGTCGTGT--CGTCTCAAAGCGCAC-GCGA--CAAACCCCG--GTCG----CCAGATCGGCTGC-  
CCGG-CGGTACTCGCA-TGGTATCGGGCCGCAAT--ACTCGAA--CTGCGTC-AAGCCCGTCGCAAGCGCGGT-  
CAGT---TTTGTC-GCGGAGGT--ACGGACCTA-GCGCCGTCCCCGTG-CCTGGCCAGCTGTT--GGCAG-----  
ACGGTGTCTCTGACTGGCCAAGAACA-----ACTTTGAATG-----TGTGTGATACCGGTCGGCGACGC-  
TACTGCTTTGGGTAA-TCTCAGGACCCGTCTTGAACACGGACCAA-GGAGTCTAACATGTGCGCGAG-  
TCATT-GGGACCGC-----ATGCC-TATAGGCGAAA-TGAAAGTGAAGGTCGGCCTC---GTGCCGACCGAGG-  
GAGGATGGGCCGMGTCACGATGCGG-CTCCGCACT-CCCGGGCGTCTCGTTTCTCAT-----
```