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Notes on rarely known Phasmatodea from Sarawak with the description of two new species and studies on the genus *Gargantuoidea* Redtenbacher, 1908

(Orthoptera: Phasmatodea)

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Abstract

A new species of the genus *Acacus* Brunner v. Wattenwyl, 1907 (type species: *Bacteria sarawaca* Westwood, 1859), *Acacus braggi* **sp. n.**, from Mt. Serapi in northwestern Sarawak is described and illustrated from both sexes and the eggs.

A discussion and determination keys, as well as a list of the known species of *Gargantuoidea* Redtenbacher, 1908 (type species: *Necroscia gargantua* Westwood, 1859) are provided. A new species from Matang in northwestern Sarawak, *Gargantuoidea matangensis* **sp. n.**, is described and illustrated from the female sex. The egg of *Gargantuoidea triumphalis* Redtenbacher, 1908 is illustrated and described in detail. The genus *Necrosciodes* Karny, 1923 (type species: *Necroscia lampetia* Westwood, 1859) is found to represent a junior synonym of *Gargantuoidea* Redtenbacher, 1908 (**syn. n.**).

Prisomera portentosum Brunner v. Wattenwyl, 1907 is transferred to the genus *Phenacephorus* Brunner v. Wattenwyl, 1907 (type species: *Phenacephorus cornucervi* Brunner v. Wattenwyl, 1907). The female and egg are described and figured for the first time. A redescription of the male is provided as well.

The holotypes of the two new taxa described in this paper (*Acacus braggi* **sp. n.** and *Gargantuoidea matangensis* **sp. n.**) are deposited in the collection of the Zoologische Staatssammlung München (ZSM), paratypes of the first are deposited in ZSM, coll. P. E. Bragg (England) and the first authors' collection.

Introduction

With more than 300 known species, of which 48 have been described by P. E. Bragg since 1992, the phasmid fauna of Borneo is apparently rich. Bragg has done extensive studies on the islands' Phasmatodea which have recently resulted in his brilliant book "Phasmids of Borneo" which will be the standard work on Borneos' stick insects for many years to come. The Bornean Aschiphasmatinae, Heteropteryginae, Korinninae and Lonchodinae are all revised in detail while the Necrosciinae have remained only partly studied. This makes the discovery of new taxa in the latter subfamily still quite probable.

The private collections of the authors include numerous specimens of Phasmatodea that were collected by the authors on two occassions in July 1994 and August 1996 in Sarawak and Sabah. This included a rarely known taxon of Lonchodinae which has only been briefly mentioned by Bragg (2001) and was so far only known from a single specimen. Furthermore, the material included an undescribed species of *Acacus* Brunner v. Wattenwyl, 1907 from Mt. Serapi in northwestern Sarawak and a new species of the remarkable genus *Gargantuoidea* Redtenbacher, 1908 from Matang, both members of Necrosciinae.

In this paper descriptions of two new species of Necrosciinae, a description of the female, male and egg of *Phenacephorus portentosus* (Brunner v. Wattenwyl, 1907) as well as studies on the genus *Gargantuoidea* Redtenbacher, 1908 are provided. These include determination keys to both sexes and special reference and measurements of three taxa.

The terminology used for the description of egg structures follows that of Clark-Sellick (1997).

Abbreviations used

NHMW:	Naturhistorisches Museum Wien, Vienna/Austria.
OXUM:	Oxford University Museum (Hope Entomological Collections), Oxford/England.
ZMHB:	Zoologisches Museum der Humboldt-Universität Berlin, Berlin/Germany.
ZSM:	Zoologische Staatssammlung München, Munich/Germany.
FH:	Private collection of Frank H. HENNEMANN, Freinsheim/Germany
OC:	Private collection of Oskar V. CONLE, Fischen/Germany
PEB:	Private collection of Phil E. BRAGG, Nottingham/England
HT, PT, ST:	Holo-, para-, syntype.

Subfamily Necrosciinae

Genus *Acacus* BRUNNER v. WATTENWYL, 1907

Type species: *Bacteria Sarawaca* WESTWOOD, 1859: 31, pl. 25: 1, 2 (♂ & ♀), by subsequent designation of BROCK, 1995: 87.

Acacus braggi sp. n.

HT: ♂: NW Sarawak, Mt. Serapi 600 m, 28.VII.1996 (FH 0324-1, ZSM).
PT: 3♀♀, 1♀ (nymph): NW-Sarawak, Mt. Serapi 600 m, 28.VII.1996 (FH 324-2 to 5); 1♀, 2♂♂: Sarawak, Mt. Serapi, 760 m, P. E. BRAGG, 27.VII.1991 (PEB 529, 530 & 532); 1♀: Sarawak, Mt Serapi, 700 m, P. E. BRAGG, 27.VII.1991 (PEB 528), 1♀, eggs: Sarawak, Mt. Serapi, 640 m, P. E. BRAGG, 12.VIII.1989 (PEB 533 & 827).

Etymology: The species is named in honour of Dr. Philip E. BRAGG (Nottingham/England) for his great effort to increase our knowledge on Bornean Phasmatodea which has recently resulted in his brilliant book "Phasmids of Borneo".

Differentiation: The new species is closely related to the type species *Acacus sarawacus* (WESTWOOD, 1859) but easily distinguished by: the more slender body, finer granulation of the thorax, differently shaped genitalia of both sexes and lack of the dentation on posterior margin of the ♀♀ anal segment. The eggs differ in shape of the micropylar plate and structure of the capsule surface.

Description

♀: Medium sized (body length 92.7-101.0 mm), slender. Surface of thorax densely granulated, general colour varying from uniformly brown over straw to pale green.

Head: Smooth, almost twice as long as broad, subcylindrical, more or less parallel-sided. Two smooth, oval and slightly raised areas between the eyes. Posterior half with a distinctly impressed median line. Two further, much shorter impressed lines on both sides of the median line. Eyes, greyish brown, oval, slightly projecting from head capsule. Antennae reaching abdominal tergite VI, brown and slightly darkening towards distal end. Scapus oval in cross-section, rectangular, almost twice as long as broad. Pedicellus cylindrical, longer than broad and about half as long as scapus.

Thorax: Pronotum minutely granulose, indistinctly narrower and shorter than head, slightly narrowed medially. Anterior margin raised and followed by a deep transverse ridge. Lateral margins slightly raised. Median line visible, median transverse groove almost straight and covering whole width of segment. Mesothorax strongly elongated, cylindrical and slightly broadened at posterior margin, whole surface densely granulated. Mesonotum with an indistinct median line. Metathorax much shorter than mesothorax, cylindrical, densely granulate and slightly broadening towards posterior margin. Metanotum 2.5× as long as broad, median line very indistinct.

Abdomen: Median segment slightly longer than wide, about half the length of metanotum, anterior margin rounded. Surface as meso- and metathorax. All remaining segments smooth, except for a few granules on tergite II. Segments II-VII cylindrical, parallel-sided, about 2.5× as long as broad. Praeopercular organ formed by a minute scale-like tubercle on sternite VII. Tergites VII-X with a more or less distinct median carina, most prominent on VIII and IX. VIII half the length of VII and strongly narrowed medially. IX shorter than VIII, narrowing towards posterior margin. Anal segment as long as IX, posterior margin

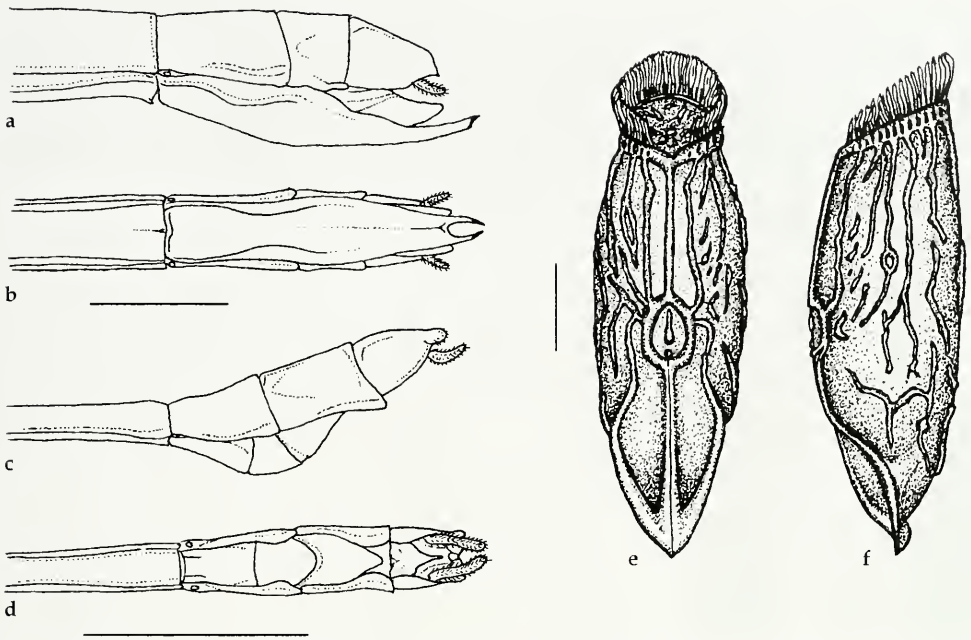

Fig. 1: *Acacus braggi* **sp. n.** (scale = 5 mm). **a-d:** apex of abdomen, **a.** ♀, lateral view, **b.** ♀, ventral view, **c.** ♂, lateral view, **d.** ♂, ventral view; **e-f:** egg, **e.** dorsal view, **f.** lateral view. (scale = 1 mm).

smooth, rounded and with a minute posteromedial incision. Lateral margins slightly impressed at bases of cerci. Supraanal plate, very small and rounded. Cerci small, cylindrical, finely setose and slightly projecting over posterior margin of anal segment. Operculum elongate, slightly projecting over posterior margin of anal segment and distally with deep medial incision forming two slightly incurving points. Lateral surfaces with a distinct, waved longitudinal carina.

Legs: All very long and slender, destitute of spines, except for 4-7 minute teeth in distal section of ventromedial carina of meso- and metafemora. All femora quadrangular in cross-section. Profemora distinctly compressed and curved basally, meso- and femora slightly narrowing towards apical end. Pro- and metabasitarsus longer than remaining segments combined, mesobasitarsus equal to these in length.

♂: Medium sized (body length 68.0-74.0 mm), very slender, smaller than ♀♀. Surface of thorax densely granulated but less prominent than ♀♀. General colour uniformly rusty brown, the three terminal abdominal segments darker, knees and distal end of tibiae black.

Head: As ♀♀, but eyes comparatively larger and more prominent. The median line in posterior half is less distinct. Antennae as ♀♀, but darker brown.

Thorax: Pronotum as ♀♀. Mesothorax strongly elongated, very slender, cylindrical and densely granulated. Median line on mesonotum very indistinct. Metathorax almost 5× longer than broad, much shorter than mesothorax, narrowed medially and slightly broadening towards posterior margin. Surface as mesothorax, median line very indistinct.

Abdomen: Median segment about ⅓ the length of metanotum, almost twice as long as broad, anterior margin rounded. Segments II-VI smooth, cylindrical, parallel-sided and about 4x as long as broad. VII slightly shorter. Tergite VIII half the length of VII, broadening towards posterior margin. IX longer than VIII, parallel-sided, with an indistinct median carina. Anal segment half the length of IX slightly narrowing towards posterior end. Posterior margin raised and slightly concave medially, forming two rounded, lateral humps. Supraanal plate very small and rounded. Cerci small, cylindrical, slightly incurving and projecting over posterior margin of anal segment. Vomer broad, triangular and ending in a long distal point. Subgenital plate slightly convex, scoop-like, not reaching posterior margin of tergite IX.

Legs: As ♀♀, but comparably longer and more slender. Pro- and metabasitarsus almost twice the length of remaining segments combined. Mesobasitarsus slightly longer than remaing segments combined.

Description of the egg: Capsule elongate, cylindrical, pointed towards posterior end, generally cartridge-shaped. Surface strongly sculptured with numerous raised ridges; a fine median keel on dorsal surface. General colouring rusty brown. Micropylar plate small, oval with a raised median keel and surrounded by a raised rim; almost in central of dorsal surface. Micropylar cup in posterior third of plate, circular and strongly convex. Operculum almost cylindrical, slightly concave and covered with several raised ridges. Outer edge with long, distally incurving hair-like structures, black at their bases. Opercular angle about 25°.

Measurements (in mm): Length 5.0, length (including opercular hairs) 5.6, width 1.8, height 1.9, length of micropylar plate 0.7.

Table 1: Lengths of *Acacus braggi* **sp. n.** (in mm).

	♂, HT (ZSM)	♂♂, PT (PEB)	♀♀, PT
Body (excl. cerci)	68.0	71.0-74.0	92.7-101.0
Head	2.8	3.0	4.8-5.0
Pronotum	2.8	3.0	4.0-4.5
Mesonotum	18.5	19.0-21.0	22.5-25.0
Metanotum	6.2	6.0-6.5	6.5-7.0
Median segment	2.5	2.5	3.7-4.0
Profemora	25.5	27.5-29.0	26.8-29.0
Mesofemora	19.5	21.0	19.5-21.5
Metafemora	25.5	27.0-28.0	27.0-29.5
Protibiae	31.8	30.0-32.0	28.5-29.0
Mesotibiae	20.0	22.0-23.0	19.0-20.5
Metatibiae	27.0	32.0-33.0	29.0-30.5
Antennae	>42.0	76.0-88.0	72.0-78.0

Genus *Gargantuoidea* Redtenbacher, 1908

Type species: *Necroscia gargantua* Westwood, 1859: 130, pl. 29: 3 (♀) [= *Necroscia phaetusa* Westwood, 1859: 137, pl. 38: 4 (♂)], by subsequent designation of Brock, 1995: 89.

Gargantuoidea Redtenbacher, 1908: 501. (in part)
Brock, 1995: 91.
Brock, 1999: 76 & 174, fig. 45a-b (♂), c-d (♀), e (egg).
Seow-Choen, 2000, pls. 43-45.
Bragg, 2001: 559 & 633.
Aruanoidea Redtenbacher, 1908: 519 & 520 (in part).
Necroscia, Westwood, 1859: 137, pl. 38: 5 (in part).
Necrosciodes Karny, 1923: 241. [type species: *Necroscia lampetia* Westwood, 1859, by original designation] **syn. n.**
Brock, 1996: 89.
Bragg, 2001: 576 & 638.

Comments: Redtenbacher (1908: 501) established the genus *Gargantuoidea* for Westwoods' two Bornean species *Necroscia phaetusa* Westwood, 1859 and *Necroscia gargantua* Westwood, 1859 which were synonymized by Wood-Mason, 1877: 349, and four new species. Brock (1996: 89) subsequently designated *Necroscia gargantua* Westwood as the type species.

Both Brock (1999: 76, fig. 45e) and Seow-Choen (2000, pl. 44e) provided and illustration of the egg of *Gargantuoidea triumphalis* Redtenbacher, 1908 which has so far remained the only one to be known from the genus. Redtenbacher (1908: 501) erroneously described *Gargantuoidea* to be closely related to *Asceles* Redtenbacher, 1908 (type species: *Necroscia malaccae* Saussure, 1868: 69, by subsequent designation of Kirby, 1904: 436) but examination of the genitalia and eggs show it to be clearly more closely related to e.g. *Necroscia* Audinet-Serville, 1838 (Type species: *Necroscia roseipennis* Audinet-Serville, 1838 by subsequent designation of Kirby, 1904: 436).

The type species of *Necrosciodes* Karny, 1923, *Necroscia lampetia* Westwood, 1859, proved to be very

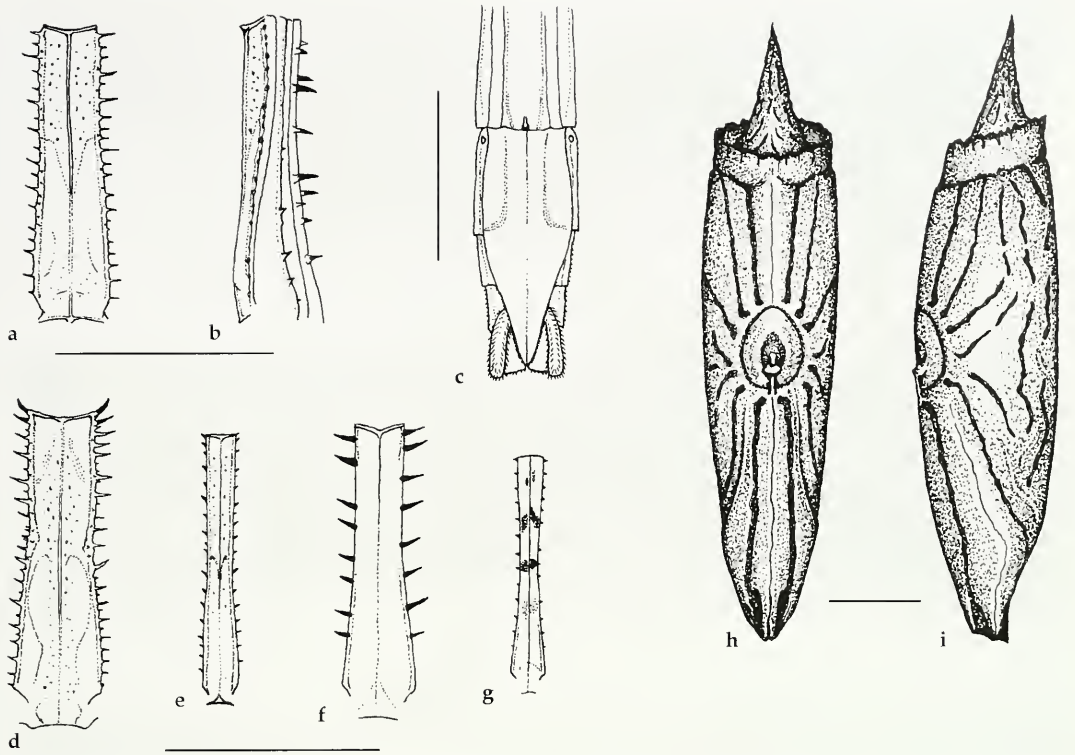

Fig. 2: (scale=5 mm), **a-c:** *Gargantuoidea matangensis* **sp. n.**, HT, ♀, **a.** apex of abdomen seen ventrally, **b.** mesonotum seen laterally, **c.** mesothorax seen dorsally. **d.** *Gargantuoidea triumphalis* REDTENBACHER, mesonotum seen dorsally (♀), **e.** *Gargantuoidea triumphalis* REDTENBACHER, mesonotum seen dorsally (♂), **f.** *Gargantuoidea phaetusa* (WESTWOOD, 1859), mesonotum seen dorsally (♀), **g.** *Gargantuoidea phaetusa* (WESTWOOD, 1859), mesonotum seen dorsally (♂), **h-i.** Egg of *Gargantuoidea triumphalis* REDTENBACHER, **h.** dorsal view, **i.** lateral view (scale=1 mm).

similar and undoubtly very closely related to *Gargantuoidea tessellata* REDTENBACHER, 1908 (= *Aruanoidea excisa* REDTENBACHER, 1908). Examination of the ♂ holotype in OXUM showed no features that would distinguish it from *Gargantuoidea* REDTENBACHER, which makes *Necrosciodes* KARNY, 1923 a junior synonym of *Gargantuoidea* REDTENBACHER. In his catalogue of Malaysian Phasmatodea BROCK (1995: 91) listed *Aruanoidea excisa* REDTENBACHER as belonging to *Necrosciodes* KARNY and subsequently (1999: 174) synonymized it with *Gargantuoidea tessellata* REDTENBACHER. In the catalogue attached to that publication BROCK (1999) however omitted *Necrosciodes* KARNY.

A complete new diagnosis, precise differentiation and systematic placement of the genus within the Necrosciinae is not possible without examining material from all described genera. There is the urgent need of a revisional study of the complete subfamily, which is in its present organization clearly polyphyletic. Although no diagnosis is provided here, all known species of *Gargantuoidea* REDTENBACHER, 1908 are remarkable for a number of features which may readily distinguish them from other closely related taxa.

Typical features of the genus are: the short and dorsoventrally flattened mesonotum which is at best 1.5× as long as the combined length of head and pronotum; the more or less prominent spines or tubercles on the lateral margins of the mesonotum and raised median carina; more or less strongly developed spines on the mesosternum; glossy black metanotum, median segment and first three or four tergites; serrate anteroventral carina of profemora; plain greyish brown or tessellated anal region of the wings as well as the large body which usually exceeds 100.0 mm in ♀♀. The eggs are similar to those of *Necroscia* AUDINET-SERVILLE, 1838 but remarkable for the distinctly, conically raised operculum.

Examination of the holotype of *Gargantuoidea macheli* REDTENBACHER, 1908 from Indragiri, Sumatra in NHMB has clearly shown this not to belong to that genus.

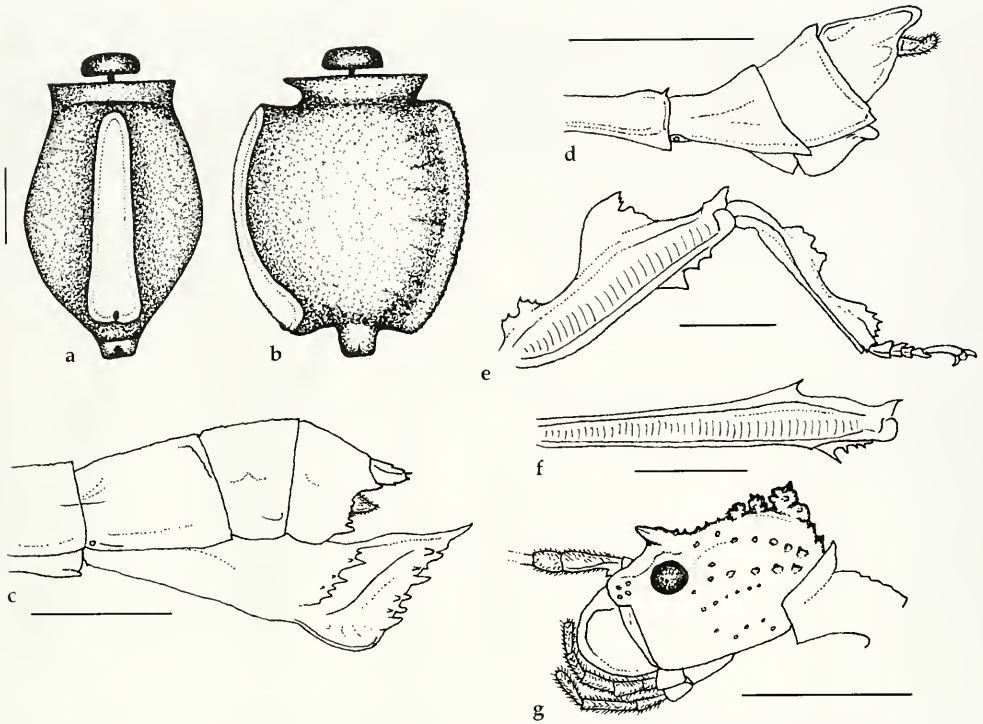

Fig. 3: *Phenacephorus portentosus* (BRUNNER V. WATTENWYL, 1907) (scale = 5mm). **a-b:** Egg, **a.** dorsal view, **b.** lateral view (scale = 1 mm), **c-g:** c. apex of abdomen seen laterally (♀), **d.** apex of abdomen seen laterally (♂), **e.** left mid-leg (♀), **f.** left mesofemur (♂), **g.** head seen laterally (♀).

Distribution: Peninsular Malaysia, Singapore, Sumatra, Borneo (Sarawak, Sabah, Kalimantan and Brunei), Java.

Species included (distribution in brackets):

1. *Necroscia lampetia* WESTWOOD, 1859: 137, pl. 38: 5 (♂) [Sarawak and Brunei]
2. *Gargantuoidea matangensis* **sp. n.** [Sarawak (Matang)]
3. *Necroscia phaetusa* WESTWOOD, 1859: 130, pl. 29: 3 (♂) [Sarawak, Sabah, Singapore, Kalimantan]
   = *Necroscia gargantua* WESTWOOD, 1859: 137, pl. 38: 4 (♀) (synonymized by WOOD-MASON, 1877: 349)
4. *Gargantuoidea spinipes* REDTENBACHER, 1908: 502 [Borneo]
5. *Gargantuoidea tessellata* REDTENBACHER, 1908: 502 [Peninsular Malaysia]
   = *Aruanoidea excisa* REDTENBACHER, 1908: 519 (synonymized by BROCK, 1999: 174)
6. *Gargantuoidea triumphalis* REDTENBACHER, 1908: 502, pl. 26: 4 (♀). [Peninsular Malaysia, Singapore, Sumatra, Java]

Keys to the species of *Gargantuoidea* REDTENBACHER, 1908

♀♀ [the ♀ of *G. lampetia* (WESTWOOD) is not known]

1. Lateral margins of mesonotum with 13-20 minute spines; ventral carinae of meso- and metafemora smooth 2
– Lateral margins of mesonotum with 8-10 prominent spines; ventral carinae of meso- and metafemora dentate 3

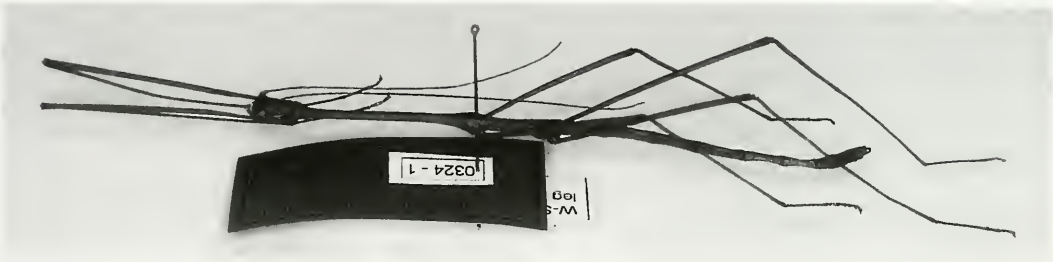

Fig. 4: *Acacus braggi* **sp. n.**, HT, ♂.

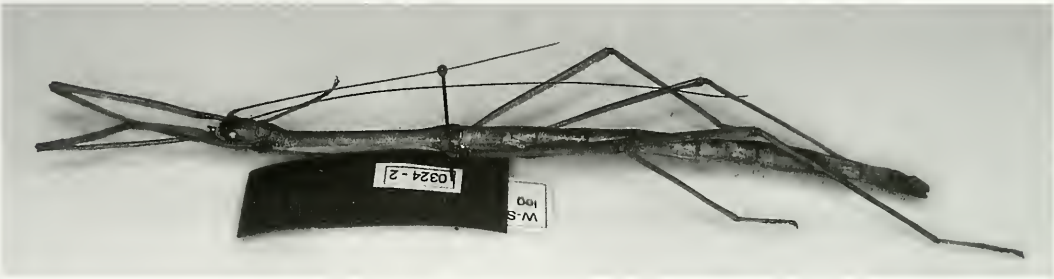

Fig. 5: *Acacus braggi* **sp. n.**, PT, ♀.

2. Large (body length 134.0-139.5 mm); anal region of alae plain dark brown; Peninsular Malaysia, Singapore, Sumatra & Java ..... *triumphalis*
– Medium-sized (body length 125.3 mm); apical end of alae transparent orange; Sarawak ..... *matangensis*

3. Mesonotum smooth; anal region of alae with a pale transverse band near apex ..... *phaetusa*
– Mesonotum granulose; anal region of alae distinctly tessellated 4

4. Ventral carinae of all femora entirely dentate; green species; Peninsular Malaysia ..... *tessellata*
– Posteroventral carina of femora only with 3-4 apical teeth; brownish species; Borneo ..... *spinipes*

♂♂ [the ♂♂ of *G. matangensis* **sp. n.** and *G. spinipes* REDTENBACHER are not known]

1. Mesosternum with two longitudinal, parallel rows of tubercles 2
– Mesosternum smooth; head globose; Sarawak ..... *lampetia*

2. Ventral carinae of meso- and metafemora smooth; anal region of alae not tessellated 3
– Ventral carinae of meso- and metafemora very minutely dentate; anal region of alae tessellated; Peninsular Malaysia ..... *tessellata*

3. Mesonotum dorsally smooth and with 8-10 very minute lateral spines; anal region of alae with a pale transverse band near apex; Borneo & Singapore ..... *phaetusa*
– Mesonotum granulated, without lateral spines; anal region of alae plain dark brown; Peninsular Malaysia, Singapore, Sumatra & Java ..... *triumphalis*

Gargantuoidea matangensis **sp. n.**

HT, ♀: NW-Sarawak, Matang nr. Mt. Serapi, leg. F. HENNEMANN & H. P. HENNEMANN, 28.VII.1994 (FH 0169-1, ZSM)

Etymology: The new species is named after its type locality Matang, a small town east of Mt. Serapi in northwestern Sarawak.

Fig. 6: *Gargantuoidea matangensis* **sp. n.**, HT, ♀.

Differentiation: Closely related to the two Bornean members of the genus, *Gargantuoidea phaetusa* (WESTWOOD, 1859) and *Gargantuoidea spinipes* REDTENBACHER, 1908. From the first it is distinguished by: the more parallel mesonotum, distinctly smaller but more numerous spines on the lateral margins of the mesonotum, relatively shorter abdominal segments and the coloration of the wings. From the latter it differs by: the smaller but more numerous lateral spines of the mesonotum, smooth meso- and metafemora and the plain greyish brown anal region of the alae.

In the shape and spination of the mesonotum it strongly resembles *Gargantuoiodea triumphalis* REDTENBACHER, 1908 from Peninsular Malaysia and Sumatra but is easily distinguished by: the smaller size of the body, shape of genitalia and the transparent orange apical section of the alae.

Description:

♀: Long (body length 125.3 mm) and slender species, body almost of uniform width (± 4.5 mm) and slightly dorsoventrally compressed. Alae long (76.8 mm), almost reaching half way along tergite VII. General colouring of body and legs pale to mid-brown, slightly darker on mesothorax and with very indistinct pale mottling on the legs. Metanotum, median segment and dorsal surface of tergites II-V distinctly glossy black. Tegmina and costal region of alae plain mid brown, tegmina with a very indistinct paler marking at anterior margin and alae with a bold yellowish marking in the medial third. Bases of alae red, anal region plain blackish-brown with apices transparent orange. Antennae pale-brown with several black bands.

Head: Elongate, 1.5× longer than wide, dorsoventrally flattened and parallel-sided. Dorsal surface plain with a small circular impression between the bases of antennae. Eyes large, very prominent, oval and reddish brown. Antennae reaching posterior margin of tergite V, all antennomeres very short and minutely setose. Scapus almost rectangular, slightly longer than wide and oval in cross-section. Pedicellus cylindrical, ⅔ the length of scapus.

Thorax: Pronotum slightly shorter and narrower than the head, almost 2× longer than wide, rectan-

gular. Lateral margins very slightly raised, median transverse depression slightly curved and reaching lateral margins of segment. Mesonotum slightly longer than combined length of head and pronotum, parallel-sided in anterior half and slightly widening in posterior half. Dorsal surface with a fine but distinctly raised median carina and covered with numerous minute, pointed granules. Anterior margin with a raised transverse carina. Lateral margins with 14-16 long, needle-like and forward pointing spines of variable size and accompanied by numerous much smaller spines between their bases. Mesopleurae with 3-5 minute spines in posterior third of median longitudinal carina. Mesosternum with two parallel, longitudinal rows of spines: each consisting of 5-6 very prominent, black spines which are occasionally hooked, and a similar number of distinctly smaller spines. Metanotum about ⅔ the length of mesonotum. Mesopleurae with three black granules near posterolateral margin. Mesosternum with a slightly impressed median line and a few small granules between mesocoxae. Tegmina slightly projecting over posterior margin of metanotum, oval and flat. Alae almost reaching half way along tergite VII.

Abdomen: Median segment longer than metanotum, 2× longer than wide, rectangular. Segments II-VI parallel-sided, about 3× longer than wide. VII slightly shorter and less than 2.5× longer than wide. Tergites II-VII smooth, sternites with a blunt median carina and raised lateral margins. Praeopercular organ formed by a rounded median tubercle at posterior margin of sternite VII. Tergite VIII slightly shorter than VII and as long as IX and X combined, almost 2× longer than wide. IX broader than wide, less than half the length of previous and slightly narrowing towards posterior margin. Anal segment slightly longer than IX, tapering towards apex and with a very fine median carina. Posterior margin with broad but flat triangular incision and lateral margins with an indention near bases of cerci. Cerci dorsoventrally flattened, elongate and very slightly projecting over apex of anal segment. Operculum elongate, not reaching apex of anal segment, anterior half flattened, afterwards strongly constricted and becoming tube-like towards medially incised apex.

Legs: All very long and slender, profemora basally compressed and strongly curved. All femora and tibiae with a blunt medioventral carina. All carinae entirely smooth except for a single, very indistinct apical spine on anteroventral carina of mesofemora (absent on the right femur of HT) and anteroventral carina of profemora which is minutely but densely serrate. Profemora trapezoidal in cross-section, meso- and metafemora almost quadrate, tibiae trapezoidal. Basitarsi as long as remaining segments combined, tarsomeres II-IV distinctly decreasing in length.

♂♂ and eggs unknown.

Gargantuoidea phaetusa (Westwood, 1859)

Necroscia phaetusa Westwood, 1859: 130, pl. 29: 3 (♂); HT, ♂: Sar, E coll. (1830-73) W. W. Saunders Purchased and press. 73 by Mrs. F. W. Hope, *Necroscia phaetusa* Westwood Type, *Phaetusa* Westw., (OXUM, No. 637).
Wood-Mason, 1877: 349.
Gargantuoidea phaetusa, Brock, 1999: 75 & 174, fig. 44a-c (♂), 44d (♀).
Seow-Choen, 2000: 18, pl. 43a-b (♂,♀).
Bragg, 2001: 599.
Necroscia gargantua Westwood, 1859: 137, pl. 38: 4 (♀); HT, ♀: ♂: Sar, E coll. (1830-73) W. W. Saunders Purchased and press. 73 by Mrs. F. W. Hope, *Necroscia gargantua* Westwood Type, *Phasma gargantua* mon pl. 29f3. (OXUM, No. 639) [the HT is a ♀, not a ♂ as stated by Westwood] (synonymized by Wood-Mason, 1877: 349)
Aruanoidea (?) gargantua, Kirby, 1904: 378.
Gargantuoidea gargantua, Redtenbacher, 1908: 502.
Günther, 1943: 158.
Seow-Choen et al., 1994: 9.
Brock, 1996: 89.

Material examined: 1♂: N Sabah, Mt. Kinabalu, nr. Poring Hot Springs, 480 m, leg. Hennemann & Conle, 4.-8.VIII.1998 (FH 0331-1).

Comments: Comparison of the specimen in the collection of FH with the holotype in OXUM proved it to be identical with the same except for lacking the dark median line on the head and pronotum as well as having a more distinctly mottled costal region of the alae. The measurements of this specimen are provided below.

Westwoods' type specimens were both from Sarawak and since then only Günther (1943: 158) and Bragg (2001: 55) have recorded it from Mahakam in Kalimantan, this being the first record in Sabah. It has also been recorded from Singapore by Seow-Choen (1994: 9).

Gargantuoidea triumphalis REDTENBACHER, 1908: 502, pl. 26: 1, 1a (♀); ST: 1♀: Sumatra, Glen Beroi, Beneden, Langkat, Ernst von BUREN leg. (ZMHB); 1♂, 2♀♀: Malacca, Kwala Gangsar (Perak), 1902 GRUBAUER leg. (NHMW, No. 978); 1♀: Java, Montes Gede, 4,000 m, 1896, H. FRUHSTORFER (NHMW, No. 978).
BROCK, 1996: 89.
BROCK, 1998: 63.
BROCK, 1999: 76 & 174, fig. 45a-b (♂), c-d (♀), e (egg).
SEOW-CHOEN, 2000: 18, pl. 44ab (♂), c-d (♀), e (egg).

Material examined: 1♀: West Malaysia, Tapah Hills, native collector, via WONG TET FATT, X. 1993 (FH 0361-1); 1♀, 2 eggs: West Malaysia, Perak, Tapah Hills, native collector, via WONG TET FATT, VII. 1996 (coll. FH 0361-2 & E); 1♂: N Thailand, Chiang Mai, leg. LEHMANN, 1995 (FH 0361-3).

Comments: Apart from the illustration of the ♀ provided by REDTENBACHER (1908, pl. 26), the species has been illustrated in both sexes by BROCK (1999: 76, pl. 45) and SEOW-CHOEN (2000, pl. 44). Both authors provided an illustration of the egg, for which BROCK (1999: 77) only included a very undetailed characterization. Therefore the egg is redescribed and illustrated based on a single example which was obtained from a living ♀ during a visit in Cameron Highlands in July 1996. The illustrations provided by BROCK (1999) and SEOW-CHOEN (2000) lack the prominent conical projection on the operculum, suggesting the illustrated egg had already hatched or the operculum had been broken off during conservation.

All three specimens in collection of FH are typical for the species and perfectly match with the syntypes in NHMW and ZMHB. The ♂ represents the first record from northern Thailand. It is widely distributed in Peninsular Malaysia and also recorded from Sumatra and Java. BROCK (1999: 77) lists numerous records in Peninsular Malaysia.

The measurements given below are taken from the two ♀♀ and ♂ in the collection of FH.

Description of the egg: The following description is based on a single egg which was laid by a living ♀ during a visit in Cameron Highlands in July 1996.

General colouring of capsule and operculum rusty or orange-brown. Very large, capsule very elongate, cylindrical and sharply tapered towards posterior end, generally of cartridge-like appearance. Polar area forming three blunt converging carinae. Surface of capsule very minutely granulose and with numerous impressed longitudinal furrows. There is a fine median longitudinal carina posterior of the micropylar plate on dorsal surface. Micropylar plate very small, oval, with a raised outer margin and an oval central impression which contains the micropylar cup. Median line raised and short, just projecting over posterior margin of micropylar plate, black. Operculum cylindrical, strongly sculptured with outer margin prominently raised and a strongly raised conical projection in its centre.

Table 2: Lengths of *Gargantuoidea* spp. (in mm).

	G. matangensis **sp. n.** HT, ♀	*G. phaetusa* ♂ (FH)	*G. triumphalis* ♂ (FH)	*G. triumphalis* ♀♀ (FH)
Body (excl. cerci)	125.3	95.0	91.8	137.5-139.5
Head	6.7	4.0	4.1	5.5-5.8
Pronotum	5.7	3.6	3.2	5.7-6.0
Mesonotum	13.3	10.0	11.1	15.1-16.7
Metanotum	8.8	4.7	4.3	9.5-10.5
Median segment	11.0	6.6	7.0	11.8-13.0
Tegmina	12.0	6.1	6.8	13.3-14.8
Alae	76.8	49.6	49.0	85.5-86.0
Profemora	35.8	28.7	28.4	38.0-38.6
Mesofemora	23.6	19.6	18.7	26.8-27.5
Metafemora	35.4	27.4	27.0	39.3-39.5
Protibiae	34.9	30.4	29.0	40.8-43.0
Mesotibiae	21.5	19.4	18.0	24.2-25.1
Metatibiae	34.6	30.0	29.2	38.8-41.2
Antennae	94.0	>57.0	>85.0	106.0

Measurements (in mm): Length 8.3, length (including operculum) 9.6, width 2.1, height 2.4, length of micropylar plate 1.2.

Subfamily Lonchodinae

Genus *Phenacephorus* Brunner v. Wattenwyl, 1907

Type species: *Phenacephorus cornucervi* Brunner v. Wattenwyl, 1907, by subsequent designation of Bragg, 1994: 232.

Phenacephorus portentosus (Brunner v. Wattenwyl, 1907)

Prisomera portentosum Brunner v. Wattenwyl, 1907: 291. HT, ♂: Museum Paris, Borneo, R. Oberthur 1898, Coll. Br. v. W., det. Br. v. W. *Prisomera portentosum*, 23.344 (NHMW, No. 571).
Lonchodes portentosus, Günther, 1932: 387.
Brock, 1998: 50.
Bragg, 2001: 491.
Lonchodes imitator, Bragg, 2001: 474. (in part – only the specimen from Bau, PEB-1731).

Material examined: 1♂, 1♀, 2♀♀ (nymphs): NW Sarawak, Mt. Santubong, ca. 60 m, 29.-30.VII.1996 (FH 0345-1 to 4); 2♂♂, 2♀♀, eggs: ex Zucht. F. Hennemann, 1997, Sarawak (FH 0345-5 to 8 & E).

Differentiation: Closely related to *Phenacephorus nieuwenhuisi* Bragg, 1994 from Kalimantan but distinguished by: the longer and more robust body of both sexes, more roughly granulose body surface and larger dorsal lobe of mesofemora of ♀♀, the much larger and more prominently laterally flattened and keeled egg-capsule and more prominent, knob-like capitulum.

Description: The ♀ and egg of this species are still undescribed. Descriptions of these and a redescription of the ♂ is provided below.

♀: Medium sized (body length 124.3-131.0 mm), rather massive Lonchodinae. Whole surface of body roughly granulose, and rugulose, abdominal segment V occassionally verrucose or lobed. Body coloration quite variable, ranging from more or less plain light brown to almost black. Interior surfaces of metafemora pale red, rest of legs similar to body coloration.

Head: Globose, slightly longer than wide and narrowing towards posterior end, broadest near the eyes. Back of head conical and covered with numerous distinct tubercles. Between the eyes are two transverse, rounded and scale-like lobes. Laterally a row of minute tubercles, each ending in a rounded hump. Lateral surfaces with 3-4 longitudinal rows of small granules. Eyes greyish brown, circular and convex. Antennae projecting over posterior margin of mesonotum, brown with several black bands in distal half. Scapus dorsoventrally compressed, laterally dilated, oval. Pedicellus longer than wide, globose and cylindrical in cross-section.

Thorax: Pronotum rectangular, 1.5× as long as wide and slightly longer than head. Surface densely granulose, anterior margin raised, with distinct, slightly curved median transverse groove. Mesothorax slightly oval in cross-section, strongly elongated, narrowed at anterior and broadened near posterior margin. Mesonotum roughly granulose with several more prominent, rounded tubercles; posterior margin and median line raised. Mesopleurae with numerous large, flattened tubercles becoming distinctly pointed and tooth-like near posterior margin. Mesosternum rugulose except lateral margins. Metathorax almost cylindrical, about ⅔ the length of mesothorax, slightly broadened at anterior margin. Metanotum almost parallel-sided, with a raised median line and structured like mesonotum. Metapleurae densely granulose, metasternum like mesosternum.

Abdomen: Median segment narrower than metanotum, less than half of its length, 1.5× as long as broad. Segments II-VII cylindrical, 1.5× as long as broad, of same width as thorax. All tergites (except IX) with a more or less prominent, fine median carina and a minute pair of spines near anterior margin. V-VI slightly broadened and swollen, V with a more or less prominent, irregularely shaped, scale-like hump at posterior margin. Sternites distinctly keeled, and with a fine, longitudinal lateral carina. Lateral margins of sternites elevated into an irregularly dentate ledge. Sternite II with two rounded tubercles near anterior

margin. Praeopercular organ formed by two low subparallel carinae at posterior margin of sternite VII. Tergite VIII indistinctly longer than wide, shorter than VII and strongly keeled. IX narrower and half as long as VIII, narrowing towards posterior margin. Anal segment longer than IX, posterior margin toothed and with a broad, concave indention medially. Supraanal plate variable, from small semicircular to slightly pointed lobe, projecting over posterior margin of anal segment. Cerci very small, oval in cross-section. Operculum projecting over apex of anal segment, deeply keeled, apex variably serrated.

Legs: Profemora basally compressed and curved, all carinae more or less distinctly dilated, the dorsal carina raised into wave-like ledge. Posteroventral carina with a triangular, spine-like lobe and 1-2 minute teeth. Protibiae with strongly dilated dorsal carina, which is elevated into a rounded and dentate lobe near distal end. Mesofemora distinctly swollen, anterodorsal carina with a small serrated lobe near apex, posterodorsal carina with large, triangular and serrated lobe two thirds of the way along the femur. Distal quarter of ventral carinae with triangular spine-like lobe and 1-2 small teeth. Mesotibiae dorsally with two serrated lobes: one apically one distally. Hind legs short, reaching tergite VI. Metafemora slender, ventral carinae distally with 1-3 minute teeth. Probasitarsus and following two segments with a distinctly raised dorsal carina. Mid- and hind-tarsi short, segments 1-4 of almost equal size.

Lengths (in mm): Body 124.3-131.0, head 7.5-7.7, pronotum 5.6-6.2, mesonotum 25.0-26.0, metanotum 15.0-15.2, median segment 5.9-6.1, profemora 20.8-21.8, protibiae 20.0-20.5, mesofemora 15.5-16.0, mesotibiae 11.4-12.0, metafemora 18.0-20.0, metatibiae 18.0-20.3, antennae > 39.0.

♂: Medium sized (body length 90.5-92.0 mm), slender, typical Lonchodinae. Head and thorax densely granulose, abdomen smooth. General coloration uniformly yellowish-brown to brown, metanotum with broad, dark-green median transverse band.

Head: Globose, slightly longer than wide and narrowing towards posterior end, broadest near the eyes. Back of head slightly raised and covered with numerous small tubercles and granules. Two blunt spines between eyes, indistintly connected by a fine, transverse carina. Eyes greyish brown, circular and convex. Antennae projecting over posterior margin of abdominal segment II, brown. Scapus and pedicellus like ♀♀.

Thorax: Pronotum as long as head, like in ♀♀ but less granulose. Mesothorax cylindrical, strongly elongated and dilated near posterior margin. Metathorax as mesothorax but less than ⅔ of its length and distincly arched seen laterally.

Abdomen: Median segment narrower than metanotum, rectangular and twice as long as broad, anterior margin convex. Segments II-VII cylindrical, parallel-sided, almost 4x as long as broad, longer than median segment. Tergite VII slightly shorter than VI broadening towards posterior margin, which is 1.5× the width of anterior margin. VIII broader than long, distinctly dilated, broadening towards posterior margin. IX shorter than VIII, transverse, narrowing towards posterior margin which is only half the width of anterior margin, conically raised posteromedially. Tergites VIII and IX forming an oval, seen dorsally. Anal segment short, distinctly keeled and divided, forming two triangular lobes. Cerci very small, cylindrical and incurving at apex. Subgenital plate cup-like, convex with a median carina in posterior half.

Legs: All femora quadrate in cross section. Profemora basally compressed and curved, posteroventral carina with two minute distal teeth. Dorsal carina of protibiae raised over whole length and slightly rounded distally. Mesofemora strongly thickened, posterodorsal carina protuding as a small triangular lobe in distal half. Ventral carinae with a triangular spine and two minute teeth at apex. Ventral surface with a distinct median carina. Dorsal carina of mesotibiae thickened and occassionally toothed at apex. Hind legs like ♀♀ but more slender and projecting over apex of abdomen. Probasitarsus as long as following three segments combined with distincly raised triangular dorsal carina. Dorsal carina of second and third tarsomeres less distinct. Meso- and metabasitarsus slightly longer than second segment.

Description of the egg: Medium sized, capsule laterally flattened, oval in cross-section, dorsal and ventral edges forming a rounded keel, indented at anterior margin and polar mound. Surface covered with minute, creamish pits. General colour creamish brown, with indistinct slightly darker patches laterally. Micropylar plate, polar mound, anterior edge, and operculum lighter than capsule; capitulum dark-red. Polar mound with central hollow and lower on the dorsal side. Micropylar plate elongate, parallel-sided and slightly wider at posterior end. Micropylar cup small, oval, placed in a posteromedial notch. Operculum flat, capitulum knob-like, with a central hollow and on a distinct black stalk.

Measurements (in mm): Length 3.5, length (including operculum) 3.9, width 2.0, height 3.0, length of micropylar plate 2.8.

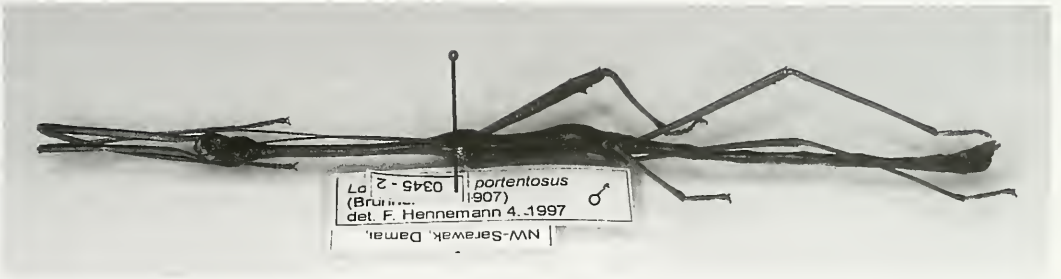

Fig. 7: *Phenacephorus portentosus* (Brunner v. Wattenwyl), ♂.

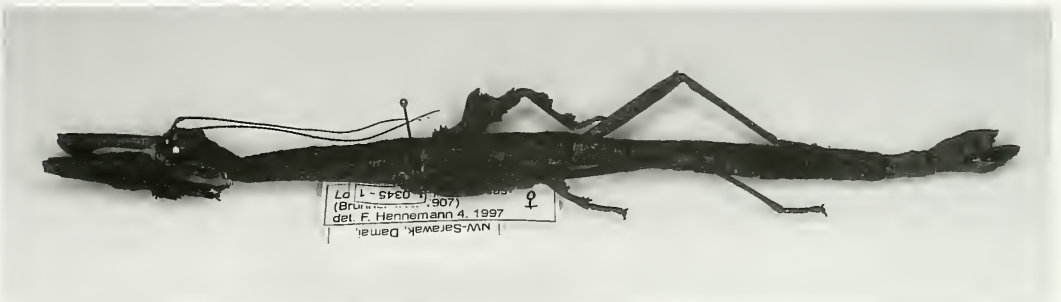

Fig. 8: *Phenacephorus portentosus* (Brunner v. Wattenwyl), ♀.

Comments: The species has so far only been known from the single ♂ holotype in NHMW and was only briefly mentioned by Bragg (2001: 491) who had not examined any material. The two subadult nymphs have body lengths of 95.0 and 99.0 mm.

The conical vertex of both sexes, short mesofemora which are shorter than the combined length of the metanotum and median segment in ♀♀, and no longer than the combined length in ♂♂ as well as egg structures clearly place this species in *Phenacephorus* Brunner v. Wattenwyl, 1907.

One dozen eggs were obtained from the wild caught ♀ and hatched after about 5 months. The nymphs were raised in humid conditions, immediately started to feed on bramble (*Rubus* spp., Rosaceae) and produced two adult pairs. Several eggs laid by these ♀♀ did however not hatch.

Table 3: Lengths of *Phenacephorus portentosus* (Brunner v. Wattenwyl) (in mm).

	♂♂ (FH)	♀♀ (FH)
Body (excl. cerci)	90.5-92.0	124.3-131.0
Head	4.0	7.5-7.7
Pronotum	4.1	5.6-6.2
Mesonotum	17.5-18.7	25.0-26.0
Metanotum	13.7-14.0	15.0-15.2
Median segment	4.0-4.2	5.9-6.1
Profemora	21.0-24.2	20.8-21.8
Mesofemora	16.7-18.5	15.5-16.0
Metafemora	19.4-21.5	18.0-20.0
Protibiae	22.0-26.0	20.0-20.5
Mesotibiae	12.7-13.4	11.4-12.0
Metatibiae	20.8-21.3	18.0-20.3
Antennae	>57.0	>39.9

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