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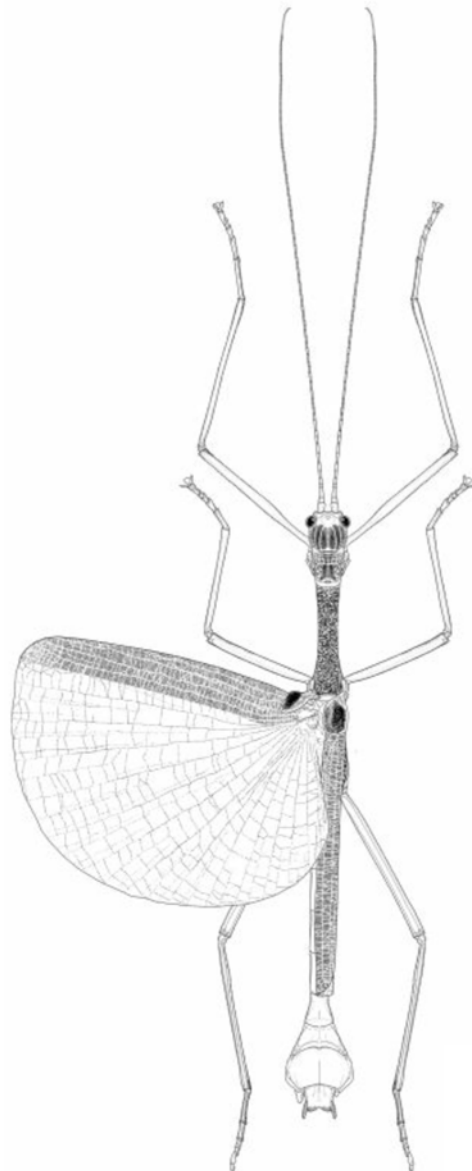
# PHASMID STUDIES

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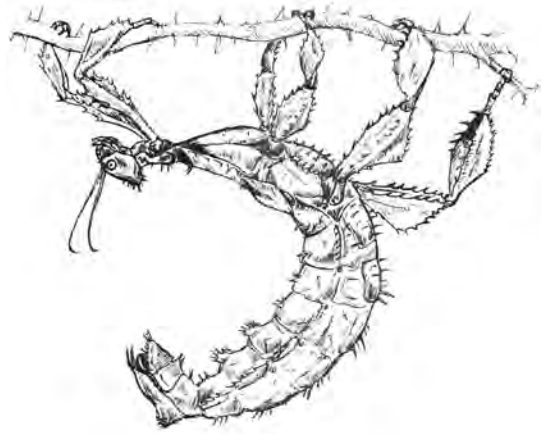
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# The two indomalayan genera *Tagesoidea* Redtenbacher, 1908 and *Euryneuroscia* Dohrn, 1910. (Phasmatodea: Anareolatae: Diapheromeridae: Necrosiinae)

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## Abstract

The two genera *Tagesoidea* Redtenbacher, 1908 (Type-species: *Necroschia tages* Westwood, 1859) and *Euryneuroscia* Dohrn, 1910 (Type-species: *Euryneuroscia festiva* Dohrn, 1910, = *Tagesoidea nigrofasciata* Redtenbacher, 1908), both subfamily Necrosiinae, are re-diagnosed. *Euryneuroscia* is shown to be a valid genus and removed from synonymy with *Tagesoidea* (**rev. stat.**). *Battacus* Werner, 1918 (Type-species: *Battacus schneideri* Werner, 1918, = *Tagesoidea nigrofasciata* Redtenbacher, 1908) is a synonym of *Euryneuroscia*. *Euryneuroscia* is a monotypical genus, which only includes the well-known and beautiful *Euryneuroscia nigrofasciata* (Redtenbacher, 1908, **n. comb.**). *Tagesoidea* comprises two fairly small species, the type-species *T. tages* (Westwood, 1859) from NE-India and Peninsular Malaysia and *T. fasciata* Redtenbacher, 1908 from Borneo, the latter of which is still of doubtful generic position. *Tagesoidea* is shown to be closely related to *Calvisia* Stål, 1875. A table and illustrations are provided to distinguish *Tagesoidea* and *Euryneuroscia*.

## Introduction

The anareolatae Asian and Australasian subfamily Necrosiinae (family Diapheromeridae) is one of the largest subordinate taxa amongst the Phasmatodea and currently comprises almost 70 distinct genera and some 600 known species. Most taxa are winged and many are very colourful. The only complete available key to all genera and species was provided by Redtenbacher (1908) but at that time only listed 50 genera. Subsequent work on the subfamily has mostly been defined to single genera or species, or local faunas and many genera are still only known from a single sex. The subfamily has not previously been divided into tribes and the only tribe (Necrosiini Brunner v. Wattenwyl, 1893) has so far not been technically necessary. The whole subfamily requires a complete revision, since several genera are still poorly defined or obviously form artificial taxa and numerous species are currently assigned to wrong genera. Furthermore, the authors are aware of a large number of still unnamed genera and species, which still await formal description.

One case of wrongly assigned species and misinterpreted genera concerns to the two beautiful indomalayan *Tagesoidea* Redtenbacher, 1908 and *Euryneuroscia* Dohrn, 1910. One of the best-known species (*Tagesoidea nigrofasciata* Redtenbacher, 1908), which is commonly sold by Asian insect-suppliers and very sought for by collectors, has proven to be generically

misplaced. The present paper clarifies the generic position of this magnificent, winged stick insect and provides new characterizations of the two genera mentioned.

### Abbreviations

BMNH:	Natural History Museum, London / England.
MHNG:	Museum d'Histoire Naturelle, Geneva / Switzerland.
MNHN:	Museum d'Histoire Naturelle, Paris / France.
MNHU:	Museum für Naturkunde der Humboldt-Universität, Berlin / Germany.
NHMW:	Naturhistorisches Museum Vienna / Austria.
NHRS:	Naturhistoriska Riksmuseet, Sektion für Entomologie, Stockholm / Sweden.
NZSI:	National Zoological Survey of India, Calcutta / India.
OXUM:	Oxford University Museum of Natural History, Oxford / England.
RMNH:	Nationaal Natuurhistorisch Museum, Leiden / Netherlands.
ZMPA:	Polish Academy of Sciences, Warszawa / Poland.
ZMUH:	Zoologisches Museum und Institut, Hamburg / Germany.
FH:	Private collection of Frank Hennemann /Germany.
OC:	Private collection of Oskar Conle / Germany.
PDB:	Private collection of Paul D. Brock / England.
HT:	Holotype
PT:	Paratype
ST:	Syntype

### Taxonomic Treatments

#### *Tagesoidea* Redtenbacher, 1908

**Type-species:** *Necrosia tages* Westwood, 1859: 152, pl. 18: 1, by subsequent designation of Brock, 1995: 93.

*Tagesoidea* Redtenbacher, 1908: 564 (in part).

Bradley & Galil, 1977: 183.

Brock, 1995: 93 (in part).

Brock, 1999: 118, 179 (in part).

Seow-Choen, 2000: 33 (in part).

Bragg, 2001: 606, 644 (in part).

Otte & Brock, 2005: 329 (in part).

Mandal & Yadav, 2010: 6, 23.

**Description (Figs. 1-8):** Fairly small (body length ♂♂ 39 mm, ♀♀ 45-52 mm), moderately robust and very colourful Necrosiini with a short mesothorax and very long alae; body cylindrical. Body surface very slightly glossy and densely setose. Head, thorax and legs yellowish to green, abdomen reddish brown. All dorsal body parts with conspicuous dark markings (Fig. 1). Tegmina and costal region of alae green with a red radial vein. Anal fan of alae dark brown to black with a large white basal marking and a radial, sub-marginal row of oval white spots. Head ovoid, somewhat longer than wide and slightly flattened; vertex gently convex and smooth (Fig. 3). No ocelli. Antennae filiform and almost as long as body; scapus slightly compressed dorsoventrally and sub-quadrate in dorsal view, pedicellus round in cross-section and antennomere III longer than pedicellus. Pronotum about equal in length to head, rectangular, the transverse sulcus indistinct and considerably displaced towards the anterior. Mesothorax short and roughly 1.5x longer than pronotum. Mesonotum about 1.5x

(♀♀) to 2x (♂♂) longer than wide, parallel-sided but narrowed post-anteriorly; anterior margin swollen, surface rugose and with a pair of shallow rounded swellings pre-medially. Mesopleurae and mesosternum smooth. Tegmina broad, almost square in outline and strongly conical. Alae reaching to or slightly projecting over apex of the abdomen, anal fan longer than wide. Abdomen excluding median segment considerably longer than head and thorax combined. Abdominal segments II-VII of ♀♀ roughly quadrate, II-V slightly widening, VI-VII gradually narrowing; somewhat longer than wide and parallel-sided in ♂♂. Anal segment of ♀♀ longer than wide and gradually tapered and slightly declining towards a fairly narrow apex; in ♂♂ broad, slightly globose with the posterior margin widely rounded. Cerci elongate, round in cross-section, slightly (♀♀) or considerably (♂♂) projecting over apex of anal segment and gently in-curving (Figs. 4, 6). No praeopercular organ on sternum VII of ♀♀. Subgenital plate of ♀♀ small, reaching to posterior margin of tergum IX and with the apex broadly rounded (Fig. 4). Gonapophyses VII elongated, up-curving and projecting considerably over subgenital plate (Fig. 4). Poculum of ♂♂ cup-shaped and slightly arched (Fig. 6). Vomer triangular with a fairly narrow terminal hook (Fig. 8). Legs fairly short and simple with the femora distinctly carinated and rectangular in cross-section. Profemora slightly constricted towards the base and with the basal portion very indistinctly curved; almost (♀♀) or a little longer (♂♂) the head, pro- and mesothorax combined. Basitarsi about equal in length to following three tarsomeres combined.

**Eggs (Fig. 5):** Barrel-shaped, angular, almost 2x longer than wide and with the ventral surface flattened. Polar-area flattened with the outer margin distinctly separated from the rest of the capsule by a circular carina. Operculum circular, flattened. Micropylar plate small, oval. General colouration drab.

**Differentiation:** The short mesothorax, lack of ocelli, features of the genitalia and barrel-shaped eggs (Fig. 5), which are glued in longitudinal rows to a support by the sticky and flattened ventral surface of the chorion, place *Tagesoidea* in a generic group of the tribe Necrosciini that contains genera such as *Calvisia* Stål, 1875 (type-species *Necroscia sangarius* Westwood, 1859), *Marmessoidea* Brunner v. Wattenwyl, 1893 (type-species *Necroscia marmessus* Westwood, 1859 (= *Marmessoidea rosea* (Fabricius, 1793)) and *Trachythorax* Redtenbacher, 1908 (type-species *Phasma maculicollis* Westwood, 1848). From these, *Tagesoidea* is apparently very closely related to *Calvisia* and in fact only differs by the conspicuous colouration of the anal fan of the alae, which is black with a large white basal marking and a sub-marginal, radial row of white oval spots. In *Calvisia* the anal fan of the alae is usually plain in colour, either transparent, grey or black, more rarely tessellated (e.g. *C. virbius* (Westwood, 1859)) or at best with small transparent markings along the outer margin (e.g. *C. coerulescens* Redtenbacher, 1908 and *C. fuscoalata* Redtenbacher, 1908). The morphology of the eggs and egg-laying procedure of *Tagesoidea* fully agrees with that of *Calvisia*.

**Comments:** Redtenbacher (1908: 564) originally established *Tagesoidea* for four species, which together formed an artificial taxon. One, *T. pulchella* (de Haan, 1842) has been removed and placed in *Kalocorinnis* Günther, 1944 (Prisopodidae: Korinninae) by Bragg (1995: 46) and a second species, *T. nigrofasciata* Redtenbacher, 1908, is here transferred to *Euryneuroscia* Dohrn, 1910 (**n. comb.**, see below). Brock (1995: 93) designated *T. tages* (Westwood, 1859) as the type-species of *Tagesoidea*. The fourth species included in *Tagesoidea* by Redtenbacher, the Bornean *T. fasciata* Redtenbacher, 1908, is still of questionable generic position, since the holotype is not traced or even lost. Apart from the type-species, *T. fasciata* (Redtenbacher, 1908) is the only other species currently in the genus.

As *T. fasciata* Redtenbacher, 1908 is of questionable generic position, the above description of the genus is solely based on the type-species *T. tages* (Westwood, 1859). The eggs are here briefly characterized for the first time but only known from the inside of a damaged abdomen of a ♀ in MNHU (Fig. 4).

**Distribution:** NE-India (Assam, Sikkim & West Bengal) and Peninsular Malaysia.

### Species included:

1. *Tagesoidea fasciata* Redtenbacher, 1908: 565. **HT**, ♀: Britisch-Borneo [not traced].

*Tagesoidea fasciata*, Bragg, 2001: 606.

Otte & Bock, 2005: 329.

**Comments:** The generic position of this species is still doubtful, since the ♀ holotype is not traced or even lost. Already Redtenbacher (1908: 565) was unaware of its deposition and commented: “*Das Museum, welches diese Spezies enthält, ist in Brunner’s Notizen nicht angegeben*”. The type-locality and features such as the small size, straight profemora, depressed head and colouration of the anal fan of the alae presume it may belong in Prisopodidae: Korinninae.

**Distribution:** N-Borneo, Sabah [type-locality].

2. *Tagesoidea tages* (Westwood, 1859: 152, pl. 18:1 (♀)) [*Necroscia*]. **HT**, ♀: in I. ori.; S.o.w. *Tages* Westw.; E

coll (1839-73) W.W. Saunders, purchased and pres. ’73 by Mrs. F.W. Hope; Type, Westwood, *Necroscia tages*, mon pl. 18f1 [OXUM, No. 675].

*Tagesoidea tages*, Redtenbacher, 1908: 365.

Brock, 1995: 93.

Brock, 1999: 119, fig. 180.

Seow-Choen, 2000: 33, pl. 84 (♀).

Otte & Bock, 2005: 330.

Mandal & Yadav, 2010: 6, 23.

*Calvisia tages*, Kirby, 1904: 370.

**Comments:** The ♀ holotype is from “India Orientali” which has been linked with several species from Peninsular Malaysia (Brock, 1999), but in this case is likely to refer to a locality in India. The ♂ was described by Redtenbacher (1908: 565) based on two specimens in NHMW, one from Assam and one from Sikkim. While frequently recorded from Northeast India, there is one record from Peninsular Malaysia (Brock, 1999: 119), based on a single, fairly damaged ♀ in coll. PDB. The locality “Peru” of the two ♀♀ in MNHU is obviously erroneous and caused by mislabelling of the concerned specimens.

**Distribution:** East-India [OXUM]; NE-India, Assam [NHMW]; NE-India, Assam, Cachar [NZSI]; NE-India, Assam, Sivasagar [NZSI]; NE-India, Sikkim [BMNH, NHMW, NZSI]; NE-India, West Bengal, Darjeeling [MNHN]; Peninsular Malaysia, Perak, Tapah Hills [coll. PDB]; “Peru” [MNHU].





**Figs. 1-8:** *Tagesoidea tages* (Westwood, 1859)

- 1. ♀ [MNHU].
- 2. ♂: Sikkim [BMNH]. Photo by Paul D. Brock.
- 3. Head and thorax of ♀ [MNHU].
- 4. Apex of abdomen of ♀ in lateral aspect [MNHU].
- 5. Damaged abdomen of ♀ showing the eggs [MNHU].

- 6. Apex of abdomen of ♂, lateral view [BMNH]. Photo by Paul D. Brock.
- 7. Apex of abdomen of ♂, dorsal view [BMNH]. Photo by Paul D. Brock.
- 8. Apex of abdomen of ♂, ventral view [BMNH]. Photo by Paul D. Brock.

*Euryneoscia* Dohrn, 1910

rev. stat.

**Type-species:** *Euryneoscia festiva* Dohrn, 1910: 413 (= *Tagesoidea nigrofasciata* Redtenbacher, 1908), by monotypy.

*Euryneoscia* Dohrn, 1910: 413. (Synonymised with *Tagesoidea* Redtenbacher, 1908 by Brock, 1995: 93)

Günther, 1943: 165.

Bradley & Galil, 1977: 182.

Bragg, 2001: 624. (As a synonym of *Tagesoidea* Redtenbacher, 1908)

Otte & Brock, 2005: 329. (As a synonym of *Tagesoidea* Redtenbacher, 1908)

*Battacus* Werner, 1918: 267. (Synonymised with *Tagesoidea* Redtenbacher, 1908 by Brock, 1990: 14)

Günther, 1943: 165. (As a synonym of *Euryneoscia* Dohrn, 1910)

Bradley & Galil, 1977: 182.

Brock, 1990: 14. (As a synonym of *Tagesoidea* Redtenbacher, 1908)

Bragg, 2001: 622. (As a synonym of *Tagesoidea* Redtenbacher, 1908)

Otte & Brock, 2005: 329. (As a synonym of *Tagesoidea* Redtenbacher, 1908)

*Tagesoidea* Redtenbacher, 1908: 564 (in part).

Bradley & Galil, 1977: 183.

Brock, 1995: 93 (in part).

Brock, 1999: 118, 179 (in part).

Seow-Choen, 2000: 33 (in part) – only plate 85)

Bragg, 2001: 606, 644 (in part).

Otte & Brock, 2005: 329 (in part).

**Description (Figs. 9-18):** Large (body length ♂♂ 55-59 mm, ♀♀ 77-96 mm) and fairly robust and colourful Necrosiini with very long alae; ♀♀ particularly massive insects (Fig. 9) and body oval in cross-section. Body surface strongly glossy. Head, body and legs bright yellow to pale green in ♀♀, ♂♂ with head and thorax metallic dark blue or green, abdomen dark blackish brown and legs black. In ♀♀ tegmina and costal region of alae pale green, anal fan of alae bright yellow with a broad black and white radial, sub-marginal band (Fig. 9), in ♂♂ tegmina and alae bright yellowish green and the anal fan of the alae yellow with a broad, black marginal band (Fig. 10). Head globose, hardly longer than wide with the vertex roundly convex and smooth (Figs. 11-12); in ♀♀ cheeks widening towards posterior. No ocelli. Antennae filiform,  $\frac{3}{4}$  the length of body in ♀♀ and equal in length to body in ♂♂. Scapus compressed dorsoventrally and subquadrate, pedicellus cylindrical and shorter than scapus and antennomere III elongate and considerably longer than pedicellus. Pronotum of ♀♀ somewhat longer and wider than head (a little shorter and narrower than head in ♂♂) and gently widening towards posterior, trapezoidal; transverse sulcus shallow and slightly displaced towards anterior of segment. Mesothorax fairly short and about 1.8x (♀♀) or 3x (♂♂) longer than pronotum; gradually widening towards the posterior in ♀♀. Mesonotum in ♀♀ slightly widening towards the posterior and about 2.2x longer than wide; surface with several blunt tubercles in anterior half, the lateral margins with a row of short spines and the anterior margin with a fine, transverse carina (Fig. 11). Mesonotum of ♂♂ slightly widened and raised in the posterior portion, the anterior half with a few very low tubercles; anterior margin as in ♀♀ (Fig. 12). Mesopleurae smooth in ♂♂, gradually widening towards the posterior and with a longitudinal marginal row of spines in ♀♀ (Fig. 7). Metapleurae smooth in ♂♂ and with a longitudinal marginal row of minute spines in ♀♀. Meso- and metasternum

smooth. Tegmina scale-like, rounded and a little wider than long. Alae reaching to abdominal tergum VIII (♂♂) or almost reaching apex of abdomen (♀♀); anal fan almost as wide as long and roughly shaped like the quarter of a circle (Figs. 9-10). Abdomen excluding median segment somewhat longer than head and thorax combined; swollen medially in ♀♀, parallel-sided in ♂♂. Abdominal segments II-VII almost 2x wider than long in ♀♀ and about 3x longer than wide in ♂♂. Sternum VII of ♀♀ with a distinct praeopercular organ, which is formed by prominent transverse, medially notched and protruded swelling at posterior margin (Figs. 13, 15). In ♀♀ tergites VIII-X considerably shorter than previous, anal segment wider than long and broadly rounded posteriorly (Fig. 14). In ♂♂ tergites VIII-X broader than previous, VIII shortened, IX much longer than VIII or X. Anal segment broader than all previous tergites with lateral surfaces strongly convex (Fig. 17), the posterior half slightly tectiform, the posterior margin deeply excavated and the posterolateral angles protruded into a finger-like process (Fig. 16); these with a marginal row of very minute spines interiorly (Fig. 18). Vomer prominent, triangular with the outer margins swollen, slightly curved dextrally and with a single terminal hook (Fig. 18). Poculum roundly convex, sub-acuminate apically and with a concave lateral excavation sub-basally (Fig. 16). Subgenital plate of ♀♀ reaching to posterior margin of tergum IX, notched and bi-dentate apically, with a longitudinal median furrow and the lateral surfaces with a distinct, roundly triangular projection sub-basally (Fig. 15). Cerci slightly projecting over apex of abdomen in ♀♀, cylindrical basally and laterally compressed apically (Fig. 15). Cerci of ♂♂ strongly elongated, considerably longer than anal segment and with the apex strongly flattened and truncate (Fig. 16, 18). Legs slender, simple and unarmed in ♂♂, the femora considerably broadened in ♀♀. Profemora straight and all femora trapezoidal in cross-section. In ♀♀ the two outer ventral carinae of the femora tuberculose, the medioventral carina distinct and minutely spinulose. Basitarsi about equal in length to following three tarsomeres combined.

**Eggs (Figs. 19-20):** Elongate, capsule almost 4x longer than wide and distinctly curved in lateral aspect. Capsule surface minutely rugulose with the anterior portion strongly rugose and wrinkled. Ventral surface of posterior portion, with several spiniform tubercles. Posterior portion of capsule tapered towards an acutely pointed polar-area and with two distinct, converging, longitudinal and bluntly serrate carinae, which merge at polar-area. Dorsal surface with a longitudinal median carina, which is covered by several blunt teeth towards the polar-area. Micropylar plate very small, ovoid and with the outer margin distinctly raised; positioned somewhat towards the anterior of capsule. Micropylar cup roughly placed in centre of plate and formed by a distinct rounded swelling. Median line a short longitudinal furrow on median carina of capsule. Operculum sub-spherical, with the surface rugose. Colouration of capsule dark mahogany brown, the strongly wrinkled anterior portion dull greyish. Operculum black. Measurements (in mm): length 7.0, width 1.9, height 1.8, length of micropylar plate 0.7.

**Differentiation:** Features of the genitalia, e.g. the specialized cerci of ♂♂ and apically notched subgenital plate of ♀♀, as well as the elongate, bullet-shaped eggs, which have the polar-area pointed and carinate place *Euryneoscia* in close relation to a generic subgroup of the tribe Necrosiini that contains genera such as *Necrosia* Audinet-Serville, 1838 (type-species *Phasma prasinum* Burmeister, 1838), *Paranecrosia* Redtenbacher, 1908 (type-species *Paranecrosia operculata* Redtenbacher, 1908), *Orthonecrosia* Kirby, 1904 (type-species *Phasma (Necrosia) filum* Westwood, 1859), *Gargantuoidea* Redtenbacher, 1908 (type-species *Necrosia gargantua* Westwood, 1859 (= *Gargantuoidea phaetusa* (Westwood, 1859)) and *Syringodes* Redtenbacher, 1908 (type-species *Syringodes pallidus* Redtenbacher, 1908). However, *Euryneoscia* differs from all these genera by the massive body, spinose mesopleurae, prominent praeopercular organ, spiniform sub-basal projecting on the lateral surfaces of the subgenital plate and broadened femora of ♀♀, strongly elongated cerci of ♂♂,

as well as the remarkably coloured, broad anal fan of the alae of both sexes. While the anal fan of the alae has the shape of a quarter of a circle (Figs. 9-10), is bright yellow and bears a broad radial, marginal (♂♂) or sub-marginal (♀♀) dark band in *Euryneoscia*, the anal fan in the other genera mentioned above is distinctly longer than wide and mostly plain in colour, being either transparent, grey or reddish. As in these genera, the bullet-shaped eggs are pressed into a substrate (e.g. soil, moss or bark), which is supported by the pointed polar-area (Figs. 19-20).

**Comments:** Dohrn (1910: 413) established *Euryneoscia* for the type-species *E. festiva* Dohrn, 1910, which is a synonym of *Tagesoidea nigrofasciata* Redtenbacher, 1908 (synonymised by Brock, 1995: 93), and placed it in close relation to *Loxopsis* Westwood, 1859. Due to the synonymy of the type-species *E. festiva* Dohrn, 1910 with a species that Redtenbacher (1908: 565) placed in his *Tagesoidea*, namely *T. nigrofasciata*, *Euryneoscia* became a synonym of *Tagesoidea* Redtenbacher, 1908. However, as there are fundamental differences between the type species of *Tagesoidea*, *T. tages* (Westwood, 1859), and *Euryneoscia* (see table below), *Euryneoscia* must be re-established as a valid genus to include Redtenbacher's *T. nigrofasciata* (**rev. stat.**). Accordingly, *Battacus* Werner, 1918 is a synonym of *Euryneoscia* Dohrn, 1910 (synonymised by Günther, 1943: 165), but is not synonymous with *Tagesoidea*. The type-species of *Battacus* is a synonym of the type-species of *Euryneoscia*, *E. festiva* (= *E. nigrofasciata* (Redtenbacher, 1908) **n. comb.**).

**Distribution:** Borneo, Sumatra and Peninsular Malaysia. Possibly also Thailand.

### Species included:

1. *Euryneoscia nigrofasciata* Redtenbacher, 1908: 565, pl. 27: 7 (♂) [*Tagesoidea*]. **LT**, ♂: Coll. B. v. W.,

Borneo, Boucard; det. Redtenb. *Tagesoidea nigrofasciata*; 10.040; Lectotype, *Tagesoidea nigrofasciata* Redt. [NHMW, No. 1147]; **PLT**, ♂: Deli, Sumatra. W. Boucard leg. ded. 12.X.1895.; 128. [ZMUH]. **n. comb.**

*Tagesoidea nigrofasciata*, Weidner, 1966: 232.

Brock, 1995: 93.

Seow-Choen, Seow-En & Seow-An, 1996: 46, figs.

Seow-Choen, 1997: 11, fig.

Brock, 1998: 45.

Brock, 1999, 119, pl. 21 (♀).

Seow-Choen, 2000: 33, pl. 85 (♀, ♂, egg)

Bragg, 2001: 606.

Zompro, 2002: 194.

Seow-Choen, 2003: 48, photos.

Brock, 2003: 222, fig.

Otte & Brock, 2005: 330.

Seow-Choen, 2005: 76.

= *Euryneoscia festiva* Dohrn, 1910: 413. **ST**, 2 ♀♀ : N-Borneo, Waterstradt [ZMPA]. (Synonymised by Brock, 1995: 93).

Günther, 1943: 165.

Brock, 1995: 93.

Liana, 1996: 5.

Otte & Brock, 2005: 330.

= *Battacus schneideri* Werner, 1918: 267. **HT**, ♀: Sumatra, Binthang Mariah, Mt. Battak [MHNG]. (Synonymised by Brock, 1990: 14)

Günther, 1943: 165. (Listed as a synonym of *Euryneoscia festiva* Dohrn, 1910)

Brock, 1990: 14.

Brock, 1995: 93.

Zompro & Brock, 2003: 22.

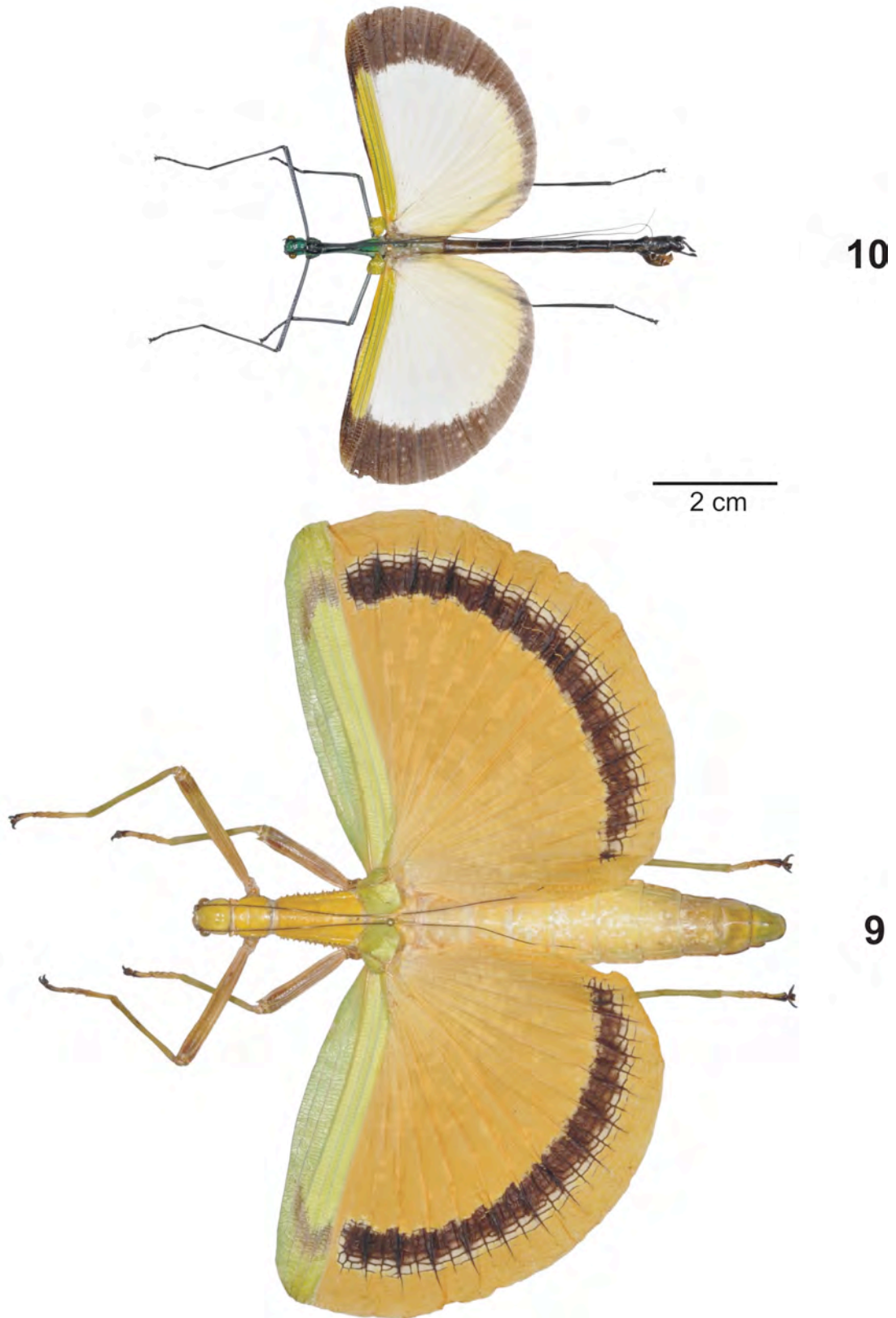
Otte & Brock, 2005: 330.

**Comments:** The record from Thailand (a pair in BMNH) is not fully confirmed, since it is not clear whether these specimens were collected in Thailand or obtained from a Malaysian supplier. However, the fauna of southern Thailand is closely related to that of Malaysia and includes several species commonly found throughout the Malay Peninsular, so it is not unlikely that this species also occurs there.

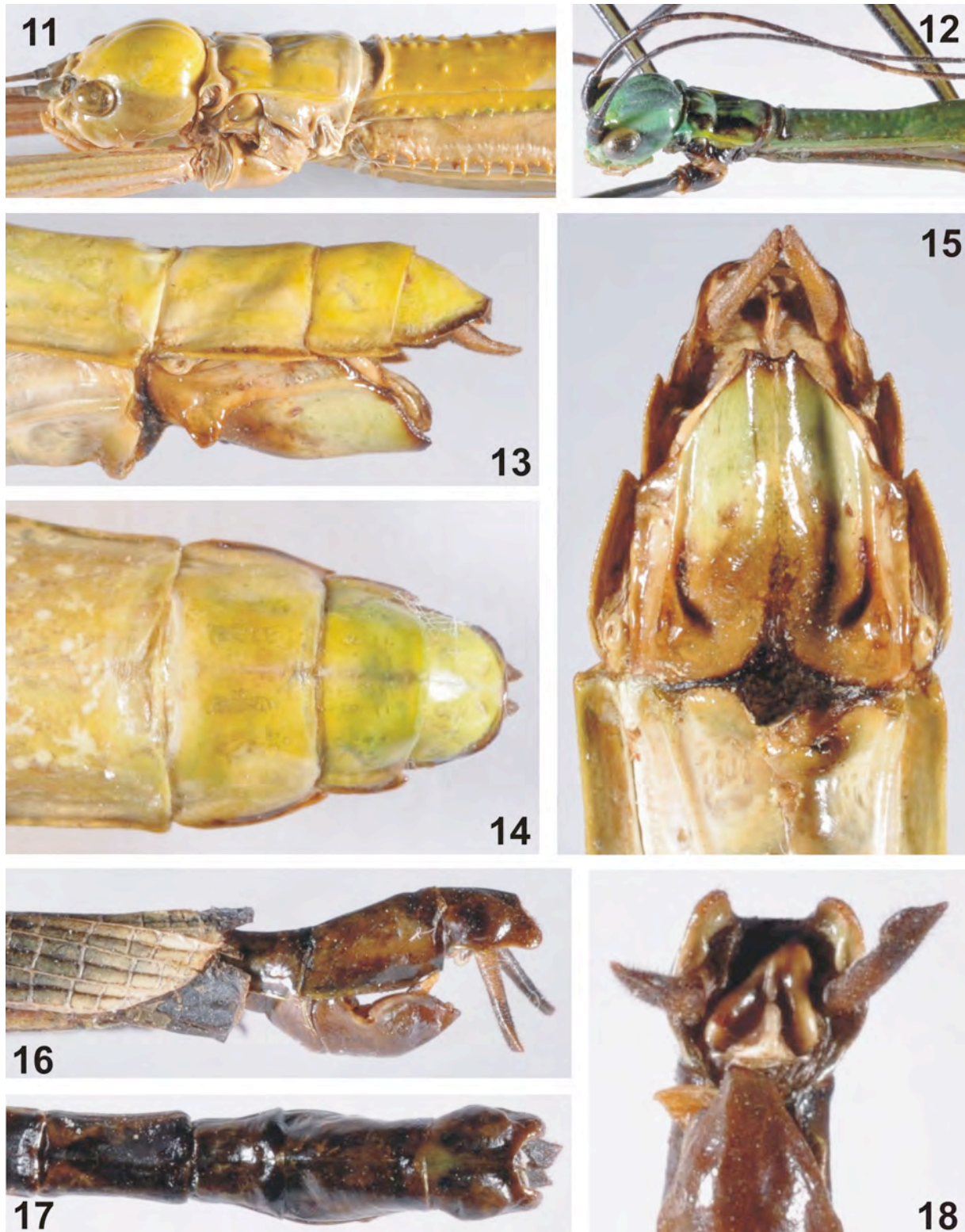
**Distribution:** Borneo [BMNH, NHMW]; Borneo, E-Kalimantan, Selatan, Mount Bakayan [coll. FH] Borneo, E-Kalimantan, Selatan, Mahakam River [RMNH]; N-Sumatra, Medan, Deli [ZMUH]; N-Sumatra, Batak Highlands, Binthang Mariah [MHNG]; N-Sumatra, Batak Highlands [NHRS]; Sumatra [MHNG]; Peninsular Malaysia, Perak, Tapah Hills [MHNG, coll. FH, coll. OC, coll. PDB]; Thailand [BMNH]. As far as known not found below 600 metres in Peninsular Malaysia.

	<i>Tagesoidea</i>	<i>Euryneoscia</i> <b>rev. stat</b>
Body length	♂♂ 39 mm ♀♀ 45-52 mm	♂♂ 55-59 mm ♀♀ 77-96 mm
Body surface	Dull to very slightly shiny and distinctly setose	Glossy, not setose
Mesothorax (♂♂)	Short; 2x longer than wide	Elongate; 5x longer than wide
Mesothorax (♀♀)	Short; 1.5x longer than wide and narrowed pre-anteriorly	2x longer than wide and gradually widening towards posterior
Mesonotum (♀♀)	Rugose with two shallow pre-medial humps	Tuberculose; flattened (Fig. 11)
Mesopleurae (♀♀)	Unarmed	With a longitudinal marginal row of spines (Fig. 11)
Tegmina	Subquadrate; strongly conical	Scale-like; flattened
Alae	Ovate, distinctly longer than wide (Fig. 1)	Very broad and shaped like the quarter of a circle (Figs. 9-10)
Abdominal segments II-VII (♀♀)	Roughly quadrate	Distinctly wider than long (Fig. 9)
Anal segment (♀♀)	Tapered towards apex; longer than wide	Broadly rounded; wider than long (Fig. 14)
Praeopercular organ (♀♀)	Destitute	A prominent, transverse, medially protuded and notched swelling at posterior margin of sternum VII (Figs. 13, 15)
Subgenital plate (♀♀)	Simple with apex blunt and rounded (Fig. 5)	Lateral surfaces with a distinct, roundly triangular sub-basal projection; apex notched medially (Figs. 13, 15)
Cerci (♂♂)	Cylindrical and in-curving (Fig. 6)	Strongly elongated, straight with apex laterally flattened, broadened and truncate (Figs. 16, 18)
Cerci (♀♀)	Cylindrical and in-curving (Fig. 4)	Straight with apex laterally flattened and truncate (Fig. 15)
Gonapophyses VII (♀♀)	Elongated and distinctly projecting over apex of subgenital plate (Fig. 5)	Short, hidden underneath subgenital plate (Fig. 15)
Legs (♀♀)	Slender	Femora considerably thickened
Eggs	Barrel-shaped, angular, 2x longer than wide with the ventral surface flattened; glued to a surface (Fig. 5)	Very elongate, curved longitudinally with the polar-area pointed and tri-carinate/serrate; pressed into a substrate (Figs. 19-20)

**Table 1:** Differentiation between *Tagesoidea* and *Euryneoscia*



**Figs. 9-10:** *Euryneoscia nigrofasciata* (Redtenbacher, 1908)  
9. ♀: Peninsular Malaysia, Perak, Tapah Hills [coll. FH, No. 0033-3].  
10. ♂: Borneo, E-Kalimantan, Selatan, Mount Bakayan [coll. FH, No. 0033-10].



**Figs. 11-18:** *Euryneoscia nigrofasciata* (Redtenbacher, 1908)

**11.** Head and thorax of ♀ [coll. FH, No. 0033-5]

**12.** Head and thorax of ♂ [coll. FH, No. 0033-7]

**13.** Apex of abdomen of ♀, lateral view [coll. FH, No. 0033-4].

**14.** Apex of abdomen of ♀, dorsal view [coll. FH, No. 0033-4].

**15.** Apex of abdomen of ♀, ventral view [coll. FH, No. 0033-4].

**16.** Apex of abdomen of ♂, lateral view [coll. FH, No. 0033-6].

**17.** Apex of abdomen of ♂, dorsal view [coll. FH, No. 0033-9].

**18.** Apex of abdomen of ♂, ventral view [coll. FH, No. 0033-6].



**Figs. 19-20:** Egg of *Eurynecrosia nigrofasciata* (Redtenbacher, 1908)  
19. Dorsal view [coll. FH, No. 0033-E]  
20. Lateral view [coll. FH, No. 0033-E]

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### References

- Audinet-Serville, J. G. (1838)** Histoire Naturelle des Insectes. Orthoptères. *Libraire Encyclopédique de Roret, Paris*, 18. 776pp.
- Bradley, J. C. & Galil, B. S. (1977)** The taxonomic arrangement of the Phasmatodea with keys to the subfamilies and tribes. *Proceedings of the Entomological Society of Washington*, 79(2), 176-208.
- Bragg, P. E. (1995)** A review of the subfamily Korinninae (Phasmida: Pseudophasmatidae), with the description of a new species. *Tijdschrift voor Entomologie*, 138: 45-50.
- Bragg, P. E. (2001)** Phasmids of Borneo. *Natural History Publications (Borneo), Kota Kinabalu*, 772 pp.
- Brock, P. (1990)** Stick insect hunting in Malaysia. *The Phasmid Study Group, Newsletter* 45: 12-14.
- Brock, P. D. (1995)** Catalogue of Stick and Leaf-Insects (Insecta: Phasmida) associated with Peninsular Malaysia and Singapore. *Malayan Nature Journal*, 49, 83-102.



- Brock, P. D. (1998)** Catalogue of the type specimens of Stick & Leaf-insects in the Naturhistorisches Museum Wien (Insecta: Phasmida). *Kataloge der wissenschaftlichen Sammlungen des Naturhistorischen Museums in Wien*, 13(5): 5-72.
- Brock, P. D. (1999)** *Stick and Leaf Insects of Peninsular Malaysia and Singapore*. Malaysian Nature Society, Kuala Lumpur, 223 pp.
- Brock, P. D. (2003)** Phasmida (Stick and leaf insects). In : Gale Research Staff. Grzimek's Animal Life Encyclopedia: Insects. 221-231.
- Brunner v. Wattenwyl, K. (1893)** Révision du Système des Orthoptères et description des espèces rapportées par M. Leonardo Fea de Birmanie. *Annali des Museo Civico di storia naturale Giacomo Doria, Genova*, (2)13(33), 76-101& 217-219, pls. 2-4.
- Dohrn, H. (1910)** Beitrag zur Kenntnis der Phasmiden. *Stettiner Entomologische Zeitschrift*, 1910, 397-414
- Fabricius, J. C. (1793)** *Entomologia Systematica emendata et aucta. Secundum Classes, Ordines, Genera, Species, adjectis Synonymis Locis Observationibus, Descriptionibus. Orthopt.* Vol. 2. Hafniae [Copenhagen]. 519 pp.
- Günther, K. (1943)** Die Phasmoiden (Orthoptera) der „Borneo-Expedition Dr. Nieuwenhuis“ aus dem Stromgebiet des oberen Mahakam. *Eos Madrid*, 19: 149-172.
- Günther, K. (1944)** Bemerkungen über indomalayische Stabheuschrecken (Orth.), besonders die Gattung *Haaniella* Kby. *Stettiner Entomologische Zeitung*, 105: 68-79.
- Haan, W. de (1842)** Bijdragen tot de Kennis der Orthoptera. Verhandelingen over de natuurlijke Geschiedenis der Nederlandsche overzeesche Bezittingen. In: Temminck, C.J. [Ed.]: *Verhandelingen Zoologie*, Vol. 2, pp. 95-138, pls. 10-15.
- Kirby, W. F. (1904)** *A synonymic catalogue of Orthoptera. I. Orthoptera Euplexoptera, Cursoria et Gressoria. (Forficulidae, Hemimeridae, Blattidae, Mantidae, Phasmidae)*. British Museum, London, 501 pp.
- Liana, A. (1996)** A Note on the Collection of Walkingsticks (Phasmatodea) in the Museum and Institute of Zoology of the Polish Academy of Sciences in Warsaw. *Metaleptea*, 16(1): 5.
- Mandal, S. K. & Yadav, K. (2010)** Some Phasmida (Stick and Leaf Insects) of India. *Records of the Zoological Survey of India. Occasional Paper No. 318*: 1-64.
- Otte, D. & Brock, P. (2005)** *Phasmid Species File. Catalog of Stick and Leaf Insects of the World, 2<sup>nd</sup> Edition*. The Insect Diversity Association and the Academy of Natural Sciences, Philadelphia. CafePress.com, 414 pp.
- Redtenbacher, J. (1908)** Die Insektenfamilie der Phasmiden. III. Phasmidae, Anareolatae (Phibalosomini, Acrophyllini, Necrosiini). *Verlag W. Engelmann, Leipzig*, pp. 341-589, pls. 16-27.
- Seow-Choen, F. (1997)** A guide to the stick & leaf insects of Singapore. *Singapore Science Centre*, 160 pp.
- Seow-Choen, F. (2000)** An Illustrated Guide to the Stick and Leaf Insects of Pensinsular Malaysia and Singapore. *Natural History Publications (Borneo), Kota Kinabalu*, 173 pp.
- Seow-Choen, F. (2003)** The Yellow Umbrella Stick Insect *Tagesoidea nigrofasciata* Redtenbacher. *Malaysian Naturalist* 56(4): 48-51.
- Seow-Choen, F. (2005)** *Phasmids of Peninsular Malaysia & Singapore*. Natural History Publications (Borneo), Kota Kinabalu. 120 pp.
- Seow-Choen, F., Seow-En, I. & Seow-An, S. (1996)** Colour in stick and leaf insects. *Nature Malaysiana* 21(2): 40-47.
- Stål, C. (1875)** *Recensio Orthopterorum, 3. Revue critique des Orthoptères décrits par Linné, de Geer et Thunberg*. P.A. Norstedt & Söner, Stockholm, 105 pp.
- Weidner, H. (1966)** Die Entomologischen Sammlungen des Zoologischen Staatsinstituts und Zoologischen Museums, Hamburg. Insecta III. *Mitteilungen des Hamburger Zoologischen Museums und Institutes*, 63: 209-264.

**Werner, F. (1918)** Eine neue Gespenstschrecke aus Sumatra. *Bericht der Sektion für Zoologie*, 267-268.

**Westwood, J. O. (1848)** The Cabinet of Oriental Entomology. London.

**Westwood, J. O. (1859)** *Catalogue of Orthopterous insects in the collection of the British Museum. Part 1, Phasmidae*. British Museum, London, 195 pp., 40 plates.

**Zompro, O. (2002 b)** Catalogue of type material of the insect order Phasmatodea at the Zoologisches Museum der Universität Hamburg (Insecta: Orthoptera: Phasmatodea). *Mitteilungen aus dem Hamburger Zoologischen Museum und Institut*, 99, 179-201.

**Zompro, O. & Brock, P. D. (2003)** Catalogue of type material of stick-insects housed in the Muséum d'histoire naturelle, Geneva, with descriptions of some new taxa (Insecta: Phasmatodea). *Revue Suisse de Zoologie*, 110(1): 3-43.

# *Necroschia perplexus* (Redtenbacher, 1908) comb. nov. (Phasmatodea: Diapheromeridae: Necroschiinae), a new species to China.

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## **Abstract**

*Necroschia perplexus* (Redtenbacher, 1908) comb. nov. is reported for the first time from China and here transferred from the genus *Asceles* Redtenbacher, 1908. *Sipyloidea taeniata* Redtenbacher, 1908 is shown to represent the corresponding male of *N. perplexus* (Redtenbacher) and here synonymised.

## **Key words**

Necroschiinae, *Necroschia perplexus*, new combination, China.

## **Introduction**

The genus *Necroschia* is recognized of its diversified species distributed over most areas in Asia. In China, seven species are recognized (Hennemann, Conle & Zhang, 2008: 17; Chen & He, 2008; Chen & Zhang, 2008; Ho, 2010). The author recently conducted collection trips to Hainan and discovered the *Necroschia perplexus* (Redtenbacher, 1908) comb. nov. which is reported for the first time from China and here transferred from the genus *Asceles* Redtenbacher, 1908 based on the genital and egg structure. *Sipyloidea taeniata* Redtenbacher, 1908 is shown to represent the corresponding male of *N. perplexus* (Redtenbacher) and here synonymised with the latter. Both sexes are redescribed for this less known species. Egg structure is described and illustrated for the first time. The material mentioned in this study are deposited in Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium (ISNB); Muséum d' Histoire Naturelle, Paris, France (MNHN); Naturhistorisches Museum, Vienna, Austria (NHMW), and the private collection of George Ho Wai-Chun, Hong Kong, China (GH).

## **Taxonomic Treatment**

*Necroschia perplexus* (Redtenbacher, 1908)  
**comb. nov.**

(Figs. 1-8)

*Asceles perplexus*, Redtenbacher, 1908: 499.

Brock, 1998: 49.

Otte & Brock, 2005: 54.

### Type-material

Syntypes: ♀ & nymph ♀, Than-Moi, Tonkin, VI-VII, Fruhstorfer, H., catalog no. 962 (NHMW). Syntypes: 2♀♀, Than-Moi, Tonkin, VI-VII, Fruhstorfer, H. (ISNB). Syntype ?, Bengalen, Jawa (MNHN). [assessed by Phasmida Species File images]

= *Sipyloidea taeniata* Redtenbacher, 1908: 545. Syntype ♂, Than-Moi, Tonkin, VI-VII, Fruhstorfer, H. (NHMW); Syntype ♂, 610-914 m., Mt. Mauson, Tonkin, IV-V, Fruhstorfer, H. (NHMW). [assessed by Phasmida Species File images] **syn. nov.**

Brock, 1998: 61.

Otte & Brock, 2005: 321.

### Other specimens examined

♂ & subadult ♀, Jianfengling National Nature Reserve, Ledong Country, Hainan Province, China, 16.IV.2011, George Ho Wai-Chun (GH). 2♂♂, Bawangling National Nature Reserve, Changjiang Country, Hainan Province, China, 9.V.2011, George Ho Wai-Chun (GH). ♀, Jianfengling National Nature Reserve, Ledong Country, Hainan Province, China, 11.VII.2011, George Ho Wai-Chun (GH).

### Diagnosis

Large and slender *Necroschia*. *N. perplexus* (Redtenbacher, 1908) **comb. nov.** is similar to *Asceles malacca* (Saussure, 1868) [Singapore and Peninsular Malaysia], but differentiates by mottled anal region of alae. This species is also morphologically resembled to *Necroschia shukayi* (Bi, Zhang & Lau, 2001) [Hong Kong and Guangdong, China] but differs in its large size and elongate body.

### Description

Female (Figs. 1-3): Large size. General color of body, legs and wings brown. Covered with small granules. Alae long and anal region mottled.

Head: Oblong, longer than wide. Vertex flat, with few small granules. Occiput flat, median and lateral furrows distinct, posterior margin with six small swellings. Genae with a pale postocular stripe, running from the posterior margin of eyes to back of head. Eyes small and oval. Antennae reaching sixth abdominal tergum, brown as body; the first segment 1.5 x length of second segment.

Thorax: Densely granulated, lesser on pronotum, mesopleurum and metapleurum. Pronotum rectangular, slightly longer than head, parallel-sided, anterior and posterior margins nearly truncate; with two blackish spots near the anterior margin. Mesonotum gently expanded posteriorly after second-half, 3 x length of pronotum, median carina distinct; also with distinct lateral carinae and a row of small granules on the carinae. Metanotum broader than mesonotum, shorter than median segment.

Abdomen: Cylindrical, tapering posteriorly. Covered with short setae. Eighth tergum roughly as long as the combined length of ninth tergum and anal segment. Anal segment as long as ninth tergum, posterior margin rounded. Supra-anal plate triangular, with distinct median carina. Subgenital plate scoop-shaped, reaching the end of ninth tergum, posterior apex with deep indentation, lateral angles pointed. Cerci cylindrical, long and straight, surpassing the end of the anal segment.

Legs: Slender and long. Sparsely covered with long setae. All femora and tibiae unarmed. Medio-ventral carina of mesofemora and metafemora distinctly elevated.

Wings: Tegmina oval, longer than metanotum, brown as body, veins light brown. Alae long, reaching seventh tergum, costal region brown, anal region pale white with brown spots, blackish near base.

Male (Figs. 4-6). Similar to female, but more slender. Large size. With a dark brown longitudinal stripe running from the anterior margin of head to posterior margin of pronotum.

Head: Oblong, parallel-sided, 1.5 x longer than wide. Occiput flat, with a row of minute granules along lateral furrows. Genae with two thin postocular pale stripes, with a buff stripe between the two pale stripes, running from the posterior margin of eyes to back of head. Antennae long, reaching the end of abdomen.

Thorax: Pronotum rectangular, parallel-sided. Mesothorax broadly emarginated laterally. Mesonotum 4 x length of pronotum, densely granulated, lateral margins with two black spots medially; median and lateral carinae distinct. Metanotum longer than median segment.

Abdomen: Very slender and smooth. Parallel-sided from second to sixth tergites, seventh tergum expanded posteriorly. Lateral carina distinct on seventh to ninth tergites. Eighth tergum longer than ninth tergum. Anal segment as long as ninth tergum, with small notch posteriorly. Supra-anal plate distinct and small. Poculum cup-shaped, posterior margin pointed, reaching the end of ninth tergum. Cerci long and cylindrical, apices pointed.

Legs: Very slender and long. Brown as body, with blackish markings. All femora and tibiae unarmed. Medio-ventral carina of mesofemora and metafemora distinctly elevated.

Wings: Tegmina oval, brown, slightly as long as the combined length of head and pronotum, veins dark brown. Alae long, reaching sixth tergum, costal region brown, with blackish markings, anal region pale white with grayish brown spots, blackish near base.

#### **Measurements of both sexes (mm.)**

♀, body length 99, antennae 60, head 6, pronotum 5.5, mesonotum 16, metanotum 6, median segment 5, profemora 30.5, mesofemora 21.5, metafemora 31, protibiae 34.5, mesotibiae 22.5, metatibiae 34; tegmina 9.5, alae 50; ♂♂, body length 83-91, antennae 84-86, head 4.5, pronotum 4, mesonotum 13.5-14.5, metanotum 5.5, median segment 4.5, profemora 28-32, mesofemora 19-21, metafemora 29-32, protibiae 31-33.5, mesotibiae 20-22, metatibiae 32-35, tegmina 8-9, alae 46.

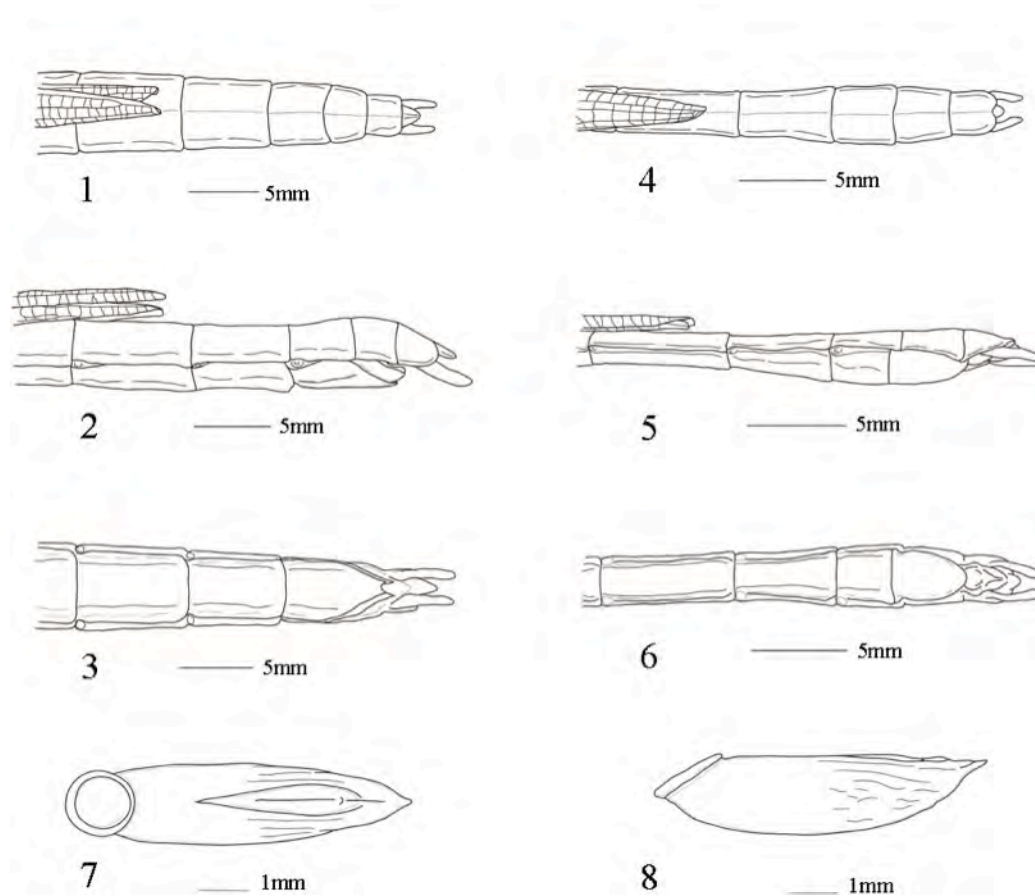
Eggs (Figs. 7-8): Capsule dull green and bullet-shaped, narrowing towards posterior end; covered with curved wrinkles and long keels; posterior part extended as tongue with a ridge on dorsal surface, apex acute. Operculum flat without capitulum, same color as the capsule; surface with short and indistinct wrinkles. Opercular collar gray, expanded outward, posterior width 2 x wider than anterior width, margin with small indentations. Micropylar plate oblong, anterior apex pointed while posterior apex rounded. Median line black.

#### **Measurements of egg (mm)**

Length 7.2, width 1.4, height 1.3.

#### **Distribution**

Hainan (Jianfengling and Bawangling) Province, China. Type-locality from Vietnam and Java.



**Figure 1-8.** *Necroschia perplexus* (Redtenbacher, 1908) comb. nov.:

1. Female, apex of abdomen, dorsal view
2. Female, apex of abdomen, lateral view
3. Female, apex of abdomen, ventral view
4. Male, apex of abdomen, dorsal view
5. Male, apex of abdomen, lateral view
6. Male, apex of abdomen, ventral view
7. Egg, dorsal view;
8. Egg, lateral view

### Remarks

The distribution of this species is restricted to Hainan in China. Although there is currently no record of this species from continental China, it could occur in the southwestern part of the region, for example, Guangxi and Yunnan.

### Acknowledgments

I wish to thank Dr Chan Pui Lok, Mr Lo Yik Fui, Mr Wan Pak Ho and Miss Carrie Wong (Kadoorie Conservation China, Kadoorie Farm and Botanic Garden) for their kind assistance. I am grateful to the staff of Bawangling National Nature Reserve, Exianling Limestone Forest and Jianfengling National Nature Reserve, Hainan for their field assistance. I must also acknowledge the authority of the Wildlife Conservation Division of Hainan Forestry Department, China for permission to collect insects in the nature reserves; and Kadoorie Farm and Botanic Garden for financial and logistic support for travelling in Hainan Island.

## References

- Brock, P.D.** *Phasmida Species File Online*. Version 2.1/4.0. Available from <http://Phasmida.SpeciesFile.org> (accessed 2 December 2012).
- Brock, P.D. (1998)** Catalogue of type specimens of stick & leaf-insects in Naturhistorisches Museum Wien (Insecta: Phasmida). *Kataloge der wissenschaftlichen Sammlungen des Naturhistorischen Museums in Wien*, **13(5)**: 1-75.
- Chen, S.C. & He, Y.H. (2008)** *Phasmatodea of China*. China Forestry Publishing House, Beijing. 476 pp, 12 pl.
- Chen S.C. & Zhang P.Y. (2008)** Five new species of stick insects from Yunnan Province and description of male *Cnipsomorpha colorantis* (Chen & He) (Phasmatodea: Heteronemiidae, Phasmatidea). *Entomotaxonomia*, **30**: 245-254.
- Hennemann, F.H., Conle, O.V. & Zhang, W.W. (2008)** Catalogue of the Stick and Leaf-insects (Phasmatodea) of China, with a faunistic analysis, review of recent ecological and biological studies and bibliography (Insecta: Orthoptera: Phasmatodea). *Zootaxa*, **1735**: 1-76.
- Ho, G.W.C. (2010)** Taxonomic note on *Necroschia shukayi* (Bi, Zhang & Lau 2001) comb. nov. (Phasmida: Necroschiinae: Necroschiini) and first description of its egg. *Journal of Orthoptera Research*, **19**: 1-5.
- Otte, D. & Brock, P.D. (2005)** *Phasmida Species File. Catalog of stick and leaf insects of the world*. The Insect Diversity Association and the Academy of Natural Sciences, Philadelphia. 414 pp.
- Redtenbacher, J. (1908)** *Die Insektenfamilie der Phasmiden. III. Phasmidae Anareolatae (Phibalosomini, Acrophyllini, Necroschiini)*. Wilhelm Engelmann, Leipzig. 250 pp.

# Type specimens of phasmids in the National Zoological Survey of India collection (NZSI), Kolkata, India (Insecta: Phasmida).

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## **Abstract**

34 specimens of Wood-Mason's thirteen species (of 23 species) and 22 specimens of Günther's nine species present in the NZSI, Kolkata (Calcutta) are listed.

## **Introduction**

In 1808 the Asiatic Society of Bengal formed the first museum in India. In 1866 the British government turned the Asiatic Society Museum into the Imperial Museum by an Act of Parliament and soon after it was renamed the Indian Museum, and moved to a new building in 1875. The Zoological Survey of India (ZSI) was established in 1916 and took over responsibility for the Zoological collections of the Indian Museum.

The Headquarters of the ZSI is situated at New Alipore, Kolkata (Calcutta). This building houses the Central Entomological Laboratory (CEL), the section that maintains the type material of insect specimens in ZSI.

It is important to note that the specimens of this institute have been moved several times. This includes the evacuation of type specimens in December 1941, and the rest of the collections in 1942, because of the Second World War. Some of the type materials, at least in case of Mantodea, were later detected in the general collection, as has also happened with the Phasmida preserved here. There are nearly one thousand specimens of phasmids preserved in C.E.L., Wet and Dry General Collections from several parts of the globe. While many specimens have the original handwriting of Wood-Mason and Günther, many labels were later added by curators when the older were becoming brittle or illegible through fading. The later labels look new.

The collection includes type material of phasmids described by two authors: James Wood-Mason (1846-1893) who worked at the Indian Museum from 1877 until his death in 1893 (Bragg, 2008), and Klaus Günther (1907-1975) who worked in Dresden on material loaned to him by ZSI in the late 1930s.



Otte & Brock (2005) state that material of Günther and Wood-Mason that should be in Calcutta has been lost [based on a note from the museum's curator stating that all material has been lost (Brock, pers. comm., 2012)]. However, this is not the case: types of 13 of Wood-Mason's species and 22 specimens of Günther's nine species are present in the Calcutta collection. Six type specimens, of three species, that Günther listed as in Calcutta, are actually in Dresden Museum (Zompro, 2003), having been retained by Günther.

### Abbreviations

HT = Holotype, ST = Syntype [= cotype]. Museums are referred to by the standard museum codens of Arnett et al. (1993):

BMNH – Natural History Museum, London, U.K.

NZSI – National Zoological Collection, Zoological Survey of India, [preserved at Central Entomological Laboratory (C.E.L.), Kolkata (Calcutta), India.]

SMTD - Staatliches Museum für Tier-kunde, Dresden, Germany.

ZMPA – Museum of the Institute of Zoology, Polish Academy of Science, Warsaw, Poland.

Some type material was traced in the wet or dry collections in the Orthoptera Section, as mentioned below, and will be transferred to C.E.L. type collection. Type specimens already at C.E.L. bear a Registration No. starting with NZSI. However, this is not the case for those discovered in the general (dry or wet) collection of Orthoptera Section of Z.S.I., Kolkata.

The data below is a combination of data on the specimens and the published data. The data on the specimen labels is often limited, but was expanded when the data was published; this is particularly true for specimens described by Wood-Mason. For example, in the case of the *Bacillus (Baculum) insignis* the data label on one female reads only “Naga Hills, Butler” but Wood-Mason expanded this in his description saying “Samagooting, Naga hills, Assam (Captain Butler)”. Where there is a significant difference we have commented on the discrepancies.

The current combination is given after the remarks for each species, as listed in the on-line Phasmida Species File: <http://Phasmida.SpeciesFile.org>. Photographs of all type material can be accessed on this website.

### Phasmids of Wood-Mason

Wood-Mason described a total of 24 species of phasmids. The type specimens of 23 of these should be in Calcutta. The type specimens of the other species, *Cotylosoma dipneusticum* Wood-Mason, 1878, are in BMNH.

#### Species of Wood-Mason present at NZSI: listed in page sequence for each year

##### 1873

1. *Bacillus fuscolineatus* Wood-Mason, 1873a: 46, pl. 5.7, 5.7a-b (♂). HT ♂. Murree, Punjab, India; Dr. W. Waagen.

**Remarks:** In General Collection, bottle No. P/11 contains this specimen with Regd. No. 448/1, ♂. This is labelled as *Bacillus fuscolineatus*. Other labels lost. Upon scrutiny, the specimen agrees perfectly with description. However original colour pattern and line (brown streak

alongside eye) are lost due to preservation. The measurements show slight reduction due to preservation. Present measurements (mm.) are: total length 47.5; head 2.75, antennae 7, prothorax 2.2, mesothorax 9. In foreleg, femur 18, tibia 20, tarsi 7.5; in middle leg, femur 12, tibia 11, tarsi 4; in hind leg femur 17, tibia 18, tarsi 7; abdomen 25.5.

*Ramulus fuscolineatus* (Wood-Mason, 1873)

**2. *Bacillus hispidulus*** Wood-Mason, 1873a: 47, pl. 7.2, 7.2a-c (♂) & 7.3(♀). Syntypes: 2♂♂ (NZSI 8/24 [in alcohol]), ♂ & ♀ in cop. (NZSI 443/1 [in alcohol]) South Andaman; Wood-Mason. ST ♂ (NZSI 441/1 [in alcohol]) Arakan Coast; Dr. Stoliezka [spelling mistake on label, should be *Stoliczka*]. (2♀♀ missing)

Remarks: The C.E.L. collection contains a total of five specimens in alcohol: Wood-Mason refers to seven specimens, 3♂♂, 3♀♀ and the ♂ specimen from Dr. Stoliezka. The labels do not appear to be Wood-Mason's – they were clearly added when the types were numbered.

*Sceptrophasma hispidulum* (Wood-Mason, 1873)

**3. *Bacillus oxytenes*** Wood-Mason, 1873a: 48, pl. 5.3 & 5.3a (♀). HT ♀, Pegu Yomah, Birma; S. Kurz.

Remarks: In general wet collection bottle No. P/13 contains 1 female, *Bacillus oxytenes*, Pegu, 440/1 (on lead label; a paper label mentions 440/6 which seems wrong, because in practice, lead labels were used by earlier scientists). No other label present. The specimen agrees perfectly with the description and measurements given by Wood-Mason. Additional measurements are: antennae 13.75, head 5.5, pronotum 4.4, mesonotum 24.75, metanotum 19.25, abdomen 73.7. in fore leg: femur 34, tibia 31, tarsi missing; in middle leg: femur 25, tibia 27, tarsi 7; in hind leg, femur 28.5, tibia 34, tarsi 7.

*Woodmasonia oxytenes* (Wood-Mason, 1873)

**4. *Bacillus scabriusculus*** Wood-Mason, 1873: 55, pl. 7.1 & 7.1a (♀). HT ♀ (NZSI 1223/H5) Naga Hills, Assam; Captain Butler.

Remarks: The dry specimen is present at C.E.L.

*Medaura scabriuscula* (Wood-Mason, 1873)

**5. *Bacillus westwoodii*** Wood-Mason, 1873a: 50, pl. 6.3, 6.3a-b (♀). Syntypes: 9♀♀, 3♀♀ nymphs. Near Port Blair, South Andaman. viii-x.1872. [in lit., one nymph from Camorta, Nicobar Islands, collected by Mr Homfray remained untraced]

Remarks: In general wet collection, bottle Nos. P/16, P/17 and P/69 contain this species. P/16: *Bacillus westwoodi*, Regd. No. absent., 9 adult females, 2 immature females. There is an adult female (in bottle No. P/16) which is tied by a thread along with Wood-Mason's handwritten label in pencil: *Bacillus westwoodi*, Andamans, female. The measurements agree perfectly with this particular female. Additional measurements for this specimen are: metanotum

18; in fore leg: femur 36, tibia 40, tarsi 13.5; in middle leg: femur 22, tibia 21, tarsi 8.5; in hind leg: femur 28, tibia 30, tarsi 10.

P/17: *Bacillus westwoodi*, Regd. No. 447/1, 1 adult female, nic [?] Roefu, legs broken. P/69: *Lonchodes westwoodi*, S. Andamans, JWM, Regd No 191/1, 2 males (75 mm and 45 mm). The collections in these two bottles (P/17 and P/69) do not appear to be part of the type series.

*Ramulus westwoodii* (Wood-Mason, 1873)

**6. *Bacillus (Baculum) insignis*** Wood-Mason, 1873a: 51, pl. 5.1, 5.1a-b (♀) & 5.2 (♀). Syntypes: ♀ (NZSI 1221/H5), Samagooting, Naga Hills, Assam, India; Captain Butler. ♀, Sikkim; Mr. Mendelli. ♀, Cherra Punji, Khasi Hills; Other ♀♀ [total number of specimens not known] “valleys around Cherra Punji, Khasi hills; Lieutenant Bourne.

Remarks: Besides the ♀ at C.E.L. (NZSI 1221/H5), there is a male at C.E.L. labelled as a type (NZSI 1222/H5, Valleys around Cherrapunji, Khasi Hills, Lieut. Bowen); however, Wood-Mason did not originally describe the male, so it is not a type specimen. The male was described later in the same year (Wood-Mason, 1873b: 149) and the data given was “Samagooting, Naga Hills, with the female, collected by Captain Butler”. Wet general collection (bottle No. P/47) contains 8 females of this species from Khasi Hills, Assam, Maj. Godwin-Austen. This conforms to locality and sex of the female syntypes. However, collector’s name differs

*Cuniculina insignis* (Wood-Mason, 1873)

**7. *Bacillus (Baculum) penthesilea*** Wood-Mason, 1873a: 52, pl. 5.5 & 5.5a (♀). HT ♀ (NZSI 445/1 [in alcohol], Baxa, Bhután Doár; Dr. Cameron.

Remarks: Besides the type at C.E.L. (NZSI 445/1), wet collection bottle No. P/53, Regd. No. 177/1, Bhutan, Dooars, Dr. Cameron, contains an undescribed male labelled as this species.

*Ramulus penthesilea* (Wood-Mason, 1873)

## 1875

**8. *Phibalosoma westwoodii*** Wood-Mason, 1875: 216-217, pl. 16-17. Syntypes: ♀, Nazeerah; Foster. ♀ Samaguting, Assam; J. Butler.

Remarks: One of the female syntypes was discovered in the general wet collection. The alcohol bottle No. P/96 contains one female with Regd. No. 628/1 and this is labelled as *Phibalosoma westwoodi* W.M., ♀, Nazeerah, Assam, Dr. Foster. It agrees perfectly with description and measurements. Its additional measurements are: foreleg: femur 47.5, tibia 51, tarsi 18; midleg: femur 38, tibia 36, tarsi 17; hindleg: femur 50, tibia 49, tarsi 20. Alcohol bottle No. P/97 contains one male of *Phibalosoma westwoodi*, Regd. No. 629/1, Samaguting, Naga Hills, Assam, Capt. Butler. Its total length is approximately 193 mm. This is not a type because Wood-Mason described female only. The other female syntype is misplaced or lost.

*Tirachoidea westwoodii* (Wood-Mason, 1875)

1877

9. *Necroscia menaka* Wood-Mason, 1877c: 130. HT ♀ (NZSI 1224/H5) Southern slopes of Khasi Hills.

Remark: The above dry preserved female types is present at C.E.L. and the collector's name given is Capt. Butler. It also bears Gunther's handwritten label "Typus".

*Scionecra menaka* (Wood-Mason, 1877)

10. *Phibalosoma annamallayanum* Wood-Mason, 1877d: 161. ST ♀ (NZSI 627/1 [in alcohol]) Annamallay forests, Southern India; Colonel R.C. Beddome. ST ♀, Travancore Hills; Mr. F. Day.

Remarks: The specimen at C.E.L. (NZSI 627/1) in alcohol is labelled "*Phibalosoma affinis*, n.sp. Wood Mason, Anamallay Forest, Beddome". The NZSI list of types shows this specimen as *Phibalosoma beddomei*. *Phibalosoma affinis* and *P. beddomei* are both unpublished names. This specimen has the correct data (locality & collector) for it to be *Phibalosoma annamallayanum*; Wood-Mason also said the specimen was in alcohol (as this is); Wood-Mason's measurements fully agree with this specimen. We have no doubt that this specimen is the type described by Wood-Mason. He may have intended to call the species *affinis* because in his description he mentions that it is "very closely allied to the preceding" (*P. acanthopus* (Burmeister)); a second specimen, from a different collector, could also explain why he rejected *beddomei* as the name.

Wood-Mason referred to "a second specimen...a much mutilated dried example, presented to me by Mr. F. Day", present in dry general collection's Cabinet No. 13, drawer No. 19 having following data: Regd No. absent, *Phibalosoma annamallayanum* W.-Mas. Female det. W.-Mas., Travancore Hills, Mr. F. Day. Antennae, right midleg and tarsi of hindlegs missing. Hence, there is no doubt regarding its syntypic status.

*Phobaeticus annamallayanus* (Wood-Mason, 1877)

11. *Bacteria sinkiebensis* Wood-Mason, 1877e: 343. Syntypes ♂♀ [in cop.]; Sinkieb (Sinkep) Island, near Linga Island, off N.E. Sumatra; native collector.

Remarks: In general collection, dry cabinet No. 13/1 contains one male and one female of this species and they are without any 'type' label. Female, Regd. No. 1157/H5, labeled as *Acacus sinkiebensis* W.M. 1878, det. K. Gunther, Sinkip Is. Its forelegs and right midleg missing. The male specimen is labelled as *Bacteria sarawaca* Westw. var. Male, Regd. No. absent, Sinkip Is. Its right antenna, forelegs and left midleg are missing. The male and female examples match exactly with descriptions and measurements given by Wood-Mason. Other measurements are: ♂: Fore legs missing. Middle leg: femur 17.0, tibia 17.0. Hind leg: femur 23.0, tibia 25.0, tarsi 7.5. ♀: Fore legs missing. Middle leg: femur 19.0, tibia 19.0, tarsi 6.0. Hind leg: femur 27.0, tibia 28.0, tarsi 8.0. It appears that Wood-Mason. initially identified the male as a variety of *Bacteria sarawaca* Westwood which he later described as new species.

*Acacus sarawacus* (Westwood, 1859)

= *Bacteria sinkiebensis* Wood-Mason, 1877

1879

12. *Parectatosoma echinus* Wood-Mason, 1879: 118. Syntypes: ♂, 2♀♀, Fianaràntsoa, Madagascar.

Remarks: The wet general collection contains two specimens of this species. Bottle No. P/91, contains one female having data as: Regd. No. 672/1, 1♀, *Parectatosoma echinus* W.M. Madagascar, purchased [broken in 3 pieces; agrees with description and measurements]. Bottle No. P/92 contains one female, Regd. No. 672/1, 1♀, *Parectatosoma echinus* W.M. Madagascar, purchased. This is wrongly labelled as male and matches exactly with the description. Its colour totally gone, now dirty white, abdomen mid-ventrally incised probably for preservation, fore legs broken. However, the male type is misplaced or lost.

*Parectatosoma echinus* Wood-Mason, 1879

13. *Parectatosoma hystrix* Wood-Mason, 1879: 117. Syntypes: 3♂♂, 3♀♀, Fianaràntsoa, Madagascar. ♀ Antanànarivo, Madagascar.

Remarks: In the dry general collection, cabinet No. 14, drawer No. 4 contains four examples of this species:

1. *Parectasoma hystrix*, Regd. No. Nil, Female, Madagascar, condition perfect.
2. *Parectasoma hystrix*, Regd. No. Nil, Female, right antenna missing.
3. *Parectasoma hystrix*, Regd. No. Nil, Female, right antenna missing.
4. *Parectasoma hystrix*, Regd. No. Nil, male, Forelegs, right midleg and right hind leg missing.

The male and female examples agree perfectly with description and measurements. The other 2 males of this species remained untraced, may be misplaced or lost.

*Parectatosoma hystrix* Wood-Mason, 1879

### Species of Wood-Mason not present at NZSI

No type material has been traced for the following species and is presumed lost. At best specimens could be somewhere else in the collections, undetected.

1. *Bacillus laevigatus* Wood-Mason, 1873a: 49, pl. 5.4, 5.4a-c (♀ nymph). HT ♀ nymph (NZSI 164/1 [in alcohol]). Samagooting, Naga Hills, Assam, India; Captain Butler.

Remarks: The spirit specimen at C.E.L. bearing Regd No. 164/1 is a member of genus *Phyllium*.

*Ramulus laevigatus* (Wood-Mason, 1873)

2. *Bacillus (Baculum) furcillatus* Wood-Mason, 1873a: 54, pl. 5.6 & 5.6a (♀). HT ♀. Baxa, Bhután Doár; Dr. Cameron. [number of specimens not stated by Wood-Mason, but presumed holotype].

*Cuniculina stilpna* (Westwood, 1859)  
= *Bacillus (Baculum) furcillatus* Wood-Mason, 1873.

3. *Lonchodes austeni* Wood-Mason, 1875: 216. HT ♂, Dikrang valley, Assam, India; Major H.H. Godwin-Austen. [The holotype was later illustrated by Wood-Mason, 1977e, pl. 3.4, 3.4a-b (♂)].

*Medaura austeni* (Wood-Mason, 1875)

4. *Phyllium westwoodii* Wood-Mason, 1875: 218, pl. 17 (♀). Syntypes: ♀, South Andaman; Captain Protheroe. ♂, Pahpoon, 150miles North of Moulmein, Salween, Burmah.

Remarks: At C.E.L., the ♀ specimen of *Phyllium* in NZSI is labelled “*Phyllium westwoodii* W.M. Type female, S.Andaman, Coll. J.W.M.” and is catalogued as type number 167/1. This is clearly not a type of Wood-Mason’s species. The data is wrong, the specimen is completely the wrong size (85mm, not 101mm), and, based on Wood-Mason’s illustration, it is not even the correct species. The spelling on the data label is also wrong. The syntypes are misplaced or lost.

*Phyllium (Phyllium) westwoodii* Wood-Mason, 1875.

5. *Lonchodes verrucifer* Wood-Mason, 1876b: 47, pl.11.1-4 (♂) 11.5-6 (♀). Syntypes: 2♂♂, 1♀, South Andaman; native collector, 1872. ♀ nymph, South Andaman; E.H. Man, 1872.

*Lonchodes verrucifer* Wood-Mason, 1876.

6. *Lonchodes valgus* Wood-Mason, 1877a: 487. HT ♀, Perak, Malay peninsula; Mr. G.E. Dobson.

*Ramulus nematodes* (Haan, 1842)  
= *Lonchodes valgus* Wood-Mason, 1877.

7. *Bacteria frenchi* Wood-Mason, 1877b: 74. HT ♀, [in alcohol] North Australia; Charles French.

*Hyrtaeus tuberculatus* Stål, 1875  
= *Bacteria frenchi* Wood-Mason, 1877

8. *Phibalosoma novae-britanniae* Wood-Mason, 1877b: 75. HT ♀, [in alcohol] New Britain; Charles French.

*Hermarchus novaebritanniae* (Wood-Mason, 1877)

9. *Phyllium novae-britanniae* Wood-Mason, 1877b: 75. HT ♀, [in alcohol] New Britain; Charles French.

*Chitoniscus feejeeanus* (Westwood, 1864)

= *Phyllium novaebritanniae* Wood-Mason, 1877

10. *Lonchodes godama* Wood-Mason, 1877d: 46: 162. Syntypes: ♀♀ & ♂♂ [number not specified] 2000-6000ft, Ahsown, Taoo Range, Upper Tenasserim.

*Lonchodes godama* Wood-Mason, 1877.

### Phasmids of Günther (1938)

Günther's paper on phasmids in the Calcutta museum (Günther, 1938) was the only one of his phasmid papers in which he did not illustrate any of his new species (Bragg & Zompro, 2007). Nine new species were described in this paper. All the specimens still exist in NZSI, SMTD, or ZMPA. Günther only listed material as being in NZSI, and two specimens in Stettin (now ZMPA). However, Günther was working at Dresden Museum (SMTD) and retained some duplicates for the museum, these were listed in a catalogue of phasmid types by Zompro (2003), and all have an "Indian Museum" label.

In addition to the nine new species described in his paper of 1938, Günther also recorded nine other species in the NZSI collection. Of particular interest is his female specimen of *Acacus sarawacus* (Westwood, 1859). because Günther used this specimen as the basis for synonymising *Bacillus sinkiebensis* Wood-Mason, 1877. See above facts regarding *Bacteria sinkiebensis*.

Unfortunately, the locality data for the specimens described by Günther is unreliable. Günther accurately recorded the data and recognised that some of the data was incorrect. Two species clearly stand out in this respect. The holotype of *Korrinis errans* Günther, 1938 is labelled "Sibsagar, North-East Assam; S.E. Peel.", Günther said it was probably from Borneo, this has since been confirmed (Bragg, 1995: 50). Most of the syntypes of *Orthonecroschia errans* are labelled Humboldt Bay, California – this is clearly wrong as they belong to a subfamily that does not occur in the New World; the others are labelled Borneo and the genus *Orthonecroschia* Kirby, 1904 is predominantly a Bornean genus (18 of 25 known species); Günther also recorded two specimens from Java which are now in Warsaw Museum. Labels given by Günther were handwritten on white paper. Sometimes in addition to white labels he used red paper.

1. *Sipyloidea ? acanthonotus* Günther, 1938: 138. HT ♀ (NZSI 619/H5) Sula Islands, W.B. Pryer.

2. *Asceles annandalei* Günther, 1938: 136. HT ♀ (NZSI 617/H5) Travancore, Western Ghats (West side), Tenmalai; 22.xi.1908, Annandale.

3. *Korinnis errans* Günther, 1938: 125. HT ♀ (NZSI 608/H5) "Sibsagar, North-East Assam; S.E. Peel. Günther states that the locality is an error and the species is probably from Borneo.

4. *Orthonecroschia errans* Günther, 1938: 140. 8 ST: ♂ (NZSI 626/H5), ♀ (NZSI 965/H5) Borneo; 5♂♂ (NZSI 623/H5, 624/H5, 625/H5, 627/H5, 964/H5), 1♀ (NZSI 622/H5) Humboldt Bay, California.

[Five syntypes in other museums: ♂, ♀ (ZMPA) Java. ♂, ♀ (SMTD) Borneo. ♂ (SMTD) Humboldt Bay, California.]

5. *Asceles glaber* Günther, 1938: 135. ST 2♂♂ (NZSI 612/H5, 614/H5) Lower Burma, Tavoy; H.S. Rao. ST 2♀♀ (NZSI 613/H5, 620/H5) Lower Burma, Tavoy; H.S. Rao. ST ♀ (NZSI 615/H5) Malay Peninsula, Perak; H.S. Rao. ST ♂ (NZSI 616/H5) New Guinea, Andai; H.S. Rao.

[Two syntypes in another museum: ST ♂ (SMTD) Lower Burma, Tavoy. ST ♀ (SMTD) Malay Peninsula, Perak (Brock 1999: 187, misidentified specimen of *Marmessoidea annulata* (Fabricius, 1798))]

6. *Ignacia lobatipes* Günther, 1938: 124. HT ♀ (NZSI 607/H5) Ecuador.

7. *Sipyloidea ? nitida* Günther, 1938: 137. HT ♀ (NZSI 618/H5) Assam, Cachar; J. Wood-Mason.

8. *Sosibia ocellata* Günther, 1938: 139. HT ♀ (NZSI 621/H5) Sinkep Island (to the east of Sumatra).

9. *Menexenus tenmalainus* Günther, 1938: 127. ST ♂ (NZSI 610/H5) Courtallum, S. India, H.S. Rao, 28.x.24; ST ♀ (NZSI 611/H5) Tenmalai, Courtallam, South India, 16.xi.21, H.S.Rao. 1♂, South India, Courtallam, Tenmalai, 16.xi.1921.

[One syntype in another museum: ST ♀ (SMTD) South India, Tenmalai, Courtallam; H.S. Rao 28.x.1926.]

The dates on the NZSI ♂ and ♀ do not agree with the published data (both should be 28.x.1926). However, the ♀ has the date that should be on the missing male. There are examples of Günther recording incorrect data for his types in other publications (Bragg, 2001: 710). Both specimens have determination labels that are undoubtedly in Günther's handwriting, so there is no doubt that these are his types.

### Acknowledgements

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### References

- Arnett, R.H., Samuelson, G.A. & Nishida, G.M. (1993) *The insect and spider collections of the world*. [second edition] Sandhill Crane Press, Gainesville, Florida.
- Bragg, P.E. (1995) A review of the subfamily Korinninae (Phasmida: Pseudophasmatidae), with the description of a new species. *Tijdschrift voor Entomologie*, **138**(1): 45-50.
- Bragg, P.E. (2001) *Phasmids of Borneo*. Natural History Publications (Borneo), Kota Kinabalu, Sabah.
- Bragg P.E. & Zompro, O. (2007) Biographies of Phasmatologists – 6. Klaus Günther. *Phasmid Studies*, **16**(2): 25-33.
- Bragg P.E. (2008) Biographies of Phasmatologists – 7. James Wood-Mason. *Phasmid Studies*, **17**(1): 1-7.
- Brock, P.D. (1999) *Stick and leaf insects of Peninsular Malaysia and Singapore*. Malaysian Nature Society, Kuala Lumpur.
- Brock, P.D. *Phasmida Species File Online*. <http://phasmida.speciesfile.org> Version 2.1/4.1. [retrieval date April 2012].
- Günther, K. (1938) Neue und wenig bekannte Phasmoiden aus dem Indian Museum Calcutta. *Records of the Indian Museum*, **40**: 123-141.



- Otte, D. & Brock, P. (2005)** *Phasmida Species File, Catalog of Stick and Leaf Insects of the World*. Insect Diversity Association, Philadelphia.
- Wood-Mason, J. (1873a)** On new or little known species of Phasmidae. Part 1. - Genus *Bacillus*. *Journal of the Asiatic Society of Bengal*, **42**(2): 45-56. pl. 5-7.
- Wood-Mason, J. (1873b)** Note on certain species of Phasmidae hitherto referred to the genus *Bacillus*. *Annals and Magazine of Natural History*, (4)**12**: 347-348.
- Wood-Mason, J. (1873c)** Note on certain species of Phasmidae hitherto referred to the Genus *Bacillus*. *Proceedings of the Asiatic Society of Bengal*, [July 1873] p. 148-150.
- Wood-Mason, J. (1875)** On new or little-known species of Phasmidae, with a brief preliminary notice of the occurrence of a clasping apparatus in the males throughout the family. *Journal of the Asiatic Society of Bengal*, **44**(3): 215-220, pl. 16 & 17.
- Wood-Mason, J. (1876a)** Description of a new Phasmideous insect from the Andamans. *Proceedings of the Asiatic Society of Bengal*, [May 1876] p. 95.
- Wood-Mason, J. (1876b)** Description of a new species of Phasmidae. *Journal of the Asiatic Society of Bengal*, **45**(1): 47-49, pl. 11.
- Wood-Mason, J. (1877a)** Description of a new species of Phasmidae from the Malay peninsula. *Annals and Magazine of Natural History*, (4)**19**: 487-488.
- Wood-Mason, J. (1877b)** On a small collection of Orthopterous insects of the families Phasmidae & Mantidae from Australia & New Britain, with descriptions of four new species. *Annals and Magazine of Natural History*, (4)**20**: 74-77.
- Wood-Mason, J. (1877c)** Description of a new species of Phasmidae from India. *Annals and Magazine of Natural History*, (4)**20**: 130-131.
- Wood-Mason, J. (1877d)** New and little known insects collected in Upper Tenasserim. Orthoptera, Phasmidae. Orthoptera. Fam. Phasmidae. *Proceedings of the Asiatic Society of Bengal*, [July 1877] pp. 160-163.
- Wood-Mason, J. (1877e)** Notes on Phasmidae. *Journal of the Asiatic Society of Bengal*, **46**(4): 342-352, pl. 2-3.
- Wood-Mason, J. (1877f)** [Untitled note on the discovery of stridulating organs in a species of *Pterinoxylus*]. *Transactions of the Entomological Society of London*, 1877, p. xxviii-xxix.
- Wood-Mason, J. (1878)** Preliminary notice of a species of Phasmidae apparently possessing all the structural arrangements needed both for aerial and aquatic respiration. *Annals and Magazine of Natural History*, (5)**1**: 101-102.
- Wood-Mason, J. (1879)** Preliminary notice of a new genus (*Parectatosoma*) of Phasmidae from Madagascar, with brief descriptions of its two species. *Journal of the Asiatic Society of Bengal*, **48**(2): 117-118.
- Zompro, O. (2003)** Catalogue of type-material of the insect order Phasmatodea deposited in the Museum für Tierkunde, Dresden, Germany. *Phasmid Studies*, **11**(2): 31-44.

# Description of female and egg of *Sinophasma hainanensis* Liu, 1987 (Phasmatodea: Diapheromeridae: Necrosciinae)

---

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Abstract.....	Error! Bookmark not defined.
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## Abstract

Female and egg of *Sinophasma hainanensis*, Liu, 1987 are described for the first time.

## Key words

*Sinophasma*, Hainan Province, China.

## Introduction

Günther erected the genus *Sinophasma* in 1940 (Günther, 1940). Twenty-five species are recognized in this genus distributed over China including Taiwan and Vietnam (Otte & Brock, 2005; Hennemann, Conle & Zhang, 2008; Chen & He, 2008; Ho, 2012). Whilst collecting phasmids in Hainan Province, China, the undescribed female *Sinophasma hainanensis*, Liu, 1987 was found. This paper described the female and its eggs for the first time.

## Abbreviations for depositories

BFU: Beijing Forestry University, Beijing, China.

CAU: China Agricultural University, Beijing, China.

TMNH: Tianjin Museum of Natural History, Tianjin, China.

GH: Private collection of George, W.C. Ho, Hong Kong, China.

## *Sinophasma* Günther, 1940

**Type-species:** *Sinophasma klapperichi*, Günther, 1940: 240, by original designation.

*Sinophasma hainanensis* Liu, 1987

*Sinophasma hainanensis*, Liu, 1987: 1, figs. 1-2.

Hua, 2000: 31.

Otte & Brock, 2005: 315.

Hennemann, Conle & Zhang, 2008: 36.

Chen & He, 2008: 140, figs. 107 a-b.

## Type-material

Holotype: ♂ (TMNH) Tianchi, Jianfengling, Hainan Province, China, 10.V.1964, Liu Shengli.

Paratypes: 8♂♂ (TMNH) Jianfengling, Hainan Province, China, 8.V.1964, Liu Shengli.

= *Sinophasma conicum* Chen & He, 1995: 328 [Holotype: ♂ (BFU) Jianfengling, Hainan Province, China, 14.XII.1974, Li Fasheng. Paratype: ♂ (CAU) Jianfengling, Hainan Province, China, 14.XII.1974, Li Fasheng.] synonymised by Chen & He, 2008: 140.

Otte & Brock, 2005: 315.

Hennemann, Conle & Zhang, 2008: 36.

### Other specimens examined

♂ (GH) Jianfengling National Nature Reserve, Ledong Country, Hainan Province, China, 6.VI.2008, Ho, G.W.C. 2♀♀ (GH) Yinggeling Nature Reserve, Baisha Country, Hainan Province, China, 19-20.VI.2011, Ho, G.W.C. ♂♀ (GH) Wuzhishan National Nature Reserve, Wuzhishan Country, Hainan Province, China, 9.VII.2011, Ho, G.W.C. ♂ (GH) Jianfengling National Nature Reserve, Ledong Country, Hainan Province, China, 12.VII.2011, Ho, G.W.C.

### Description

Female (Figs. 1-3): Medium-sized *Sinophasma*. General colour of body green and slender. Granulated, but smooth on head and abdomen. Covered with minute bristles throughout the body.

Head: Brownish green, with six blackish and faint longitudinal bands segregated by five yellowish stripes, running from the base of antennae to back of head. Rounded, vertex slightly convex, with a small oval depression between the bases of antennae. Occiput convex, median furrow indistinct. Eyes dark brown, prominent, longer than the first antennal segment. Ocelli distinct, very small, oval, above the eyes. Antennae brownish green, filiform, reaching the posterior end of alae, segments indistinct; the first segment cylindrical, longer than second segment and longer than third segment; second segment shorter than third segment.

Thorax: Dull green. Densely granulated, less distinct on prothorax. Pronotum rectangular, shorter than head, anterior margin curved inward, transverse sulcus and longitudinal sulcus crossing before middle. Mesonotum slender, 4x length of pronotum, almost parallel-sided but slightly expanded posteriorly after second-half, with distinct median line and dense granulations. Mesopleurum, mesosternum, metapleurum and metasternum dull olive green with grassy green markings, densely granulated.

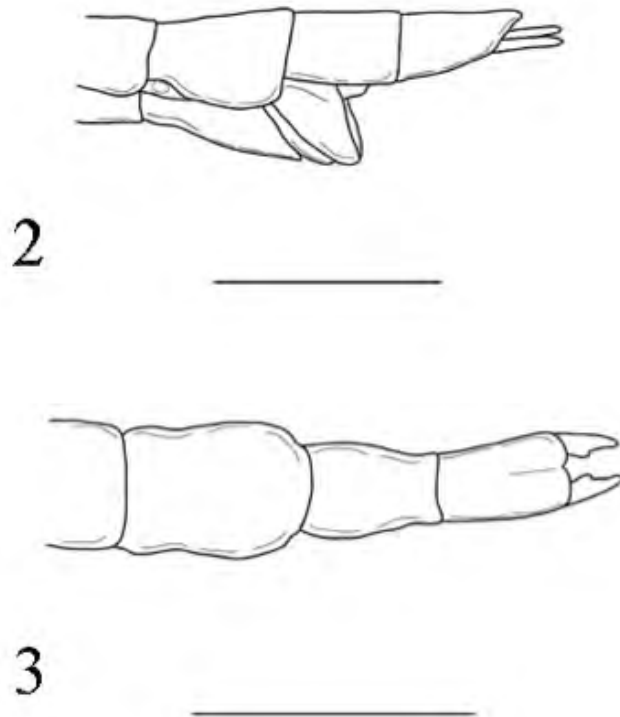
Abdomen: Green and lacking granulations. Cylindrical and slender. Median segment as long as metanotum. Second to sixth tergites parallel-sided, roughly equal in length. Eighth tergum broader than preceding tergites, 2x length of ninth tergum, dilated into a broad rounded lobe postero-laterally, which extended by as much as one-eighth the width of tergum. Anal segment as long as ninth tergum, with small notch at posterior margin. Subgenital plate very short, reaching posterior margin of eighth tergum, with two lateral carinae, posterior margin subtruncate. Gonapophyses exposed, apex pointed, reaching the end of ninth tergum. Cerci long and straight, non-cylindrical, knife-shaped.

Legs: Slender and long. Uniformly green. With sparse bristles. Unarmed. Profemora as long as mesonotum, curved basally. Apices of metafemora reaching middle of fourth tergum.

Wings: Tegmina brownish green, short, slightly as long as pronotum, elevated angle black, with a yellow stripe laterad of the elevated angle. Alae brownish green as tegmina, short, reaching fifth tergum, anal region rose.



**Figure 1.** Habitus of female *Sinophasma hainanensis* Liu, 1987



**Figures 2-3.** Abdominal feature of female *Sinophasma hainanensis* Liu, 1987 [scale = 5mm]  
**2.** End of abdomen, lateral view  
**3.** End of abdomen, dorsal view.

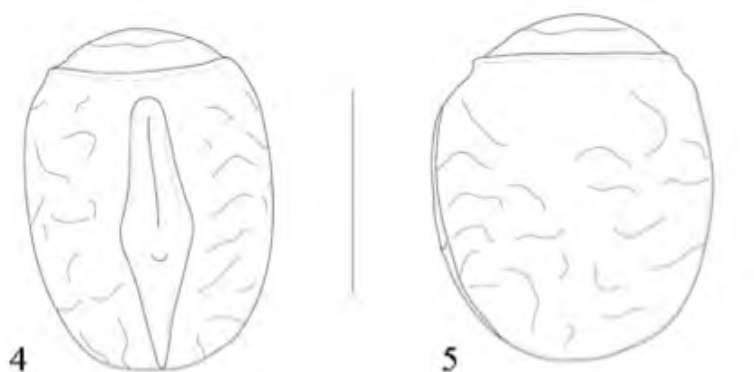
**Measurements of female (mm.)****Table 1.** Measurements of female *Sinophasma hainanensis* Liu, 1987

	Female
Body	63-64
Antennae	35-36
Head	3.5-4
Pronotum	2.5-3
Mesonotum	12
Metanotum	3.5
Median segment	3.5
Profemora	12
Mesofemora	8.5
Metafemora	12.5-13
Protibiae	10
Mesotibiae	7
Metatibiae	11-11.5
Tegmina	3
Alae	22-26.5

Eggs (Figs. 4-5): Capsule bucket-shaped, black, with brown and curved wrinkles. Operculum convex and rounded, black, lacking capitulum, with wrinkles. Micropylar plate long, posterior end pointed which extended to the polar end of the capsule, anterior end rounded reaching collar of the capsule; with distinct keels. Median line indistinct. Micropylar cup placed at the middle of the micropylar plate.

**Measurements of egg (mm.)**

Length 2, width 1.2, height 1.4.

**Figures 4-5.** Egg of female *Sinophasma hainanensis* Liu, 1987 [scale = 1mm]

**4.** Egg, dorsal view

**5.** Egg, lateral view

**Distribution**

Endemic to Hainan Province (Jianfengling, Yinggeling and Wuzhishan), China.

### Remarks

Chen and He (2008: 140) synonymised *S. conicum* Chen & He, 1995 with this species. Detailed description of male was provided by Liu (1987). This species is usually found feeding on *Quercus* species of Fagaceae.

### Acknowledgments

I wish to thank Dr Chan Pui Lok, Mr Lo Yik Fui, Mr Wan Pak Ho and Miss Carrie Wong (Kadoorie Conservation China, Kadoorie Farm and Botanic Garden for their kind support. I also want to thank Dr Hao Shulian (Tianjin Museum of Natural History) and Prof Cai Wanzhi, Prof Yang Ding, Prof Wang Xinli, and Dr Liu Xingyue (China Agricultural University) for their kind assistance and giving access to the corresponding collections. I am also grateful to the staff of Yinggeling Nature Reserve, Jianfengling National Nature Reserve and Wuzhishan National Nature Reserve, Hainan for their field assistance. I must also acknowledge the authority of the Wildlife Conservation Division of Hainan Forestry Department, China for permission to collect insects in the nature reserves; and Kadoorie Farm and Botanic Garden for financial and logistic support for travelling in Hainan Island.

### References

- Chen, S.C. & He, Y.H. (1995)** A new species of *Sinophasma* from Hainan, China (Phasmatodea: Heteronemiidae). *Scientia Silvae Sinicae*, **31(4)**: 328-329.
- Chen, S.C. & He, Y.H. (2008)** *Phasmatodea of China*. Science Press, China, 476 pp, 12 pl.
- Günther, K. (1940)** Neue Stabheuschrecken (Phasmoiden) aus China (Ausbeuten J. Klapperich, Bonn, u. a.). *Decheniana*, **99B**: 237-248.
- Hennemann, F.H., Conle, O.V. & Zhang, W.W. (2008)** Catalogue of the Stick and Leaf-insects (Phasmatodea) of China, with a faunistic analysis, review of recent ecological and biological studies and bibliography (Insecta: Orthoptera: Phasmatodea). *Zootaxa*, **1735**: 1-76.
- Ho, G.W.C. (2012)** Notes on the genera *Sinophasma* Günther, 1940 and *Pachyscia* Redtenbacher, 1908 (Phasmatodea: Diapheromeridae: Necrosciinae), with the description of four new species from China. *Zootaxa*, **3495**: 57-72.
- Hua, L.Z. (2000)** *List of Chinese Insects Vol. 1*. Zhongshan (Sun Yat Sen) University, Guangzhou. 488 pp.
- Liu, S.L. (1987)** Two new species of genus *Sinophasma* Günther (Phasmida: Heteronemiidae) of China. *Contributions from Tianjin National History Museum*, **4**: 1-3.
- Otte, D. & Brock, P.D. (2005)** *Phasmida Species File. Catalog of stick and leaf insects of the world*. The Insect Diversity Association and the Academy of Natural Sciences, Philadelphia. 414 pp.

# *Sinophasma hoenei formosanum* Y.S. Huang, subsp. nov., a new subspecies of stick insect from Taiwan (Phasmida: Diapheromeridae: Necroschiinae)

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## **Abstract**

The mating position of stick insects is defined as false male-above mating position. *Sinophasma hoenei* Günther, 1940 has symmetric male-above mating position believed to be unique in Phasmida. The male subgenital plate splits into two large specialised lobes to match the shape of the female's operculum tip. The Taiwanese new subspecies *S. hoenei formosanum* Y.S. Huang **subsp. nov.** is described and distinguished from the Chinese subspecies *S. hoenei hoenei* Günther, 1940.

## **Key words**

China, Taiwan, false male-above mating position, symmetric male-above mating position.

## **Introduction**

The genus *Sinophasma* was established by Günther (1940), who described four new species from south China. Subsequently, eighteen species have been added to the genus from south China, one species from Taiwan and one species from North Vietnam were reported in later studies (Shiraki, 1935; Chen & Chen, 1999; Huang 2002; Hennemann et al., 2008; Chen & He, 2008; Brock, 2012).

The female in the genus always looks similar. Conversely, the male has highly specialised morphology of cerci, anal segment, and subgenital plate, which provide readily identifiable characters. The male genitalia structure was thought to indicate evolutionary adaptation to the environment (Chen, 1997).

*Sinophasma hoenei* Günther is the largest species in the genus, easily recognized by its helmet-shaped anal segment and the subgenital plate, which splits into two large asymmetric auriculate lobes (Chen & He, 2008).

## **Abbreviations for depositories**

BFU: Insect Collection, Beijing Forestry University, Beijing, China

NMNS: National Museum of Natural Science, Taichung, Taiwan.

SIES: Shanghai Institute of Entomology, Chinese Academy of Sciences, Shanghai, China.

SNUB: Department of Biology, Shanghai Normal University, Shanghai, China

YH: Private collection of Yamai Shih-Fu Huang, Taipei, Taiwan.

### **Mating position and morphology of genitalia (Pl. 1&2)**

Mating position of Phasmida was defined as false male-above position, in which the male sits on top of the female, but its abdomen is bent around the female abdomen and the genitalia make contact with the female from below; in most species, the male bends down its abdomen on the right side of the female (Huber et al., 2007; Huber, 2010). The male has a vomer, elongated hook-like cerci, or split anal segment to clasp the female abdomen, or to hold to appendages of the female praeopercular organ on sternum VII, or a keel of the subgenital plate (Tilgner, 2002; Hennemann & Conle, 2008; Buckley et al., 2010).

*Sinophasma truncatum* (Shiraki, 1935) is one of the unspecialised species in this genus, and the mating position is false male-above position. However, the male does not clasp the female, but uses its subgenital plate to attach to the female operculum (Pl.2, A).

*Micadina* is a closely related to *Sinophasma*, both having a short operculum and genitalia uncovered by operculum. *M. sonani* has similar, simple subgenital plate and mating position to *S. truncatum*, but the cerci clasp the female abdomen (Pl.2, B). The other unidentified *Micadina* species from Cuc Phong, Vietnam (Pl. 2, C) recorded by Bruno Kneubühler, has the same mating position as *S. hoenei*, but uses all structures of the anal segment functions in mating, including a well-developed praeopercular organ of female, held against the male 10<sup>th</sup> tergite (but not the vomer, more usual in Phasmida) (Chen & He, 2008: 12), and cerci clasp base of operculum.

The clasping of the male subgenital plate and female operculum is the most important mechanism in mating, and other structures provide secondary assistance in *Sinophasma* species. In comparison with *Micadina* species, *Sinophasma* do not clasp the cerci during mating. Chen (1997: 25) supposed that highly diversity of the male genitalia was the evolutionary adaptation to the environment. It was thought to be caused by the unique mating mechanism here.

### ***Sinophasma hoenei formosanum* Y.S. Huang, subsp. nov. (Fig. 1 & 2; Pl. 3)**

*Sinophasma* sp., Huang, 2002: 102.

### **Diagnosis**

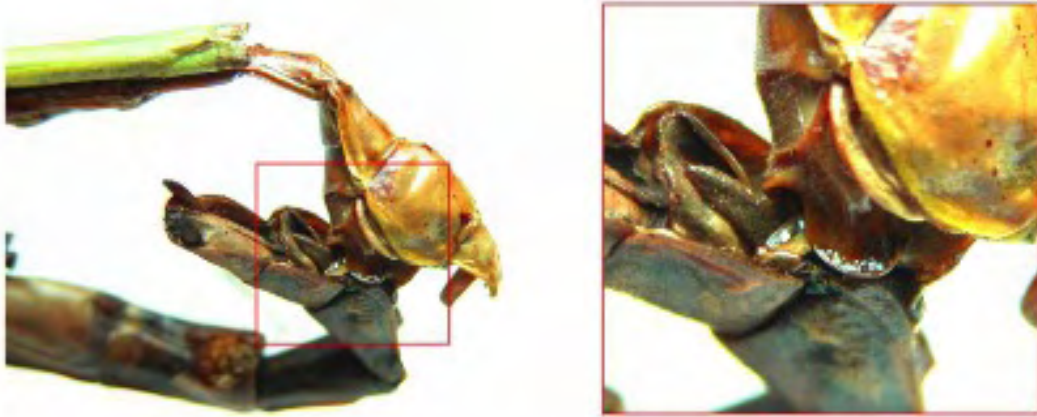
#### **Male (holotype)**

Slender, green species. Anal segment conspicuously helmet-shaped.

Head: Rounded, yellowish-pink with six dark bands in hind part and one cross-eye dark band. Antennae long, length approximately equaling the body, yellowish with 13-14 dark rings, but turning to brown upon death and dark rings are less visible.

Thorax: Pronotum orange, with lighter coloured tubercles, transversal-sulcus situated on the anterior one-third. Mesonotum green, with lighter coloured tubercles, 4 x length of pronotum, broadened behind, with distinct longitudinal carina at middle.





A

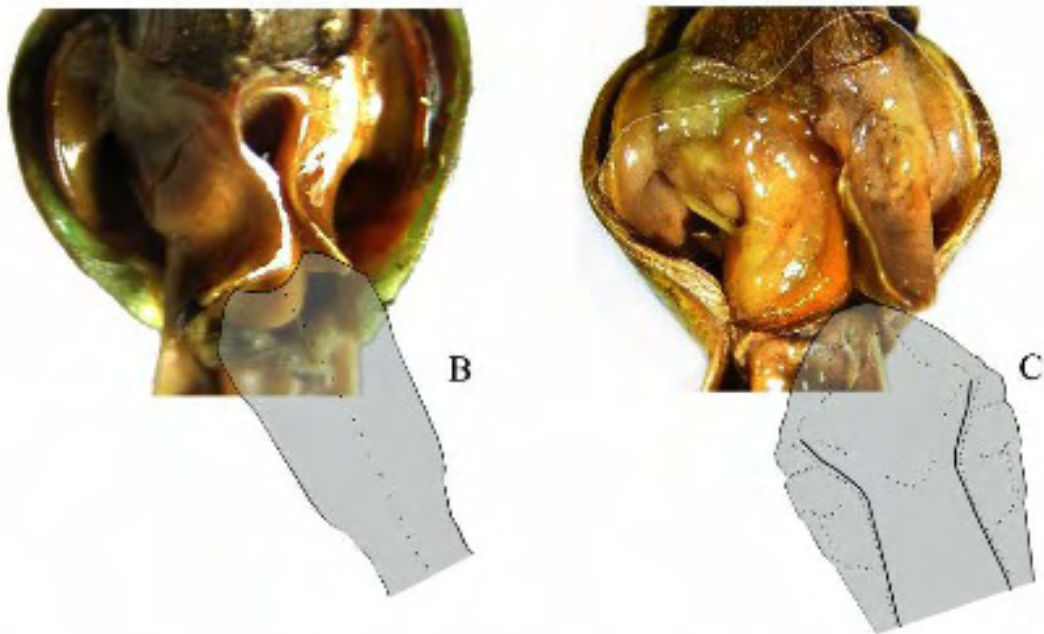


Plate 1. Mating position and structures: A. Mating position of *S. hoenei hoenei*; B. *S. hoenei hoenei*; C. *S. hoenei formosanum* (area in grey shows female operculum)



Plate 2. Mating position: A. *Sinophasma truncatum*; B. *Micadina sonani* (Photo by Shih-Jer Huang); C. *Micadina* sp. (Photo by Bruno Kneubühler)

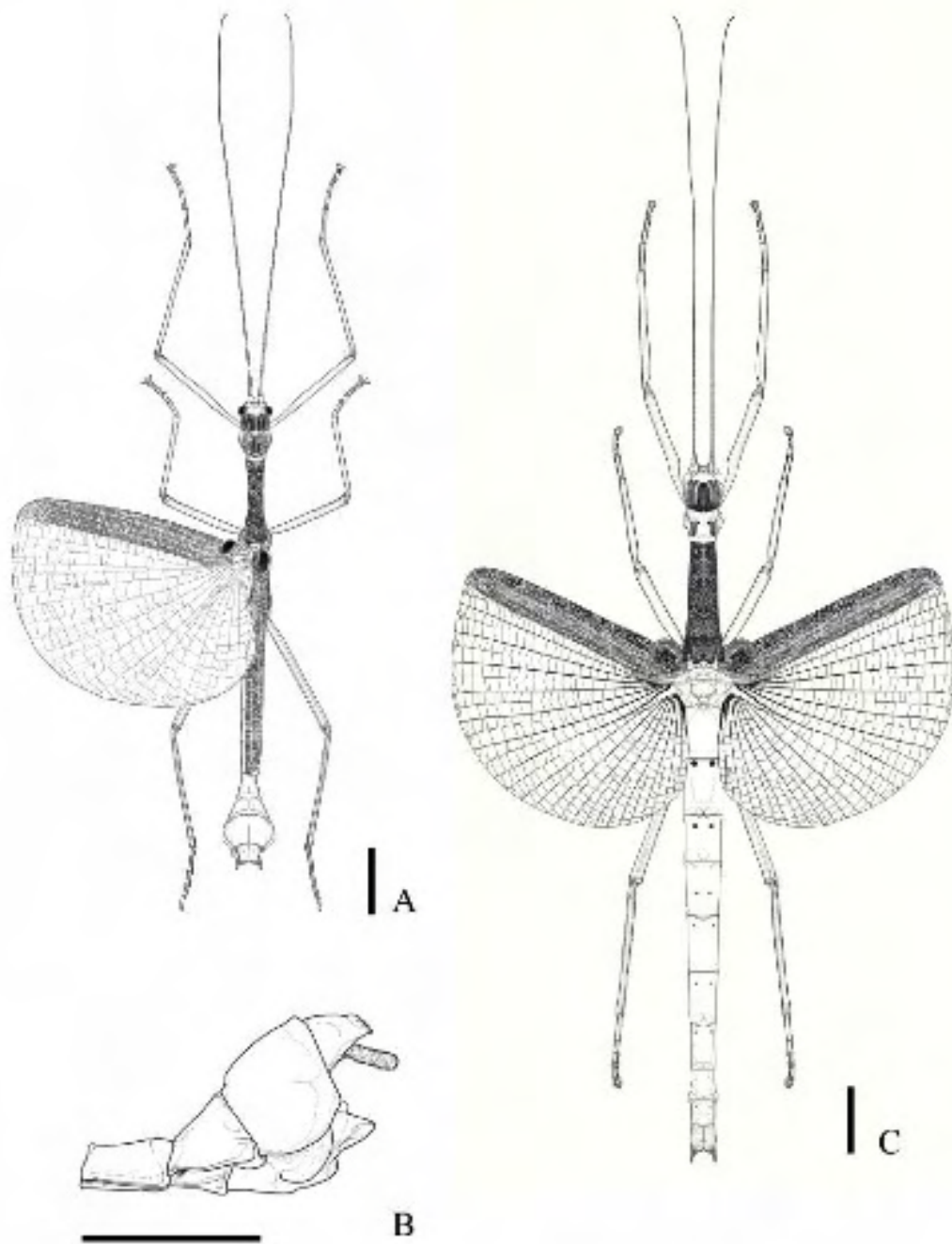


Fig. 1. *Sinophasma hoenei formosanum* ssp. nov. (scale bar = 10 mm);  
A. Male, dorsal view; B. End of abdomen, lateral view; C. Female, dorsal view

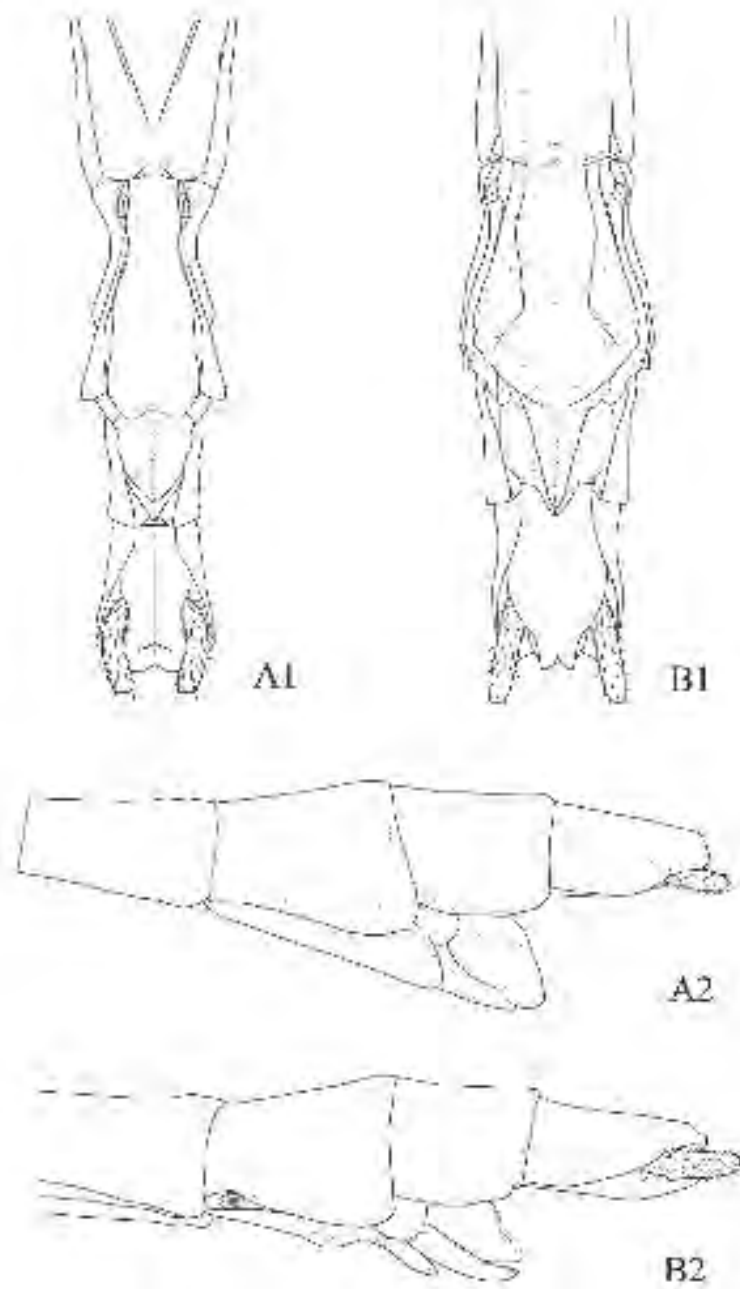


Fig. 2 End of abdomen in females of two subspecies (scale bar = 10 mm):  
A. *S. hoenei hoenei*; B. *S. hoenei formosanum*: 1. Ventral view; 2. Lateral view

Wings: Fore wings short, rather truncated behind, orange, elevated portion black. Hind wings rather short, reaching end of 6<sup>th</sup> abdominal segment. Pre-anal part green, anal part yellowish when alive, and turning to whitish-brown upon death.

Abdomen: Slender, olivish-orange. 1<sup>st</sup> and 2<sup>nd</sup> anal segments expanded, helmet-shaped, largest at 9<sup>th</sup> tergite. 10<sup>th</sup> tergite elongated, narrowed, end emerged. Subgenital plate splits into two large asymmetric auriculate lobes, equitant. Left-lobe more or less straight, reach to end of 9<sup>th</sup> tergite, slightly longer than right-lobe, outer sunken. Right-lobe more carinatous, 1<sup>st</sup> and 2<sup>nd</sup> carinae form a obvious hole, 3<sup>rd</sup> and 4<sup>th</sup> carinae together a broad carina, therefore, without subplate. Vomer large, tapered towards tip. Cerci downward, hairy, flatten cylindered, apical depressed.

Legs: Rather short and strong in Necroscini. Fore legs saffrony, except the base of femora, where is green. Middle and hind tibiae green, with orange bases and apices. Tarsi saffrony, and darker in the lateral segments.

### **Paratype males (9)**

Similar to the holotype, except the body length and the ratio between right- and left-lobe of subgenital plate. The paratype from central Taiwan (Ren-ai Township) has very reduce lobes of subgenital plate, and the hollow, formed by 1<sup>st</sup> and 2<sup>nd</sup> carinae, is so what very unapparent even than *S. hoenei hoenei*, but can be distinguished by without beneath subplate on subgenital plate right-lobe.

### **Paratype females (3)**

Robust, olive-green species, with brownish mottles.

Head: Round, rust, with six dark bands in hind part and one cross-eye dark band. Antennae long, length approximately equaling the abdomen, brownish-olive.

Thorax: Pronotum olive, with rust tubercles, transversal-sulcus situated on the anterior one-third. Mesonotum olive, with rust tubercles, 4 x length of pronotum, slightly broadened behind, with distinct longitudinal carina at middle.

Wings: Fore wings short, rather truncated behind, orange-olive, elevated portion black. Hind wings rather short, reaching end of 4<sup>th</sup> abdominal segment. Pre-anal part olive with large dark patches, anal part brownish.

Abdomen: Robust, olive with large dark patches. End of anal segment slightly emarginated in centre. Supra-anal plate small, rounded, middle pointed. Preopercular organ degenerated, slightly rised. Operculum short with uncovered ovipositor, broad and flatten, tip rounded, apical part in variable size and forms a bill shape in different lengths from lateral view. 1<sup>st</sup> valvulae coriaceous, together boat-shaped. 2<sup>nd</sup> valvula coriaceous, has clarify border with 2<sup>nd</sup> valvifer, and is bill-shaped in lateral view. Cerci backward, hairy, flatten cylindered, apical depressed.

Legs: similar to male, except have stronger tibiae carinae, colour is the same with abdomen and the pre-anal part of hind wing.

**Paratype eggs (in ethanol) (Pl. 3)**

Capsule rustish-brown, tubby, the widest on the anterior one-third., where is anterior two-third in subspecies *hoenei*. With fine net-like sculpturing, but keels are broader and lower to compare with subspecies *hoenei*.



Plate 3. Eggs of two subspecies (scale bar = 3mm): A. *S. hoenei hoenei*; B. *S. hoenei formosanum*; 1. Lateral view; 2. Dorsal view; 3. Anterior view; 4. Posterior view

**Table 1.** Measurements of *S. hoenei formosanum*

	Male (holotype)	Male (paratypes)	Female (paratypes)
Body length	67mm	60-75mm	92-150mm
Head	4mm	4-5mm	6-7mm
Antennae	56mm	55-70mm	65-68mm
Pronotum	3mm	3mm	4-5mm
Mesonotum	13mm	12-13mm	17-19mm
Metanotum	8mm	8-10mm	10-13mm
Median Segment	6mm	6-8mm	6-8mm
Fore Wing	4mm	2-4mm	3-5mm
Hind Wing	31mm	30-35mm	28-40mm
Fore Femora	16mm	15-18mm	16-19mm
Mid Femora	11mm	10-13mm	12-17mm
Hind Femora	19mm	15-20mm	16-23mm
Fore Tibiae	15mm	14-17mm	14-17mm
Mid Tibiae	11mm	10-13mm	11-12mm
Hind Tibiae	18mm	15-19mm	16-21mm

**Holotype** ♂, **Taiwan:** Taoyuang County, Fushing Township, 25.VII.2010, J.F. Liu (NMNS).

**Paratypes, Taiwan:** 1♂1♀ **eggs**, same data (YH); 1♂, Ilan County, Yuanshan Township, 15.VII.1992, Y.S. Huang (YH); 2♂1♀, Ilan County, Nan-ao Township, 21.VII.2004, J.F. Liu (YH); 4♂, Taipei County, Pingi-lin Township, 24.VI.2008, S.J. Huang (YH); 1♂1♀, Nan-to County, Ren-ai Township, 20.VII.2011, J.A. Liao (YH).

**Other material examined:**

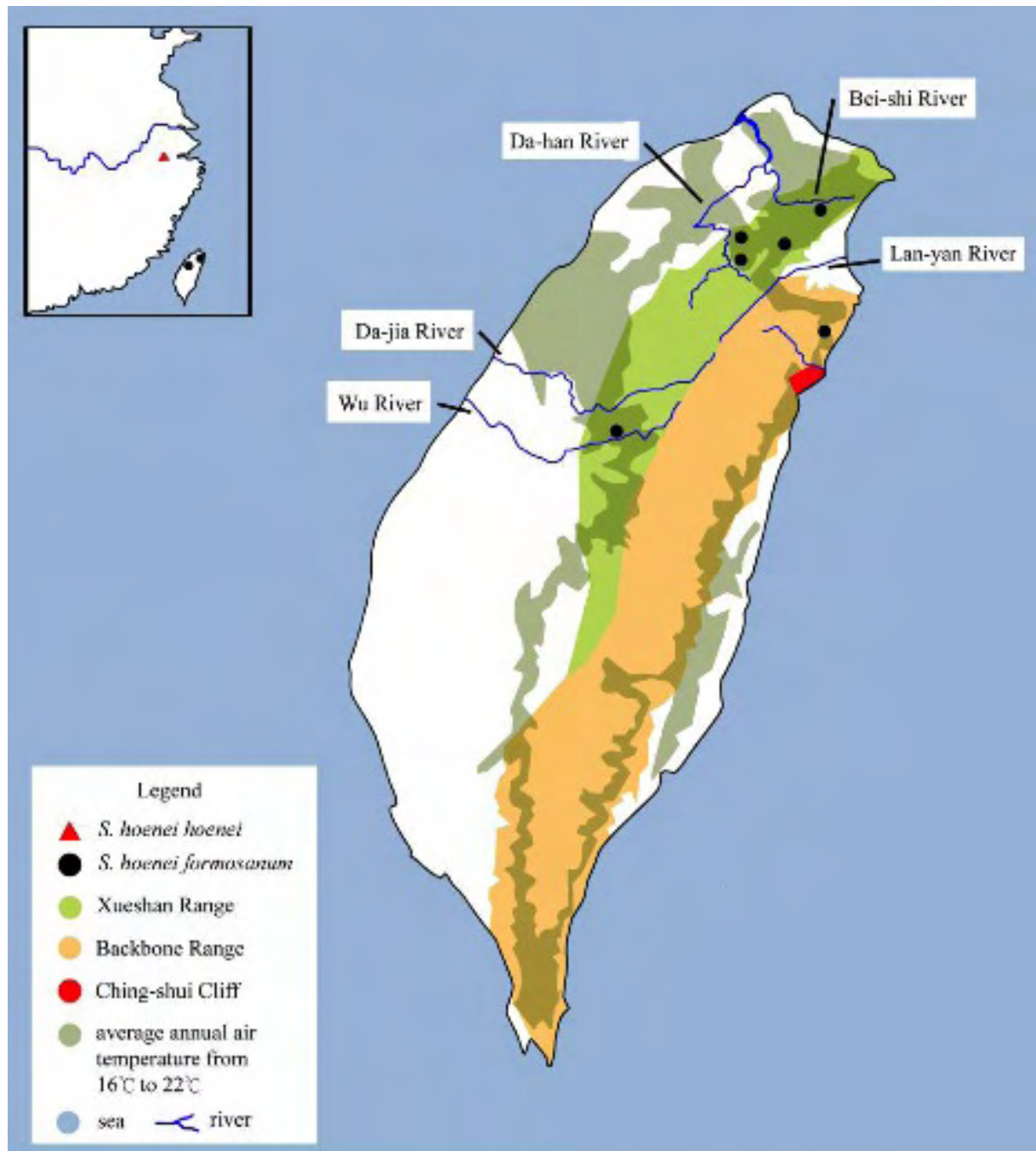
***S. hoenei formosanum*, Taiwan:** 1♂, Taoyuang County, Fushing Township, 24. VII,1993, Y.S. Huang (YH); 4♂, Ilan County, Nan-ao Township, 21.VII.2004, J.F. Liu (YH); 1♂, Taoyuang County, Fushing Township, 13.VII.2006, F.M. Wu (YH); 4♂, Taoyuang County, Fushing Township, 17.VII.2010, J.F. Liu (YH).

***S. hoenei hoenei*, China:** 5♂5♀, Zhejiang Province, Tian-Mu-Shan, 2.VIII.1962, G.T. Gin (SIES); 1♀, Zhejiang Province, Tian-Mu-Shan, Lao Dian, 31.VII.1998. Z.Y. Yu (BFU); 1♂, Zhejiang Province, West Tian-Mu-Shan, 19.VIII.1999, collector unknown (BFU); 1♂, Zhejiang Province, Lin-an, West Tian-Mu-Shan, 1100m, 20.VIII.2010, G.Y. Hu & L. Tan (YH); 3♂, Zhejiang Province, Lin-an, West Tian-Mu-Shan, 1000m, 25-27.VII.2011, Y.H. Pan(YH); 5 **eggs**, Zhejiang Province, Tian-Mu-Shan, Simian Feng, 13.VIII.2011. L. Tan (YH); 2♀, Zhejiang Province, Lin-an, West Tian-Mu-Shan, 1000m, 21.VIII.2011, L. Tan (YH).

**Distribution** (Map 1)

So far, only known from Taiwan. Distribution is bounded by both geographical and climatic limits. By geography, it is separated into three populations: Northern Xueshan Range population (**NX**) is surrounded by Bei-shi River, Da-han River and Lan-yan River; Northern Backbone Range population (**NB**) is surrounded by Lan-yan River and Ching-shui Cliff; and Southern Xueshan Range population (**SX**) is surrounded by Da-jia River and Wu River. By climate, it is bounded by average annual air temperature from 16 to 22 .

The NX population is the largest population both in range and quantity. The males have hole-like hollow between 1<sup>st</sup> and 2<sup>nd</sup> carinae of right-lobe. The females have broad apical part of operculum, so what with conspicuous bill in lateral view. The NB population only collected from single location. The males is the same to the NX population, but the single female has very reduce apical part of operculum, so what the tip is almost truncated. Only single male collected from SX population, the body length is in average, but much thinner than other populations, and has very reduce lobes of subgenital plate, so what the hollow between 1<sup>st</sup> and 2<sup>nd</sup> carinae is unapparent even than subspecies *hoenei*.



Map 1. Distribution of two subspecies



**Discussion** (Pl. 1 & 4):

Males: Left-lobe of subspecies *hoenei* is quite variable both in size and shape, where in subspecies *formosanum* is steadier. 1<sup>st</sup> and 2<sup>nd</sup> carinae of right-lobe form a hollow, it is shallow in subspecies *hoenei*, but always form a deep hole in subspecies *formosanum*, expect the single specimens from Ren-ai County (SX population), which has very reduced lobes. Beneath subplate is surrounded by 3<sup>rd</sup> carina and 4<sup>th</sup> carina, it is clarify in subspecies *hoenei*, but 3<sup>rd</sup> carina and 4<sup>th</sup> carina connect together or very close in subspecies *formosanum*, makes it look like single broad carina. This character is stable, but sometimes unviewable by the observe angle, especially observe by pictures. While that, the beneath carina is thin (only 3<sup>rd</sup> carina) in subspecies *hoenei*, and broad (3<sup>rd</sup> and 4<sup>th</sup> carinae together) in subspecies *formosanum*.

Females: Chen & He (2008: 146-147) sketched the operculum of *S. hoenei* (subsp. *hoenei*) with a bill-shaped apex in lateral view, just like the new subspecies *formosanum*, and the description with the apex of operculum is obtuse. However, no subspecies *hoenei* specimens checked fits in with it. Some subspecies *hoenei* specimens show operculum ribs are distorted by dehydrate, and make dents in lateral view, while the dent is close to the tip, always make a false broad bill, but the back edge is straight.

**Table 2.** Comparisons between two subspecies

	♂♂		♀♀
	Subplate of subgenital plate right-lobe	operculum	2 <sup>nd</sup> valvifer & 2 <sup>nd</sup> valvulae
<i>S. hoenei hoenei</i>	conspicuous	tip is emarginated, operculum is triangular in lateral view.	hard to identified into two parts, and form a triangular plate together in lateral view.
<i>S. hoenei formosanum</i> subsp. nov.	3 <sup>rd</sup> and 4 <sup>th</sup> carinae together a broad carina, subplate is non or hard to see	tip is rounded, operculum has a bill-shaped apical part in lateral view	has clarify border, and 2 <sup>nd</sup> valvulae is bill-shaped in lateral view

**Etymology**

The subspecific name refers to the type-locality, Formosa, the past name of Taiwan.

**Host Plants**

The host plants are *Quercus* spp., *Castanopsis* spp., and *Lithocarpus* spp. (Fagaceae).

**Note**

Both male and female secrete a lemon-smelling defense secretion from prothoracic glands in defence.

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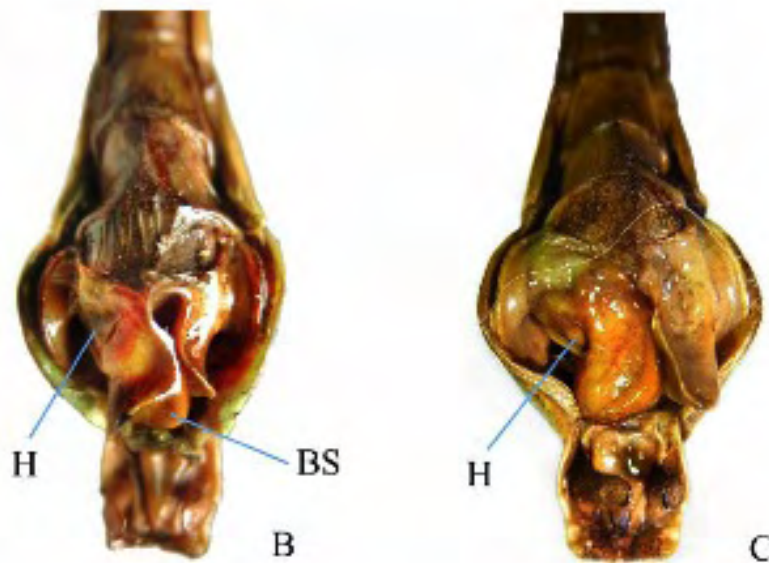
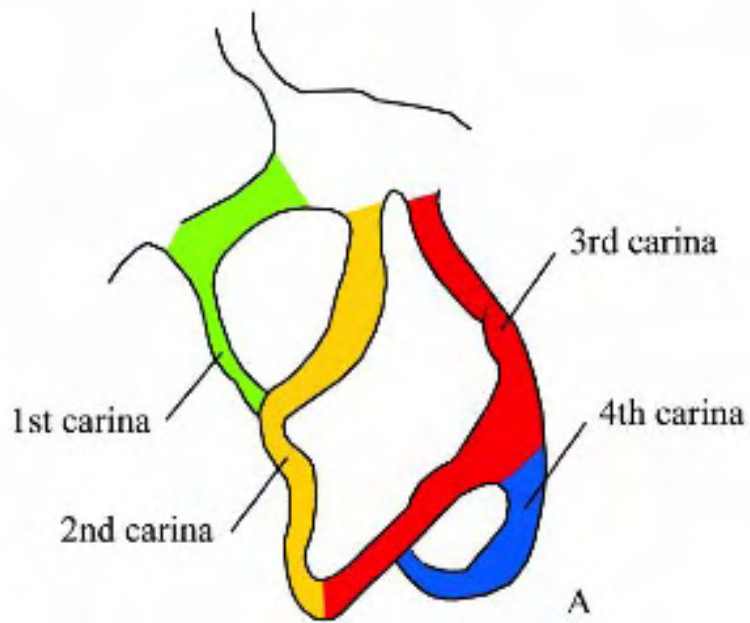


Plate 4. Structures of male subgenital plate lobes: A. Diagram of right-lobe structure; B, *S. hoenei hoenei*; C, *S. hoenei formosanum*. (H: hollow; BS: beneath subplate)

## References

- Brock, P.D.** Phasmida Species File Online. Version 2.1/4.0. [retrieval date 20 March 2012]. <http://Phasmida.SpeciesFile.org>
- Buckley, T.R., Attanayake, D., Nylander, J.A.A. & Bradler, S.** (2010) The phylogenetic placement and biogeographical origins of the New Zealand stick insects (Phasmatodea). *Systematic Entomology*, **35(2)**: 207-225.
- Chen, P.C.** (1997) Studies on Chinese *Sinophasma* Günther. *Master thesis of the Beijing Forestry University*. 53 pp.
- Chen, S.C. & Chen, P.C.** (1999) A new species of the genus *Sinophasma* from Viet Nam. *Acta Entomologica Sinica*, **42(3)**: 300-302.
- Chen, S.C. & He, Y.H.** (2008) Phasmatodea of China. China Forestry Publishing House, Beijing, 476 pp., 12 pls.
- Günther, K.** (1940) Neue Stabheuschrecken (Phasmoïden) aus China (Ausbeuten J. Klapperich, Bonn, u.a.). *Decheniana*, **99B(2)**: 237-248.
- Hennemann, F.H. & Conle, O.V.** (2008) Revision of Oriental Phasmatodea: The tribe Pharnaciini Günther, 1953, including the description of the world's longest insect, and a survey of the family Phasmatidae Gray, 1835 with keys to the subfamilies and tribes. (Phasmatodea: "Anareolatae": Phasmatidae). *Zootaxa*, **1906**: 1-316.
- Hennemann, F.H., Conle, O.V. & Zhang, W.W.** (2008) Catalogue of the Stick and Leaf-insects (Phasmatodea) of China, with a faunistic analysis, review of recent ecological and biological studies and bibliography (Insecta: Orthoptera: Phasmatodea). *Zootaxa*, **1735**: 1-77.
- Huang, Y.S.** (2002) Phasmids in Taiwan. Bigtree Culture Enterprise Co. Ltd., Taiwan, 142 pp.
- Huber, B.A.** (2010) Mating positions and the evolution of asymmetric insect genitalia. *Genetica*, **138**: 19-25.
- Huber, B.A., Sinclair, B.J. & Schmitt M.** (2007) The evolution of asymmetric genitalia in spiders and insects. *Biological Reviews*, **82**: 647-698.
- Shiraki, T.** (1935) Orthoptera of the Japanese Empire (Part IV) Phasmidae. *Memoirs of the Faculty of Science and Agriculture, Taihoku Imperial University*, **14(3)**: 23-88, pl. 4-10.
- Tilgner, E.H.** (2002) Systematics of Phasmida. *Ph.D. Dissertation of the University of Georgia*. 113 pp.