

AXEL KALLIES

Melbourne, Australia

THE BRACHODIDAE OF THE ORIENTAL REGION AND ADJACENT TERRITORIES (LEPIDOPTERA: SESIOIDEA)

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The present paper summarizes the knowledge on the Brachodidae of the Oriental region and adjacent territories, including the Arabian Peninsula and New Guinea. It comprises descriptions of new taxa and provides a distributional checklist for the region covered. *Synechodes rotanicola* sp. n. (Java), *S. lunaris* sp. n. (Malaysia), *S. andamanensis* sp. n. (Andaman Islands), *S. exigua* sp. n. (North India), *S. sidereus* sp. n. (Papua New Guinea), *Miscera orpheus* sp. n. (Java, Sulawesi), *M. sauteri* sp. n. (Taiwan), and *Phycodopteryx tigris* gen. et sp. n. (Vietnam) are described as new to science. Additionally, the following new combinations, synonyms, and taxonomic changes are provided: *Synechodes diabolus* (Felder & Roggenhofer, 1875) comb. n., *S. agrippina* (Meyrick, 1930) (transferred from Lacturidae to Brachodidae) comb. n., *S. platysema* (Meyrick, 1921) comb. n., *Nigilgia anactis* Diakonoff, 1981 stat. n., *N. superbella* (Rebel, 1907) comb. n., and *N. venera* (Meyrick, 1921) comb. n. (= *N. nagaii* Arita, 1987 syn. n.). *Phycodes penitis* Diakonoff, 1978, and *Paranigilgia morosa* Diakonoff, 1948, are redescribed and illustrated for the first time.

Correspondence: Axel Kallies, Walter and Eliza Hall Institute of Medical Research, 1G Royal Parade, Melbourne/Parkville, Victoria 3050, Australia; e-mail: kallies@wehi.edu.au

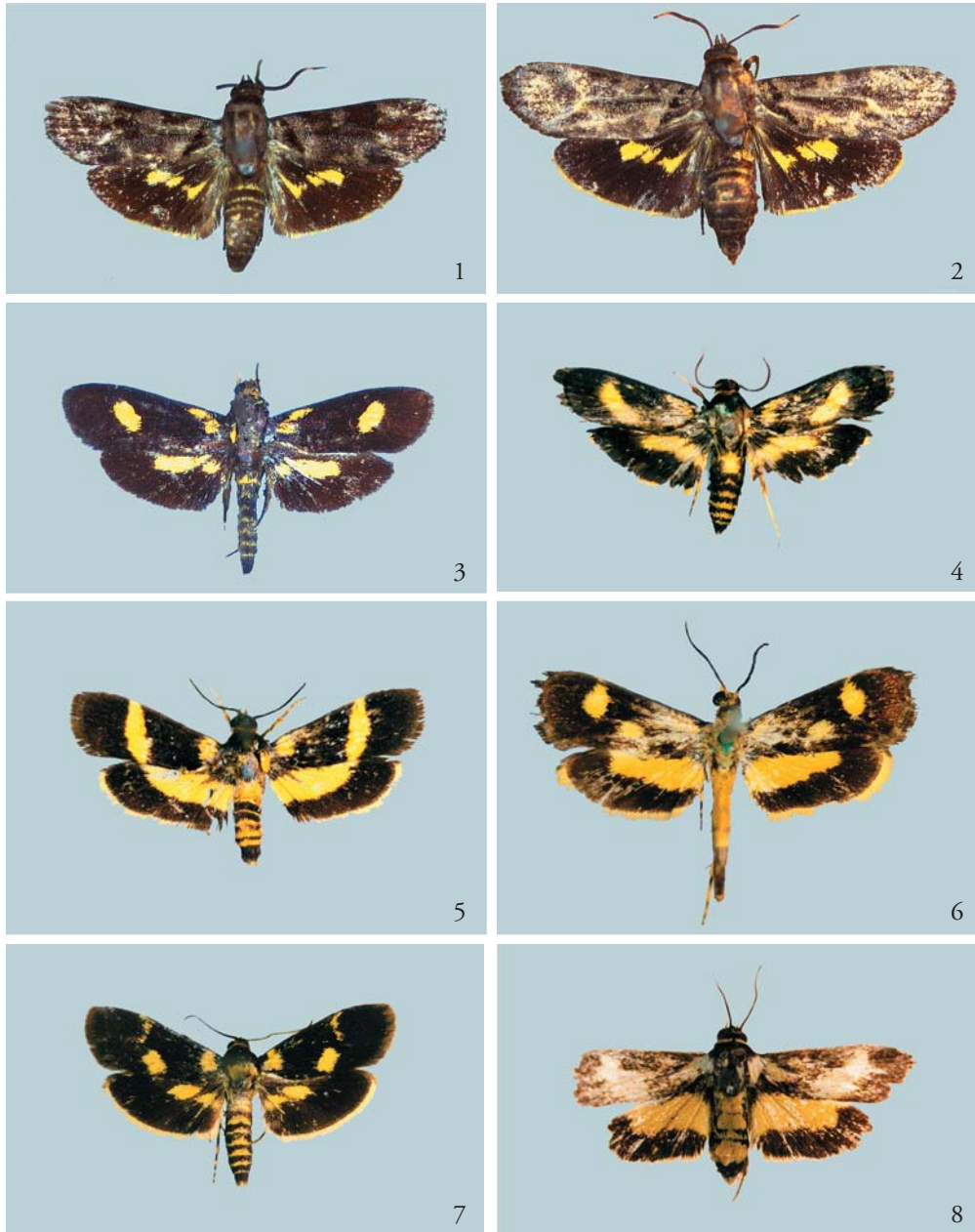
Key words. – Brachodidae, Sesiioidea, Oriental region, New Guinea, Arabian Peninsula, checklist, new species, new combinations, distribution, bionomics.

The Brachodidae are a relatively small family that, together with the Clearwing moths (Sesiidae) and the Sun moths (Castniidae), form the superfamily Sesiioidea (Minet 1991). The present concept of Brachodidae with two subfamilies, Brachodinae and Phycodinae, was established by Heppner (1981), but the monophyly of the family and its placement in the Sesiioidea is still disputed. A probable family autapomorphy is the strong reduction or loss of the ventral arms of the laterocervicalia (Minet 1991). Another character which may prove to be autapomorphic is a conspicuously bicoloured type of scales on forewings and thorax (dark, with a white or light grey distal spot). This scale type is prominent in all Phycodinae and in many Brachodinae taxa examined but has not been mentioned by previous authors. While the monophyly of the Sesiidae and Castniidae appears relatively well established, the inclusion of the Brachodidae into the Sesiioidea has been less convincingly demonstrated (Kristensen 1999). A study on the skeletal-muscular morphology, however, supported the monophyly of a group composed of all three families

(Kozlov *et al.* 1998). Superfamily autapomorphies are the enlarged patagia, extending ventrad beyond the anteroventral extremities of the pronotum, the anteriorly strongly pigmented ocular diaphragma, and the caudad or dorsocaudad elongated posterior tendons of the metafurcal apophyses (Minet 1991).

Including the species described in this paper, approximately 135 Brachodid species have been named, distributed in all regions, except the Nearctic (Heppner 1981). Although the majority of species were described from the Palaearctic region, the Brachodidae fauna of southern and south-eastern Asia appears to be the most diverse, yet, despite two recent contributions (Kallies 1998, 2000), the knowledge on Oriental Brachodid moths is still rudimentary.

The present paper completes an initial survey of the Oriental Brachodidae which was based on the type material and additional specimens selected from unsorted or unidentified material from European, Australian and Japanese institutional collections of Lepidoptera (Kallies 1998, 2000). This study aims to describe the rarely collected south and south-east



Figs. 1-8. Habitus of Brachodidae. – 1, *Synechodes rotanicola* ♂, holotype, alar exp. 26 mm; 2, *S. rotanicola* ♀, paratype, alar exp. 34 mm; 3, *S. diabolus* ♂, alar exp. 18 mm; 4, *S. agrippina* ♂, alar exp. 18.5 mm; 5, *S. lunaris* ♀, holotype, alar exp. 18 mm; 6, *S. andamanensis* ♀, holotype, alar exp. 19 mm; 7, *S. exigua* ♂, holotype, alar exp. 16 mm; 8, *S. platysema* ♀, holotype, alar exp. 18 mm.

Asian Brachodid moths to provide a broader foundation for a future phylogenetic analysis of the family. Beside descriptions of eight new species and the establishment of a new genus, this paper contains a distributional checklist of the 41 species described from the Oriental region and some adjacent territories, including the Arabian Peninsula and New Guinea (table 1). Apart from the species of the genus *Nigilgia* Walker, 1863, of which unnamed species have been studied only incompletely and which require further study, the majority of Oriental Brachodid species present in the collections examined is described by now. The cryptic life of Brachodid moths and the insufficient sampling of day flying Microlepidoptera in the tropical regions suggest, however, that the main fraction of the Brachodidae species still remains to be discovered. Further, it has to be stated that the presently unsatisfying classification of several species, namely of the genus *Miscera* Walker, 1863, has to await revisional work on the rich Australian Brachodid fauna.

MATERIAL AND METHODS

Material

Specimens used for this study are located in the following collections: ANIC – Australian National Insect Collection, Canberra, Australia; BMNH – The Natural History Museum, London, U.K. (formerly British Museum of Natural History); MNHB – Museum für Naturkunde, Berlin, Germany; NSMT – National Science Museum, Tokyo, Japan; NHMW – Naturhistorisches Museum, Wien, Austria; RMNH – Nationaal Natuurhistorisch Museum, Leiden, The Netherlands; ZMUC – Zoological Museum, University of Copenhagen, Denmark; CAK – Collection of Axel Kallies, Schwerin, Germany.

Methods

Genitalia were dissected and mounted according to standard methods (Robinson 1976); genitalia of Phycodinae were separated as described by Naumann (1971). Terminology followed standard literature; labels of type specimens and of historical relevant specimens are given as full citations.

TAXONOMIC PART

Synechodes Turner

Synechodes Turner 1913: 200. Type species: *Synechodes conio-phora* Turner, 1913, by monotypy.

This genus was reviewed by Heppner (1990) and subsequently extended by Kallies (1998). Including the data presented here, the genus is known from the south Asian mainland (northern India, Myanmar, Malaysia), the Andaman Islands, Sumatra, Borneo,

Java, Sulawesi, the Moluccas, Papua New Guinea and north-eastern Australia. The larvae are borers in the leaf stems of Palms (Kallies 1998; Edwards, pers. comm.).

Synechodes rotanicola sp. n. (figs 1, 2, 19, 27)

Material examined. – INDONESIA: Holotype ♀ “Java, ..., M., 24. IX. 32 S. 647, L. G. E. Kalshoven” “L. G. E. Kalshoven, Java, t 900 M., Mount Gedé, 1932. No” “R64” “156” “dari Rotan” “*Phycodes* n. sp. ?, Glyphipter., B.M. 37” (gen. ex. by A. Kallies, No AK284) (RMNH). Paratype: 1 ♂ “Java, ..., M., 31. X. 32 S. 653, L. G. E. Kalshoven” “L. G. E. Kalshoven, Java, 800 M., Mount Gedé, 1932. No” “3162” (gen. ex. by A. Kallies, No AK285) (RMNH).

Etymology. – The name relates to the possible feeding of the new species in ‘Rotan’, the Indonesian word for Rattan (Rotang Palm, *Calamus* sp., Lepidocarayoideae, Arecaceae). A noun in apposition.

Description male (paratype, fig. 1). – Alar expanse 26 mm, forewing length 11.5 mm, body length 12 mm.

Head: antenna prismatic, in middle part broadened, yellow subapically and at the very tip, otherwise black; frons and vertex black; pericephalic scales brownish, with a light grey tip; labial palps brownish grey, apical joint black. Thorax: black; patagia black, blackish grey posteriorly; tegulae blackish grey, scales with white tips; ventral side blackish grey. Forewing: black; subbasally, in middle part and in distal portion scales with whitish grey tips; at about $\frac{1}{3}$ and $\frac{2}{3}$, patches of loosely scattered blood-red scales; ventral side black with a large yellow spot near disc. Hindwing: black, with a yellow subbasal band, divided by narrow black streaks along veins; ventral side similar. Legs black to black-grey. Abdomen: black, all segments with a narrow yellow-grey posterior margin; tergite 8 with conspicuous lateral extensions, sternite 8 with paired anterior lobes.

Genitalia male (Gen. prep. AK284, fig. 19). – Valva with a basal lobe, apical portion weakly sclerotized, densely covered with setae; aedeagus with a long, straight lateral extension.

Description female (holotype, fig. 2). – Alar expanse 34 mm, forewing length 15 mm, body length 16 mm.

Similar to male, including structure of the antenna; yellow markings on the wings somewhat larger.

Genitalia female (Gen. prep. AK285, fig. 27). – Corpus bursae small and narrow; ductus bursae narrow; ostium and antrum well sclerotized; a small secondary bursa and ductus seminalis arising anterior to antrum.

Table 1. Checklist of Brachodidae of the Oriental Region and adjacent territories

Subfamily Brachodinae Agenjo, 1966*Synechodes* Turner, 1913

<i>agrippina</i> (Meyrick, 1930) comb. n.	Sulawesi (Indonesia)
<i>andamanus</i> sp. n.	Andamans (India)
<i>diabolus</i> (Felder & Roggenhofer, 1875) comb. n.	Moluccas (Indonesia), New Guinea
<i>exigua</i> sp. n.	Assam (India)
<i>fulvoris</i> Kallies, 1998	Sulawesi (Indonesia)
<i>lunaris</i> sp. n.	Malaysia
<i>megaloptera</i> Kallies, 1998	N Borneo (Malaysia)
<i>olivora</i> Kallies, 1998	Malaysia, Java (Indonesia)
<i>papuwana</i> Heppner, 1990	New Guinea
<i>platysema</i> (Meyrick, 1921) comb. n.	Java (Indonesia)
<i>rotanicola</i> sp. n.	Java (Indonesia)
<i>royalis</i> Kallies, 1998	Myanmar
<i>rubroris</i> Kallies, 1998	Sulawesi (Indonesia)
<i>sidereus</i> sp. n.	New Guinea
<i>sumatrana</i> Kallies, 2000	Sumatra (Indonesia)

Miscera Walker, 1863

<i>basichrysa extensa</i> Kallies, 1998	New Guinea
<i>dohertyi</i> Kallies, 1998	Assam (India)
<i>eubrachycera</i> (Diakonoff, [1968])	Philippines
<i>orpheus</i> sp. n.	Java, Sulawesi (Indonesia)
<i>sauteri</i> sp. n.	Taiwan

Subfamily Phycodinae Rebel, 1907*Phycodes* Guenee, 1852

= <i>Tegna</i> Walker, 1866	
<i>celebica</i> Kallies, 1998	Sulawesi (Indonesia)
<i>chalcocrossa</i> Meyrick, 1909	Middle East, Arabia
= <i>mesopotamica</i> Rebel, 1910	
<i>chionardis</i> Meyrick, 1909	Sri Lanka
<i>maculata</i> Moore, 1881	Assam (India)
<i>minor</i> Moore, 1881	South- and South East Asia
= <i>lucasseni</i> Snellen, 1901	
= <i>cyminеuta</i> Meyrick, 1909	
= <i>omnimicans</i> Diakonoff, 1978	
<i>penitis</i> Diakonoff, 1978	N Borneo (Malaysia)
<i>radiata</i> (Ochsenheimer, 1808)	Pakistan, Afghanistan, Nepal, India, Sri Lanka
= <i>hirudinicornis</i> Guenee, 1852	
= <i>hyblaeella</i> Walker, 1866	
= <i>tertiana</i> Diakonoff, 1978	
<i>taonopa</i> Meyrick, 1909	Assam (India), Vietnam
<i>tortricina</i> Moore, 1881	South India

Paranigilgia Kallies, 1998

<i>aritari</i> Kallies, 1998	Assam (India)
<i>bushii</i> (Arita, 1980)	Ryukyu Isl. (Japan), Taiwan
<i>morosa</i> (Diakonoff, 1948)	Moluccas (Indonesia), New Guinea

Nigilgia Walker, 1863

<i>anactis</i> Diakonoff, 1982 stat. n.	Sri Lanka
<i>aureoviridis</i> Kallies, 1998	Sulawesi (Indonesia)
<i>cuprea</i> Kallies, 1998	N Borneo (Malaysia)
<i>diehli</i> Kallies, 2000	Sumatra (Indonesia)
<i>limata</i> Diakonoff & Arita, 1979	Ryukyu Isl. (Japan), Taiwan
<i>superbella</i> (Rebel, 1907) comb. n.	Jemen, Saudi Arabia
<i>talhouki</i> Diakonoff, 1984	Saudi Arabia
<i>venerea</i> (Meyrick, 1921)	Java, Sumatra, Sulawesi (Indonesia), N Borneo (Malaysia)
= <i>nagaii</i> Arita, 1987 syn. n.	

Phycodopteryx gen. nov.

<i>tigris</i> sp. n.	Vietnam, Assam (India)
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Diagnosis. – The new species is similar to *S. rubroris* Kallies, 1998 and *S. fulvoris* Kallies, 1998. The latter differs by the shape of the antennal segments (with a strong spoon-like processus), the black labial palps, the ventrally yellow tarsomers, the yellow posterior margins of the tergites, and the coloration of the forewing underside (with only some yellow scales at the end of the cell). *S. rubroris* differs by its filiform antennae, the orange-red coloration of the basal and middle joints of the labial palps, and the orange red pericephalic scales. Additionally, both species differ from *S. rotanicola* fundamentally by their genitalia (cf. Kallies 1998).

Distribution. – Java, Indonesia.

Bionomics and Habitat. – The type material was collected between the end of September and the end of October in the submontane range of Mount Gede. According to the specimen's label, the holotype was reared from or collected at Rotang Palm (*Calamus* sp.).

Synechodes olivora Kallies

Synechodes olivora Kallies, 1998: 319–321, figs 5, 20, 29.

Type locality: West Malaysia, Telok Anson, Perak. Holotype ♂, in BMNH.

Material examined. – INDONESIA: 1 ♀ “Java, Banjouoangi, 12. VI. [19]36, S. 806, leg. L. G. E. Kalshoven” “larva in dead rattan” “3161” (RMNH); 1 ♂ “[Java ?] Laut Tador S. O. K., 90 m, 11. II. [19]50, Micro?” (RMNH).

This species was described from the Malay Peninsula from specimens reared from leaf stems of oil palm (*Elaeis guineensis*, Coccoideae), a plant that originates from Africa. The natural host-plant was hitherto unknown. In the material of the RMNH two specimens from Java were found of which one was reared from Rotang Palm (*Calamus* sp.), a genus with a number of species in South East Asia. Possibly, *S. olivora* is widespread in South East Asia along with its naturally growing and cultivated host-plants.

Synechodes diabolus (Felder & Rogenhofer) **comb. n.** (fig. 3)

Atychia diabolus Felder & Rogenhofer, 1875: 3. Holotype ♀, in BMNH. Heppner 1981: 14 (*Miscera*).

Material examined. – INDONESIA: Holotype ♀ “Doleschal, 1859, Amboina” [Moluccas, Ambon] (BMNH). Additional material: 1 ♂ (fig. 3) “Amboina, Holz” “150” “*Jonaca* ? sp., Named by Wlsm. 1891” “17i” (gen. ex. by A. Kallies, No AK281) (MNH); 1 ♀ “Amboina, H[o]lz” “*Diabolus* Fld.” “17i 11.” “Coll. Staudinger” (MNH); 1 ♂, 1 ♀ “N. Moluccas, 0 m, S. Batjan [Bacan] Vi-Vii, Watjana, 18. VI., A. M. R. Wegner 1959” (RMNH); 1 ♀ “Kapaur, S. W. New Guinea [Irian Jaya], sealevel-2000 ft, I. XII. [18]96 - II. [18]97, Doherty” (BMNH).

S. diabolus was hitherto known only from female specimens from the island of Ambon and has been associated with the genus *Miscera* Walker, 1863 (Heppner 1981). However, examination of the holotype and of conspecific males that were traced in different collections clearly indicates that it belongs to the genus *Synechodes*. Based on this more extensive material, the species is redescribed here. The known range extends from the Moluccas (Ambon, Bacan) to south-western New Guinea (Irian Jaya).

Redescription male (fig. 3). – Alar expanse 16.5–18.0 mm, forewing length 7–8 mm, body length 8.0–9.5 mm.

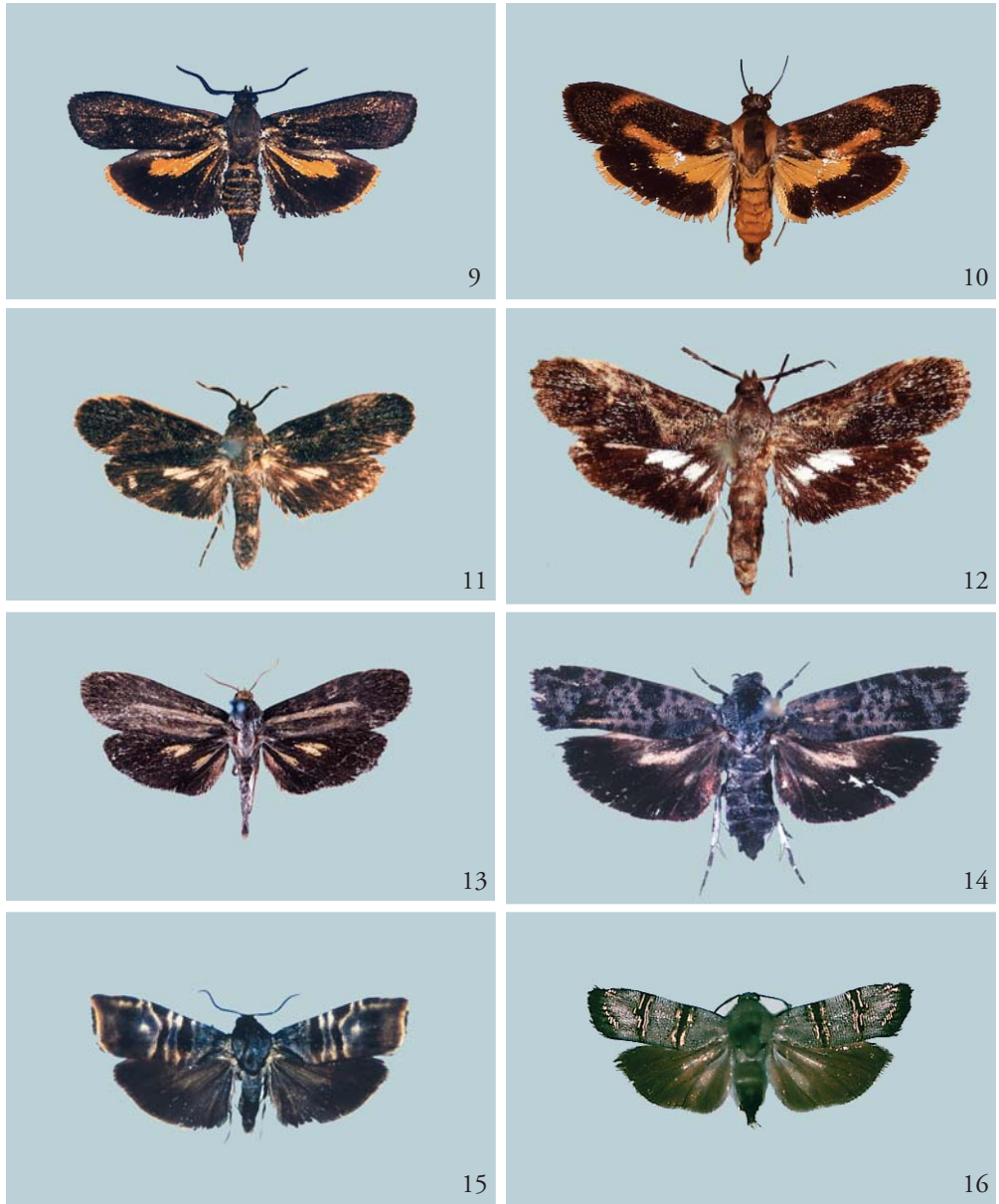
Head: antenna prismatic, yellow ventrally, black dorsally, ventrally very short ciliate, white-scaled apically; labial palps yellow; haustellum developed; frons shining black; vertex black, mixed with yellow, anterior part completely yellow; pericephalic scales yellow. Thorax: black, tegulae yellow apically. Forewing: black, with a yellow spot at about $\frac{2}{3}$ and a yellow patch near base; ventral side similar, but with more extensive yellow markings, vein Sc yellow basally. Hindwing: black, with a yellow subbasal band; ventral side similar. Legs: fore coxa yellow, mixed with black; fore tarsomers black, yellow apically; hind leg yellow, with black markings at tibia basally and subapically, and at base of each tarsomer. Abdomen: black, tergite 1 yellow posteriorly, tergites 2–7 with yellow posterior margins; anal tuft fuscous with yellow apex; sternites yellow, with black scales anteriorly, sternite 8 black.

Genitalia male. – Very similar to those of *Synechodes agrippina* (Meyrick, 1930) (fig. 20). Valva simple, gnathos well developed, sclerotized portion of juxta butterfly-shaped; aedeagus with a well-sclerotized apical edge and with a multi-furcated processus subapically.

Redescription female. – Alar expanse 22.0–22.5 mm, forewing length 10–11 mm, body length 12–13 mm.

Basic wing pattern similar to that of male, but forewing spots larger, deep orange, ventral side with an additional orange streak along stem of cubitus; hindwing orange, with black marginal band; fore coxa and hind tibia orange throughout; tarsomers orange, black basally; antenna black, apical quarter white. Abdomen: orange-yellow; tergite 7 black; sternites orange-yellow throughout.

Variability. – Depending on the origin of the specimens, the species is variable with regard to the extension of the yellow markings of the fore- and hindwing, and the abdomen. Compared with the male (fig. 3) from Ambon, the type locality, the male from Bacan has a broader and better defined yellow band on the hindwing and abdominal tergites 1 and 2 are yellow dorsally and black laterally. The correspond-



Figs. 9-16. Habitus of Brachodidae. – 9, *S. sidereus* ♀, holotype, alar exp. 21 mm. 10, *S. heppneri* ♀, holotype, alar exp. 21.5 mm; 11, *M. orpheus* ♂, holotype, alar exp. 16.5 mm; 12, *M. orpheus* ♀, paratype, alar exp. 24 mm; 13, *Miscera sauteri* ♀, holotype, alar exp. 20 mm; 14, *Phycodes penitis* ♀, alar exp. 25.5 mm; 15, *Paranigilia morosa* ♀, alar exp. 17 mm; 16, *Nigilia superbella* ♀, alar exp. 16 mm.

ing female from Bacan has broader yellow-orange markings on the forewing.

Diagnosis. – This species is somewhat similar to *Synechodes sumatrana* Kallies, 2000, but can be distinguished by the smaller size (alar expanse 20.5 mm in *S. sumatrana*), the larger yellow markings of the forewing, the partly yellow coloration of the antenna and legs (mainly black in *S. sumatrana*), and by the fundamental differences in the morphology of the male genitalia (cf. Kallies 2000). Further, *S. diabolus* is very similar to *S. agrippina* (Meyrick, 1930); see there for diagnosis.

Distribution. – Moluccas, Irian Jaya (Indonesia).

Bionomics and Habitat. – Unknown. Some specimens were collected in lowland between sea level and about 600 m.

Synechodes agrippina (Meyrick) **comb. n.**
(figs. 4, 20)

Anticrates agrippina Meyrick, 1930: 594.

Material examined. – INDONESIA: Holotype ♀ “Célèbes [Sulawesi], Macassar, W. Doherty, 1896” “*Anticrates agrippina* Meyr., det. E. Meyrick” “Type” “Paravicini Coll, B.M. 1937-383 “M485” (BMNH). Paratype: 1 ♀ “Célèbes Mérid., Région basse entre, Maros & Tjamba, W. Doherty, 1896” “*Anticrates agrippina* Meyr., det. E. Meyrick” “Cotype” “M539” “genitalia on slide 25.V.1948, J.F.G.C. 7497” (BMNH); 2 ♂ “S. Celebes (low country) Doherty, 1896” (B.M. Genitalia slide No 29203, 29206; gen. ex. by A. Kallies, No AK148, AK129) (BMNH).

This species was described by Meyrick (1930) in Yponomeutidae but transferred to Lacturidae later (Heppner 1995). Examination of the type material revealed that this species is closely related and very similar to *Synechodes diabolus*. Therefore it is hereby transferred to *Synechodes* within the family Brachodidae. In both sexes, *S. diabolus* and *S. agrippina* can be distinguished by the size and shape of the external yellow or orange marking of the forewing (conspicuously larger in *S. agrippina*, extending from about 1/2 of the posterior margin towards 2/3 of the costal margin without reaching the latter).

Genitalia male (AK129, BM29206, fig. 20). – Very similar to that of *S. diabolus*. The size of the subapical process of the aedeagus appears to be inconsistent (fig. 20 a, b).

Remark. – *S. agrippina* may represent the Sulawesian subspecies of *S. diabolus*. However, with the poor condition and the low number of specimens at hand it is inappropriate to decide this issue now.

Synechodes lunaris sp. n.
(figs 5, 28)

Material examined. – MALAYSIA: Holotype ♀ “Malay Penins: Pahang, F.M.S., Frasers Hill, 4200 ft. at light, 18. 7. 1936, H.M. Pendlebury, F.M.S. Museum.” (BMNH). Paratype: 1 ♀ “Bulsit Besar., Siam: Malay States, No.” “1903-293” “B.M. Genitalia slide No 29211” (gen. ex. by A. Kallies, No AK136) (BMNH).

Etymology. – The species’ name derives from the moon-shaped forewing markings.

Description female (holotype, fig. 5). – Alar expanse 17.0-18.0 mm, forewing length 8.0 mm; body length 8.0 mm.

Head: antenna prismatic, black, scaled dorsally, very short ciliate ventrally; scapus yellow ventrally; labial palps yellow; haustellum developed; frons very smooth scaled, shining anthracite; vertex black, periccephalic scales yellow. Thorax: black, tegulae yellow apically. Forewing: black, with a yellow band from costa to anal margin at about 2/3 and a patch of yellow scales near base; fringe black. Hindwing: yellow, with a well-defined broad black marginal band, black basally; fringe yellow; ventral side similar, but with an additional black spot at anterior margin. Legs: fore coxa deep yellow; hind leg similar as described for *S. diabolus*. Abdomen: tergites 1-2 yellow, tergites 3-6 black with yellow posterior margins; sternites yellow except for black scales latero-anteriorly; segment 7 black with a yellow tip.

Genitalia female (Gen. prep. AK136, BM29211, fig. 28). – Corpus bursae ovoid; ductus bursae normal; ostium broad, membranous; antrum with a sclerotized, ventrally open ring.

Distribution. – Malay peninsula.

Bionomics and Habitat. – Unknown. One specimen was collected at light in July at an altitude of about 1400 m.

Synechodes andamanensis sp. n.
(figs 6, 29)

Material examined. – INDIA: Holotype ♀ “Andamans. Jan. 1904. G. Rogers. 1903-349.” “B.M. Genitalia slide No 29208” (gen. ex. by A. Kallies, No AK147) (BMNH).

Etymology. – The name relates to the type locality of the new species.

Description female (holotype, fig. 6). – Alar expanse 19 mm, forewing length 9 mm, body length 10 mm.

Head: antenna prismatic, black, scaled dorsally, very short ciliate ventrally; labial palps straight, deep

yellow, with some black scales apically; haustellum developed; vertex with black and yellow scales. Thorax: black, metathorax with yellow and black hair-like scales dorso-submedially. Forewing: black with an almost circular yellow spot near costa at about $\frac{2}{3}$ and a smaller yellow spot in middle, a small patch of additional yellow scales near base and single yellow scales near termen; ventral side similar; fringe black. Hindwing: deep yellow, with a broad black marginal band and some black scales basally; fringe yellow, black at apex; ventral side similar. Legs: similar as described for *S. diabolus*. Abdomen: yellow almost throughout, with only a few brownish black scales in anterior part of each segment.

Genitalia female (Gen. prep. AK147, BM29208, fig. 29). – Corpus bursae small; ductus bursae broad; ostium and antrum well sclerotized; secondary bursa arising from sclerotized portion of antrum.

Diagnosis. – This species differs clearly from all congeners by the forewing markings (two yellow separate spots) and the yellow abdomen. Further, *S. andamanensis* differs from all related species by the structure of the female genitalia (with a comparatively long sclerotized antrum).

Distribution. – Andaman Islands, India.

Bionomics and Habitat. – Unknown. The type specimen was collected in January.

Synechodes exigua sp. n.
(figs 7, 21, 30)

Material examined. – INDIA: Holotype ♂ “India, Khasis Hills, Doherty, 1896 or 1897, Walsingham Coll. B.M. 1910-427” (BMNH). Paratypes: 1 ♂, same data, but “B.M. Genitalia slide No 29205” (gen. ex. by A. Kallies, No AK134) (BMNH); 1 ♀ “Cherra Punji., Khasias 1895, Nat. (Doncaster)” “Walsingham Collection.” “B.M. 1910-427” “B.M. Genitalia slide No 29199” gen. ex. by A. Kallies, No AK108) (BMNH).

Etymology. – The new species is one of the smallest of the genus (*exiguus* = small).

Description male (holotype, fig. 7). – Alar expanse 14-16 mm, forewing length 7-8 mm, body length 7-8 mm.

Head: antenna prismatic, black, scaled dorsally, very short ciliate ventrally; labial palps yellow, apical joint with black scales dorsally; haustellum developed; frons shining anthracite; vertex black; pericephalic scales yellow. Thorax: black, tegulae yellow distally. Forewing: black, with a short, ill-defined, transverse yellow stripe near costa at $\frac{2}{3}$; large yellow spots near anal margin and near base; fringe black; ventral side similar but yellow markings somewhat more extensive. Hindwing: black, with a yellow subbasal band, fringe consisting of an internal row of black scales and

an external row of yellow scales, near apex black; ventral side similar. Legs: fore coxa yellow, black basally; mid and hind femur black, yellow apically; mid and hind tibia yellow, black subapically; tarsomers black, yellow apically. Abdomen: tergite 1 mainly yellow; tergites 2-7 black, with broad yellow posterior margins; anal tuft with a yellow tip; sternites similar but with more yellow.

Genitalia male (Gen. prep. AK134, BM29205, fig. 21). – Valva simple, gnathos well developed, sclerotized portion of juxta butterfly-shaped, with pointed edges; aedeagus short, apically with a well-sclerotized edge.

Description female. – Similar to male, yellow markings of wings somewhat more extensive, alar expanse 15 mm.

Genitalia female (Gen. prep. AK108, BM29199, fig. 30). – Corpus bursae very small; ductus bursae broad; ostium sclerotized.

Diagnosis. – The species is unique regarding the wing markings and the structure of the genitalia, in particular the shape of the ostium of the female genitalia. It cannot be confused with any of its congeners.

Distribution. – India, Assam.

Bionomics and Habitat. – Unknown.

Synechodes platysema (Meyrick) comb. n.
(fig. 8)

Sagalassa platysema Meyrick, 1921: 180. Type locality: Java, Jakarta. Holotype ♀, in RMNH. Heppner 1981: 14 (*Miscera*).

Material examined. – INDONESIA: Holotype ♀ “Java, Batavia [Jakarta], 1882” “M444” “Type” “Museum Leiden, Holotypus ♀” “*Sagalassa platysema* Meyrick, 1921” (RMNH).

This species was originally described by Meyrick (1921) in the genus *Sagalassa* Walker, 1856. Later Heppner (1981) transferred it to *Miscera* Walker, 1863. However, examination of the holotype has revealed that it clearly belongs to the genus *Synechodes*. Since the species has never been figured it is re-described and illustrated in the present paper.

Redescription female (holotype, fig. 8). – Alar expanse 18 mm, forewing length 8 mm, body length 7.5 mm, antenna 3 mm.

Head: antenna black, flagellate, very short ciliate, scapus yellow ventrally; labial palps pale yellow, slender, slightly upcurved; haustellum well developed. Thorax: blackish dorsally, yellow-fuscous ventrally; patagia yellow; tegulae yellow in distal part. Forewing: fuscous; costal margin pale yellow, near base a yellow spot, a broad, pale yellow, moon-shaped spot extending from $\frac{1}{2}$ of posterior margin almost to distal part of costal margin; ventral side similar, but with an additional yellow spot in central part. Hindwing: yellow,

black at base; with a broad, distinct, black marginal band; ventral side similar. Legs: fuscous to yellowish (major parts broken off). Abdomen: tergites 1-6 yellow; tergite 2 fuscous laterally and at the very anterior margin; tergites 3-4 dark fuscous latero-anteriorly and laterally; tergite 7 fuscous, yellow apically; sternites 1-6 white, with single fuscous scales anteriorly; sternite 7 fuscous.

Genitalia female. – Not examined.

Diagnosis. – This species differs from all congeners by the whitish yellow markings of the forewings.

Distribution. – Java, Indonesia.

Bionomics and Habitat. – Unknown.

Synechodes sidereus sp. n.
(fig. 9)

Material examined. – PAPUA NEW GUINEA: Holotype ♀ “New Guinea, Lae, 10.6.1951, Collected by Wm. Brandt, Sir Edward Hallstrom” (ANIC).

Etymology. – The new species' name derives from the forewing pattern which in magnification appears like a starry sky (*sidereus* = starry).

Description female (holotype, fig. 9). – Alar expanse 21.0 mm; forewing length 9.5 mm; body length 9 mm.

Head: antenna black, ciliate, each joint with a short projection, dorsally strongly scaled; labial palps with basal joint pale yellow, middle and apical joint black to dark grey; frons and vertex black to dark grey; pericephalic scales black mixed with yellow dorsally, yellow towards ventral side. Thorax: dorsally black, subdorsally with yellow scales and a defined patch of orange-yellow scales in posterior portion; patagia black, with some yellowish and grey scales laterally; tegulae black, covered with orange to yellow scales near base; mesothorax black, with yellow hair-like scales subdorsally. Forewing: brownish black, lighter in anterior third; with a tiny yellow spot near base; fore costa black, yellow towards base; the entire dorsal side of the forewing covered with evenly distributed, individual, white scales; ventral side bicolored, black along fore costa and fringes, orange-yellow in posterior part including the cell, the latter with a black transverse streak; towards posterior margin covered with light grey and pale yellow scales. Hindwing: black, with a large orange-yellow spot covering the cell, the basal half of the area between cubitus and vein CuP, and stretching to the base; with yellow scales along veins A1+A2 and A3; fringes in distal wing portion yellow, black in basal part; ventral side similar but with yellow apex. Legs: fore leg mainly black; fore coxa yellow towards distal half; fore tibia with some yellow at distal end; basal and subbasal tarsomer of fore tarsus with a crème spot distally; mid and hind coxae yellow (remaining

parts of the legs broken off). Abdomen: black, segments with yellow distal margins; tergite 7 and anal tuft black, the latter with individual yellow scales.

Female genitalia. Not examined.

Bionomics and Habitat. – Unknown. The holotype was collected in June.

Distribution. – Known only from the type locality in Papua New Guinea.

Diagnosis. – This new species is similar to male specimens of the Australian *Synechodes coniophora*. The latter can be separated by the pale yellow markings of the hindwings (orange-yellow in *S. sidereus*) and the yellow patagia (almost black throughout in *S. sidereus*). The female of *S. coniophora* is not known. However, *Synechodes heppneri* Kallies, 1998 which was described on the basis of two females from Kuranda, Australia, is likely to be a junior synonym of *S. coniophora* according to Edwards (pers. comm.). Since this issue will be addressed in a future revision of the Australian Brachodidae (Kallies, in prep.) it is here refrained from synonymisation. Females of *S. heppneri* (fig. 10) can be easily distinguished from *S. sidereus* by the extensive yellow spots of the forewings, the bright yellow basal part of the hindwings, and the entirely yellow abdomen.

Miscera Walker

Miscera Walker, 1863: 457. Type species: *M. rusumptana* Walker, 1863, by monotypy.

The genus *Miscera* is poorly characterised. The type species of the genus, *Miscera rusumptana* Walker, 1863, occurs in Australia and is thought to feed on grasses (Poaceae); some other Australian species assigned to *Miscera* are believed to live on sedges (Edwards pers. comm.). Another species currently associated with this genus, *Miscera basichraya* (Lower, 1916), was reared from *Calamus* (Palmae, Lepidocarayoideae) and may represent another undescribed genus (Kallies 1998). Since the morphology of the Australian representatives of the genus is poorly known it is impossible to clarify this issue at present.

The genus *Miscera* in the present view differs from *Synechodes* by several important characters. The aedeagus of male *Miscera* bears a long and narrow coecum penis similar to that seen in most species of the Sesiidae subfamily Tinthiinae. This structure has not been observed in *Synechodes*, but was found in *M. rusumptana*, and in *Miscera orpheus* sp. n. described below. Additionally, the fishhook-like extension of the gnathos that is typical for *Synechodes* is apparently absent in species of *Miscera*. More striking are the differences in the female genitalia between *Synechodes* and *Miscera*. Both species described here in *Miscera* have a much shorter and broader ovipositor than



17



18

Figs. 17-18. Habitus of Brachodidae, *Phycodopteryx tigris*. – 17, ♂, paratype, alar exp. 25 mm (CAK); 18, ♀, holotype, alar exp. 30 mm.

species of *Synechodes*. Furthermore, the ovipositor bears a special pouch-like structure in the distal part. Also, both species have a strongly reduced haustellum, which is well developed in *Synechodes*, although this character is variable in other clearly monophyletic genera, such as *Brachodes* Guenee, 1845.

Miscera sauteri sp. n.
(figs 13, 31)

Material examined. – TAIWAN: Holotype ♀ “[Nantou County] Fuhosho [Mao-pu-juan near Meiyuan (= Baibara)] VIII. [19]09” [coll. Sauter]” (gen. ex. by A. Kallies, No AK172) (MNHB).

Etymology. – The species is named after the lepidopterist Hans Sauter (1871-1948) who collected the holotype.

Description female (holotype, fig. 13). – Alar expanse 20 mm, forewing length 9.5 mm, body length 9 mm.

Head: antenna simple, very short ciliate ventrally, scaled dorsally; labial palps straight, not brushed, dirty yellow, apical joint yellowish grey; haustellum absent; frons yellow; vertex yellow. **Thorax:** fuscous dorsally, with yellow scales in posterior part submedially; patagia fuscous; tegulae fuscous, with yellow outer margin and a yellow spot near the forewing. **Forewing:** fuscous-brownish; with a narrow yellow streak along cubital stem and single yellow scales scattered on the wing, more densely near the posterior margin, ventral side similar. **Hindwing:** fuscous-brown with two yellow poorly defined subbasal spots, fringe with a row of black scales basally and white scales distally; ventral side similar. **Legs:** yellow to grey. **Abdomen:** fuscous, each segment with a pale yellow posterior margin.

Genitalia female (Gen. prep. AK172, fig. 31). – Corpus bursae ovoid; antrum partly sclerotized; ostium well sclerotized, somewhat protruding; sec-

ondary bursa larger than primary one.

Diagnosis. – This species cannot be confused with any other species of Brachodidae. The forewing markings (a pale yellowish streak along cubitus) resemble certain species of *Brachodes* Guenee, 1845, from the Palearctic region; however, from this genus it differs fundamentally by the morphology of the genitalia.

Distribution. – Taiwan.

Bionomics and Habitat. – Unknown. The type specimen was collected in August.

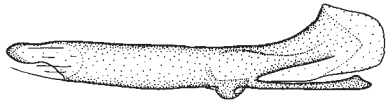
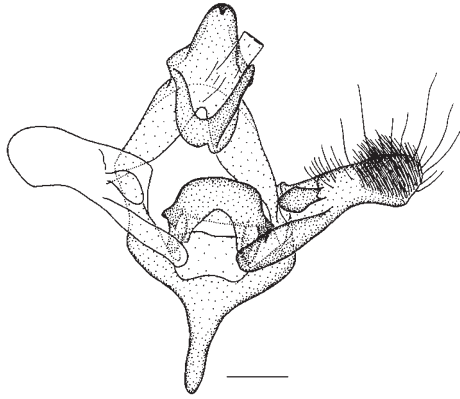
Miscera orpheus sp. n.
(figs 11, 12, 22, 32)

Material examined. – INDONESIA: Holotype ♂ “S. Java, - m., Genteng Bay, 1. VII. 1939, M. A. Lieftinck” (gen. ex. by A. Kallies, No AK238) (RMNH). – Paratypes: 1 ♀, same data as holotype (RMNH); 1 ♀ “Célèbes Mérid., région basse entre, Maros & Tjamba, W. Doherty, 1896” “Paravicini Coll., B.M. 1937-383.” (gen. ex. by A. Kallies, No AK40) (BMNH).

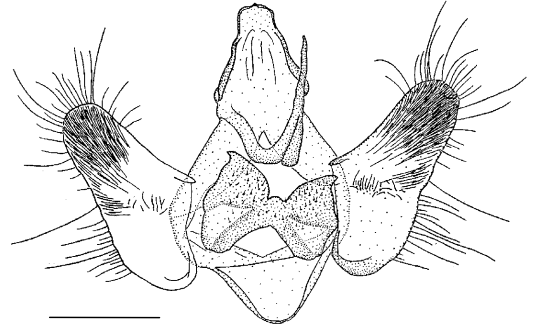
Etymology. – *Orpheus*, god of the underworld; relates to the dark coloration of the species.

Description male (holotype, fig. 11). – Alar expanse 16.5 mm, forewing length 11.5 mm, body length 8 mm.

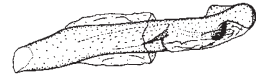
Head: antenna prismatic, short ciliate ventrally, densely scaled dorsally, dark brown, with a white subapical spot at about $\frac{3}{4}$; labial palps slightly upcurved, short scaled, not brushed, basal joint yellow, middle joint long, yellow ventrally, brown dorsally, apical joint short, brown; haustellum minute; frons somewhat extended by scales, brownish; vertex consisting of brownish, white-tipped scales. **Thorax:** black to fuscous dorsally, including patagia and tegulae; scales greyish with a white tip; ventrally yellowish grey. **Forewing:** black, in basal $\frac{1}{3}$ scales whitish tipped, in distal part mixed with single whitish scales. **Hind-**



19

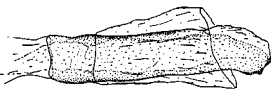
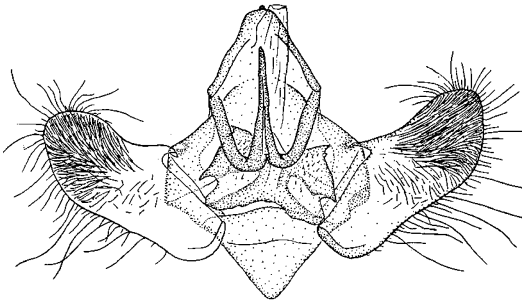


a



b

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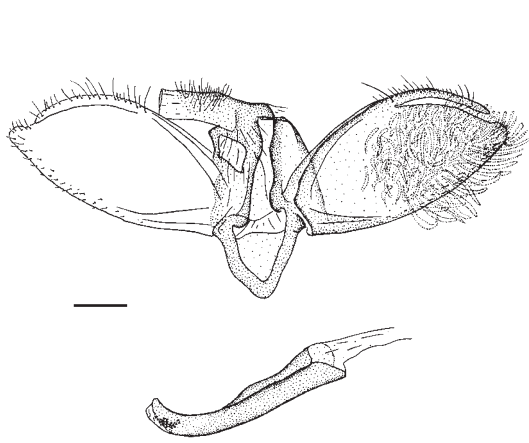


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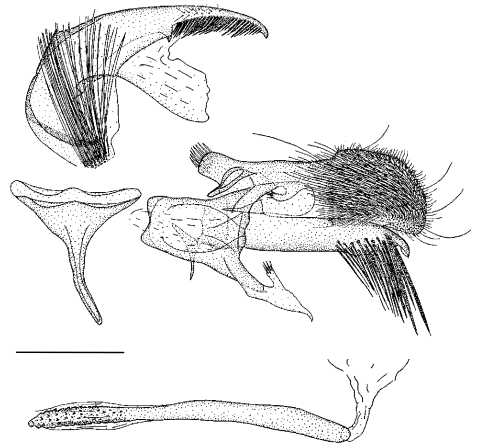


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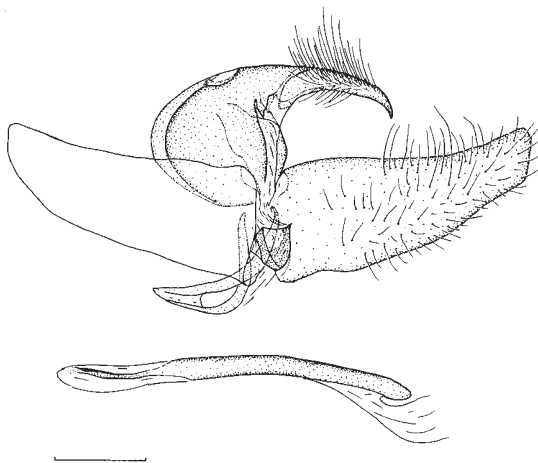
Figs. 19–22. Brachodidae, male genitalia. – 19, *Synechodes rotanicola*, holotype; 20, *S. agrippina*; 21, *S. exigua*, holotype; 22, *Miscera orpheus*, holotype. Scale bars 0.5 mm.



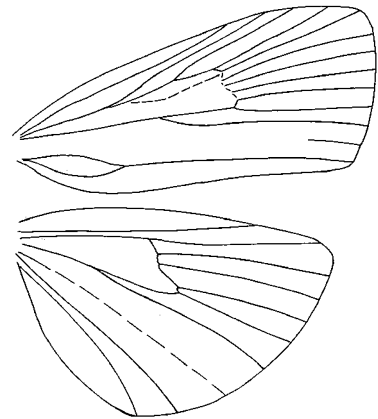
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Figs. 23–25. Brachodidae, male genitalia. – 23, *Phycodes penitis*, holotype; 24, *Paranigilgia morosa*, uncus-tegumen, vinculum, aedeagus, right valva with anellus; 25, *Phycodopteryx tigripes*, paratype. Scale bars 0.5 mm.
Fig. 26. *Ph. tigripes*, venation, ♀, paratype.

wing: black, with a white subbasal patch, divided by a black streak along CuP, fringe white; ventral side similar but with an additional white spot at posterior margin. Abdomen: fuscous-brown dorsally, white to yellow ventrally, anal tuft fuscous.

Genitalia male (AK238, fig. 22). – Valva ear-shaped, relatively short; gnathos consisting of two lateral arms that are fused distally; juxta asymmetrical; aedeagus simple, with a well-developed coecum penis.

Description female (paratype, fig. 12). – Alar expanse 24.0 mm, forewing length 11.5 mm, body length 11.5 mm.

Very similar to male; hindwing with white markings more extensive; antenna scaled ventrally and dorsally.

Genitalia female (Gen. prep. AK40, fig. 32). – Ovipositor short and broad; apophysis short, especially the anterior pair; secondary bursa larger than primary; antrum sclerotized; ostium membranous.

Variability. – The female from Sulawesi differs only in minor details from the female from Java (forewing with a white streak on the ventral side along cubital stem; labial palpus darker; antenna white scaled ventro-apically; abdomen with tergites brownish to black; tergites 1-2 with single white scales at posterior margin; sternites light brown, with a yellowish posterior margin).

Diagnosis. – This new species cannot be confused with any known Brachodidae species.

Distribution. – Java and Sulawesi, Indonesia.

Bionomics and Habitat. – Unknown. Two specimens were collected at sea level in July.

Phycodes Guenée

Phycodes Guenée, 1852: 389. Type species: *P. hirudinicornis* Guenée, 1852 (= *Chimaera radiata* Ochsenheimer, 1808), by monotypy.

Tegna Walker, 1866: 1809. Type species: *T. hyblaella* Walker, 1866 (= *Chimaera radiata* Ochsenheimer, 1808), by monotypy.

This genus is known from the most southern part of the Palaearctic region, from southern and southeastern Asia, and from Africa. In total no more than 13 valid species have been described (Diakonoff 1986, Heppner 1981, Kallies 1998).

Phycodes penitis Diakonoff

(figs 14, 23, 33)

Phycodes penitis Diakonoff, 1978: 42-43, fig. 27. Type locality: Borneo, Sarawak, Malinau, near Mt. Malu. Holotype male, in RMNH. Heppner 1981: 15.

Material examined. – MALAYSIA, BORNEO: Holotype ♂ “Malinau nr. Mt. Molu [Gunung Mulu], Nov. 6, 1910” “*Phycodes penitis* n.” “Gen. No: 7601” “Muse-

um Leiden, Holotypus, *Phycodes penitis* Diakonoff, 1978” (RMNH); 1 ♀ “Sarawak: Gunong Mulu Nat Park, R. G. S. Exped. 1977-8, J. D. Holloway *et al.*, B.M. 1978-208” “site 16. March Long Pala (Base), 70 m. 324450 Alluv. / second. for. MV-on Batu Canopy.” “B.M. Genitalia slide No. 29212” (gen. ex. by A. Kallies, No AK35) (BMNH).

The species was described in detail from a single male from Mt Mulu, Sarawak (Borneo). A second female specimen collected near the type locality was found in the unsorted material of the BMNH (fig. 14). Based on these specimens, a diagnosis and some additional notes are provided here. A female specimen and both the male and the female genitalia are figured.

Genitalia male (holotype, Diakonoff 7601, fig. 23). – Valva covered with broad scale-like setae; a finger-shaped extension along dorsal margin; aedeagus bent apically, with a group of small cornuti.

Genitalia female (Gen. prep. AK35, fig. 33). – Corpus bursae large, with a small, weak signum; ductus bursae relatively short, bent, with small sclerotized plates; ostium and antrum funnel-shaped, well sclerotized.

Diagnosis. – Alar expanse of female 25.5 mm, of male 24.5 mm. *Phycodes penitis* is similar and closely related to *Ph. radiata* (Ochsenheimer, 1808). It can be separated by only few external characters: scales in middle part of the forewing light grey with a white tip (black with white tip in *radiata*); hindwing with pale yellow markings (deep ochre-yellow in *radiata*). More importantly, *Ph. penitis* differs from *Ph. radiata* in the structure of the genitalia: finger-like extension of valva short (longer, reaching the apex of valva in *radiata*); apical part of aedeagus conspicuously bent and with small cornuti (straight, without cornuti in *radiata*); ductus bursae bent, with small sclerotization (straight, with a narrow well-defined sclerotization in *radiata*); antrum well developed, funnel-shaped (short, not funnel-shaped in *radiata*) (comp. Diakonoff, 1986: pls 68, 143, fig. 85).

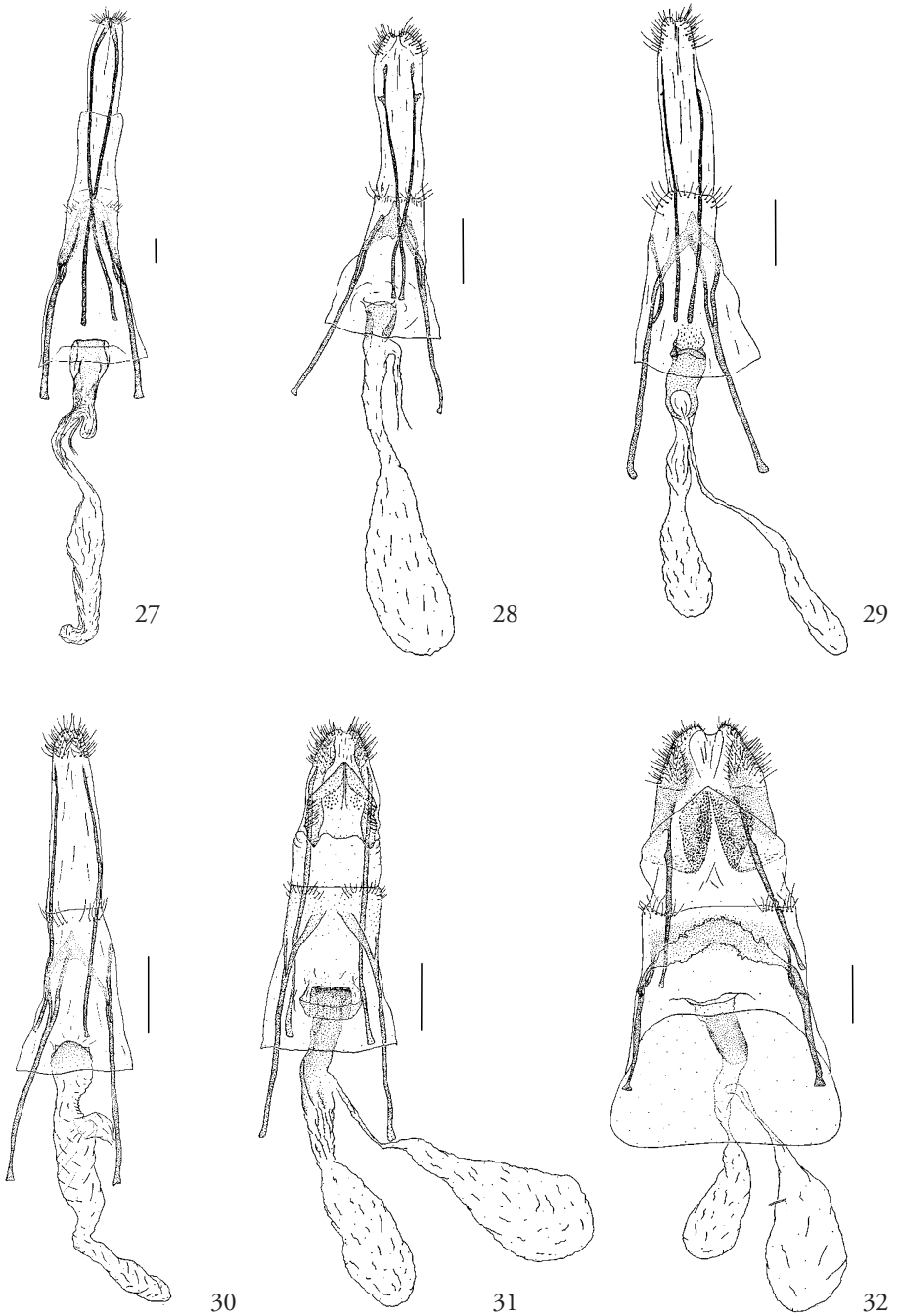
Bionomics and Habitat. – Specimens were collected in lowland secondary or alluvial forest in November.

Distribution. – Northern Borneo, Malaysia.

Paranigilgia Kallies

Paranigilgia Kallies, 1998: 327-329. Type species: *Paranigilgia aritai* Kallies, 1998, by original designation.

So far only three species of this genus are known, occurring in India, Japan, Taiwan, the Moluccas (Kallies 1998), and New Guinea (new record).



Figs. 27-32. Brachodidae, female genitalia. – 27, *Synechodes rotanicola*, paratype; 28, *S. lunaris*, paratype; 29, *S. andamanensis*, holotype; 30, *S. exigua*, paratype; 31, *Miscera sauteri*, holotype; 32, *M. orpheus*, paratype. Scale bars 0.5 mm.

Paranigilia morosa (Diakonoff)

(figs 15, 24, 34)

Phycodes morosa Diakonoff, 1948: 202, fig. 4. Type locality: Indonesia, Moluccas, Buru Island. Type ♂, in RMNH. Heppner 1981: 15. Kallies 1998: 333 (*Paranigilia*).

Material examined. – INDONESIA: Holotype ♂ "Type ♂, *Phycodes morosa*, A. Diakonoff 1946" Buru 1921, Station 9. Leg. L. J. Toxopeus, 30-VI "Gen. No., 548" (RMNH); 3 ♂, 2 ♀ Irian Jaya, Nabire, Irian Jaya - highway, km 45, 745 m, 3°29'52"S, 135°43'84"E, 23.XI.1997, leg. K. Cerny & U. Buchsbaum (gen. ex. by A. Kallies, Nos AK110, 137) (CAK, BMNH); PAPUA NEW GUINEA: 1 ♂, New Britain, Mt. Sinewit, 3500 ft, 27.VI-17.IX.1963, leg. W. W. Brandt (ANIC).

The species was described from a single badly damaged male from Buru Island, Moluccas. Later, conspecific specimens were collected in western New Guinea (Irian Jaya) and Papua New Guinea. The species is figured here and a diagnosis is provided, together with drawings of the genitalia.

Diagnosis. – Alar expanses: ♂ 16.5-18.0 mm; ♀ 17.5-18.5 mm. *Paranigilia morosa* is habitually very similar to *Paranigilia bushii* (Arita, 1980). It differs by the smaller size (alar expanse 20.0 mm in *P. bushii*) and minor characters of the wing pattern: anterior margin of hindwing grey (strongly yellowish in *P. bushii*), white specks of the forewing relatively large (smaller in *P. bushii*). Additionally, it can be distinguished from *P. bushii* by the structure of the genitalia: female genitalia (Gen. prep. AK137, fig. 34) with corpus bursae ovoid, with two distinct, moon-shaped, narrow signa (with three signa in *P. bushii*); ovipositor long and narrow; antrum and ostium well sclerotized (membranous in *P. bushii*); male genitalia (Gen. prep. AK110, fig. 24) with ventral process of valva longer and stronger, with more strong setae; aedeagus stronger; setae of gnathos shorter (cf. Kallies 1998).

Distribution. – Moluccas, Irian Jaya (Indonesia), Papua New Guinea.

Bionomics and Habitat. – Several specimens were collected at light in primary tropical forest in Irian Jaya in November at an altitude of 745 m, a specimen from Papua New Guinea was caught between end of June and mid September at more than 1000 m.

Nigilia Walker

Nigilia Walker 1863: 512. Type species: *Nigilia adjectella* Walker, 1863, by monotypy.

This genus is known from the entire tropics of the Old World, including the north-eastern part of Australia. In total only 9 species have been described, three of them currently associated with the genus *Phycodes* (Diakonoff 1986, Heppner 1981, Kallies 1998). Several as yet undescribed species are known.

Nigilia venerea (Meyrick) comb. n.

Phycodes venerea Meyrick, 1921: 181. Type locality: Java, Tegal Simpar, 3000 ft. Holotype ♀, in RMNH. Heppner, 1981: 15.

Nigilia nagaii Arita, 1987: 107-109, figs 1, 2. Type locality: Indonesia, central Sulawesi, Pucak Dingin. Holotype ♂, in NSMT (examined). Kallies 1998: 333-335, figs 13, 14, 34. Kallies 2000: 101-102, fig. 3. (syn. n.)

Material examined. – INDONESIA: Holotype ♀ "Type" [grey] "Type" [red] "Java, Tegal, Simpar, 3000 ft, Luc[assen]" "M440" "Gen. No., 10104, A. Diak[onoff]." "Metallotype ♀, *Phycodes, venerea*, Meyrick, teste: A. Diakonoff 1977"

Examination of the type specimen of *Phycodes venerea* revealed that this species belongs to the genus *Nigilia* to which it is here transferred. Furthermore, external characters provide clear evidence for *Nigilia nagaii* Arita, 1987 being a junior subjective synonym of *N. venerea*, although the slide with the genitalia preparation of the holotype of *N. venerea* has not been traced in the in RMNH (E. J. van Nieuwerkerken pers. comm.). *N. venerea* is widespread in Indonesia, ranging from Borneo (Kallies 1998), Sumatra (Kallies 2000), and Java (the type locality) to Sulawesi (Arita 1987, Kallies 1998).

Remarks. – In the original description of *venerea* Meyrick (1921) mentioned only one type specimen which is here considered as the holotype despite its misleading subsequent labelling as 'metalotype' by Diakonoff.

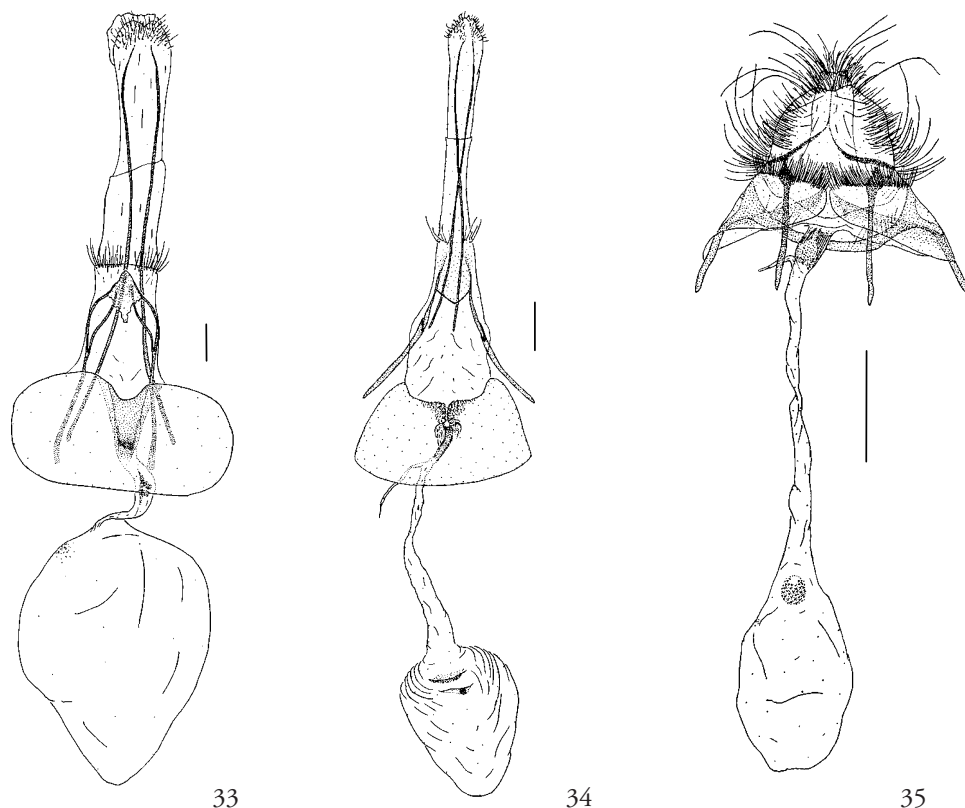
Nigilia superbella (Rebel) stat. rev., comb. n. (fig. 16)

Phycodes superbella Rebel, 1907: 89-90, pl. 1, fig. 18. Type locality: Jemen, Sokotra and Whadi Dhauruten near Ras Fartak. Syntypes in NHMW. Meyrick, 1934: 457; Heppner, 1981: 15; Diakonoff, 1986: 219; Hacker, 1999: 34.

Material examined. – JEMEN: 1 ♂, 1 ♀ (syntypes) "Sokotra, 2'99, leg. Simony" (NHMW); SAUDI ARABIA: 1 ♀, Djidda, Northern Creek, sept.-dec. 1979, U. Seneca Nielsen leg. (ZMUC).

This species was perfectly described and figured by Rebel (1907) but both the description and the type material have been overlooked by previous authors who treated this taxon as *nomen nudum* and placed it in synonymy with *Phycodes radiata* (Ochsenheimer, 1808) (Heppner 1981, Diakonoff 1986).

In the original description the close relationship of *superbella* and *Nigilia adjectella* (Walker, 1863) was pointed out by Rebel (1907). This was confirmed by the examination of the type material and consequently, *superbella* is hereby transferred to the genus *Nigilia*. This brilliant species is known from Jemen (Ras Fartak, Sokotra) and Saudi Arabia (new record).



Figs. 33-35. Brachodidae, female genitalia. – 33, *Phycodes penitis*; 34, *Paranigilgia morosa*; 35, *Phycodopteryx tigripes*, paratype. Scale bars 0.5 mm.

***Phycodopteryx* gen. n.**

Type species: *Phycodopteryx tigripes*, by present selection.

Etymology. – The genus name derives from the superficial similarity of the type species with representatives of the genus *Phycodes*.

Description. – Head: frons smooth-scaled, shining; vertex consisting of broad plate-like shining scales; ocellus present; antenna densely scaled, extremely short ciliate, lamellate, scapus short; labial palps short and broad, rough-scaled, apical joint minute; haustellum present, naked. Thorax: smooth-scaled, with bi-coloured scales (basally black, apically white). Forewings: broad, black, markings formed by bi-coloured scales (black basally, white apically); vein R5 to termen, chorda reduced, M3/Cu1 in hindwing well separated (fig. 26). Hindwing: black, with a

white subbasal band. Abdomen: smooth-scaled; segment 8 short. Legs: foreleg with a single spur, mid leg with one pair, hind leg with two pairs of tibial spurs.

Genitalia female. – Papillae anales large, with long setae; ovipositor short; apophysis short; antrum short, sclerotized; ostium small, ductus bursae long, narrow; corpus bursae relatively small; a single signum present.

Genitalia male. – Valva simple, relatively narrow and long, with simple setae; vinculum simple, saccus short; juxta small, consisting of a narrow sclerotized ring; uncus and tegumen fused; tegumen broad, large, well sclerotized, strongly convex towards dorsum; uncus well sclerotized, finger-shaped, pointed, with simple setae.

Diagnosis. – Hitherto, the subfamily Phycodinae consisted of only four genera, *Phycodes*, *Nigilgia* and

Paranigilgia, which are restricted to the Old World, and *Hoplophractis* Meyrick, 1920, which is found only in South America. The morphology of the head and wing venation of *Phycodopteryx* clearly indicates a placement of this genus in Phycodinae. In external appearance *Phycodopteryx* is similar to the genus *Phycodes*. The latter can be distinguished by the narrower forewings, the smooth labial palps, by the presence of three strong spines on the hind tibia dorso-apically, and by the venation (vein R5 to costa in *Phycodes*). From *Nigilgia*, *Phycodopteryx* differs by the absence of metallic scales on the wings and thorax. From *Hoplophractis* it differs by the presence of ocelli.

According to the morphology of the genitalia, *Phycodopteryx* is unique within the Phycodinae. While in *Phycodes*, *Nigilgia*, and *Paranigilgia* the ovipositor and the apophysis are very long and narrow, and the papillae anales are small, in *Phycodopteryx* the ovipositor and apophysis are very short and the papillae anales are large. The structure of the female genitalia of *Hoplophractis* is unknown. In the male genitalia, *Phycodopteryx* is somewhat similar to species of *Nigilgia* and *Paranigilgia*. However, both genera display highly specialised structures of the juxta, vinculum and sacculus, while these structures are simple in *Phycodopteryx*.

Phylogenetic remarks. – Phycodinae, including *Phycodopteryx*, share a distinct morphology of the head (small, labial palps short and broad with tightly appressed scales, vertex and frons with broad shining plate-like scales) (cf. Rebel 1907, Arita 1987) and a specialised type of scaling of the forewings and thorax (with bicoloured scales that are black basally and white apically). Both sets of characters should be regarded as synapomorphies indicating the monophyly of the group. The modification of the wing and thorax scales, however, may prove to be a family synapomorphy since it is also found in some Brachodinae genera. In contrast to the representatives of the subfamily Brachodinae, which are endophagous, the Phycodinae are external feeders which, with respect to the Cossoidea, the proposed sister group of the Sesiioidea, is considered to be the apomorphic state (Kristensen 1999). The female genitalia of *Phycodes*, *Nigilgia* and *Paranigilgia* species with their long, extensible ovipositor and small papillae anales suggest that these species have evolved from endophagous ancestors and that the females of these genera secrete their eggs into deep and hidden places. According to the female genitalia, it can be assumed that females of *Phycodopteryx* place their eggs on the surface of the host-plant and that, similar to other Phycodinae, the larvae feed externally. The reduction in the length of the ovipositor and the enlarged of the papillae anales are here interpreted as apomorphic state. The structure of the uncus-tegumen complex of the male *Phycodopteryx* genitalia suggests a sister group relation with *Nigilgia* and *Para-*

nigilgia both of which are recognized by the fused tegumen and uncus as well as the pointed tip of the latter.

Phycodopteryx tigripes sp. n.
(figs 17, 18, 25, 26, 35)

Material examined. – VIETNAM: Holotype ♀ 'Viet Nam, Prov. Vinh Phu, Tam Dao, 950 m, 7. 5. 1998, Riefenstahl & Wagenblaß' (CAK). Paratypes: 4 ♀, same data as holotype (CAK, RMNH, BMNH); 1 ♀, same data as holotype, but 4. V. 1998 (CAK); 1 ♀, same data as holotype, but 1100 m, 2. VI. 1997, leg. Y. Arita (CAK); 1 ♀, same data as holotype, but 1295 m, 15. V. 1997, leg. T. Yamasaki (NSMT); 1 ♂, same data as holotype, but 8. V. 1998 (Gen. prep. AK99) (CAK); 2 ♂, Cao Bang, Mt. Pia Oac, 1200 - 1400 m, 22. - 27. V. 1999, leg. M. Owada (NSMT); 2 ♀, same data, but 19. - 22. V. 2000 (NSMT). – Additional material examined (excluded from type series): INDIA: 1 ♀ "Cherra Punji, Khasias / 1894 / Nat. (Doncaster)" "Walsingham Collection 1910-427" (genitalia examined by A. Kallies, Gen. prep. AK106, BM29210) (BMNH).

Etymology. – The species name derives from the forewing markings, which resemble those of a tiger's leg.

Description female (holotype, fig. 18). – Alar expanse 25-30 mm, forewing length 12.0-14.5 mm, body length 10-14 mm.

Head: black, shiny; labial palps with basal joint bright white. Thorax: black dorsally, white ventrally; tegulae and patagia black with minute white speckles. Forewing: black, termen and fringes black, shiny; forewing with irregular grey bands that are formed by white and black, bicoloured scales; ventral side black, with an ill-defined white spot in middle. Hindwing: black, with a broad, white subbasal band; ventral side similar but white band much broader, leaving only a black band along outer margin. Legs: fore coxa white; fore femur black, white basally; remaining part of fore leg mainly black with minute white speckles; mid coxa whitish; mid femur black, white basally; mid tibia black, a white spot in middle and apically; mid tarsus black, a white spot basally and in middle; hind coxa, femur and tibia mainly white, hind tibia black basally and subapically; hind tarsus white basally and in middle. Abdomen: dirty white dorsally, tergites 1, 7 and 8 light grey; sternites white, grey basally; sternites 7 and 8 grey; anal tuft grey.

Genitalia female (Gen. prep. AK12, fig. 35). – See the generic diagnosis provided above.

Description male (paratype, fig. 17). – Alar expanse 23-25 mm, forewing length 11-12 mm, body length 10.0-10.5 mm.

Similar to female, but smaller and darker, hind-

wing blackish brown almost throughout, with white scales only in discal area.

Genitalia male (Gen. prep. AK99, fig. 25). – See the generic diagnosis provided above.

Diagnosis. – The new species cannot be confused with any other Brachodidae.

Distribution. Although the species is probably widespread, it is presently known only from two localities in northern Vietnam and another in north-eastern India.

Bionomics and Habitat. – All specimens from Vietnam were collected in submontane tropical forest by day between early May and early June, suggesting a single generation per year.

Remarks. – Owing to the differences in coloration, the female from Khaxis was excluded from the type series, although there were no differences in the structure of the genitalia. Until additional material is known it is not clear whether it indeed belongs to the species described here or should be separated.

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