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DESCRIPTIONS OF STREPSIPTERA (INSECTA) FROM SOUTHEAST ASIA, WITH A CHECKLIST OF THE GENERA AND SPECIES OCCURRING IN THE REGION

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ABSTRACT.- Ten new species: six of Halictophagidae, three of Myrmecolacidae and one of Elenchidae, are described and twelve new records: two of Corioxenidae and ten of Myrmecolacidae are provided. A checklist of the genera and species of Southeast Asian Strepsiptera, along with keys to the subfamilies of Halictophagidae, and the genera of Halictophaginae are given.

INTRODUCTION

The first strepsipteran from Southeast Asia was captured by Wallace in 1867. This was from a homopteran in Sarawak and was later described by Westwood (1877) as *Colacina insidiator.* This was also the first description of a strepsipteran from a non-hymenopteran host.

Five hundred and fifty-four species of Strepsiptera have been described worldwide so far. This paper is the first comprehensive one of Strepsiptera from Southeast Asia.

MATERIALS AND ABBREVIATIONS

Abbreviations: ZML - Zoological Museum, Lund, Sweden; CNC - Canadian National Collection, Ottawa, Canada; OUM - Hope Entomological Collections, University Museum, Oxford, U.K.; S.A. - S. Adebratt (name of collector).

Wing expanse - widest length of wing.

Location: A1L - Mendolong, Sipitang, Sabah, N. Borneo, 40^0 52' N, 115^0 43' E; W5L - Mendolong, Sipitang, Sabah, N. Borneo; P1 - Mendolong area, Sipitang, Sabah, N. Borneo, 4^0 48' N, 115^0 40' E.

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CHECKLIST OF STREPSIPTERA FROM SOUTHEAST ASIA

Taxa	Distribution	Hosts
	Family Corioxenidae Kinzelbach, 1970	
Subfamily **Corioxeninae** Kinzelbach, 1970		
Genus *Malayaxenos* Kifune, 1981		
kitaokai Kifune, 1981	Ipoh (W. Malaysia)	unknown
Subfamily **Triozocerinae** Kinzelbach, 1970		
Genus *Triozocera* Pierce, 1909		
boharti Luna de Carvalho, 1967	Negros, Mindanao	unknown
mexicana: Luna de Carvalho, 1956 (nec Pierce, 1909)	(Philippines)	
siamensis Kifune & Hirashima, 1979	San Pa Tong (Thailand)	unknown
	Tawau (Sabah)	
	Luang Prabang (Laos)	
	Perak (W. Malaysia)	
	Family Halictophagidae Perkins, 1905	
Subfamily **Tridactylophaginae** Hofeneder & Fulmek, 1943		
Genus *Tridactylophagus* Subramanium, 1932		
similis Kinzelbach, 1971a	Mindanao (Philippines)	unknown
Subfamily **Halictophaginae** Perkins, 1905		
Genus *Halictophagus* Curtis, 1831		
australensis Perkins, 1905	Qld. (Australia), W. Malaysia, Sarawak (E. Malaysia)	*Cofana spectra*
spectrus Yang, 1964	Sri Lanka, China, Japan,	
helleri Kinzelbach, 1971c	Sabah (E. Malaysia)	
jacobsoni de Meijere, 1908	Java	*Ossoides lineatus* Bierman
peradenyia (Pierce, 1911)	Peradeniya (Sri Lanka)	*Thompsoniella arcuata* Mots.
	Kuala Lumpur (W. Malaysia-Dover, 1927)	
javanensis (Pierce, 1918)	Buitenzorg (Java)	unknown
(*Cyrtocaraxenos*)	Leyte (Philippines)	
fulmeki (Hofeneder, 1927)	Sumatra	unknown
piperi Bohart, 1943	Luzon (Philippines)	*Cofana longa* Wall
bipunctatus Yang, 1955 (*Tettigoxenos*)	China, Japan	*Nephotettix nigropictus* (Stål)
munroei Hirashima & Kifune, 1978		*N. cincticepus* (Uhler)
Hirashima & Kifune, 1985	Indonesia	*N. virescens* (Distant)
	Philippines, W. Malaysia, Sarawak (E. Malaysia)	*Recilia dorsalis* (Motschulsky)
steffani Kinzelbach, 1971a	Tarawakan (Philippines)	unknown

Checklist of Strepsiptera from Southeast Asia (cont'd)

Taxa	Distribution	Hosts
longipenis Kifune, 1981	Ipoh (W. Malaysia)	unknown
malayanus Kifune, 1981	Ipoh (W. Malaysia)	unknown
chantaneeae Kifune & Hirashima, 1983a	San Po Tong (Thailand)	unknown
thaiae Kifune, 1983a	Bah Mae Kachiang (Thailand)	*Thaia oryzivora* Ghauri
yaeyamanus Kifune (in Kifune & Hirashima, 1984)	Japan	
stenocrani Kifune, 1986a	Japan	*Stenocranus minutus* (Fabricius)
thoracicus Kifune & Hirashima, 1989	Forest Camp (Sabah, E. Malaysia)	unknown
angustipes Kifune & Hirashima, 1989	Tawau (Sabah, E. Malaysia)	unknown
shepardi Barrion & Litsinger, 1989	Laguna (Philippines)	*Heralus viridis* (Distant)
libetarioi Barrion & Litsinger, 1989	Mindanao (Philippines)	unknown
Genus *Stenocranophilus* Pierce, 1914		
dicranotropidis (Pierce, 1918) (*Muirixenos*)	Java	*Dicranotropis muiri* Kirkaldy
	Family **Callipharixenidae** Pierce, 1918	
Genus *Callipharixenos* Pierce, 1918		
siamensis (Pierce, 1918) (*Chrysocorixenos*)	Thailand	*Chrysocoris grandis* Thunberg
	Family **Elenchidae** Perkins, 1905	
Subfamily Elenchinae Perkins, 1905		
Genus *Elencholax* Kinzelbach, 1971a		
noonadanae Kinzelbach, 1971a	Balabac (Philippines)	unknown
Genus *Colacina* Westwood, 1877		
insidiator Westwood, 1877	Sarawak (E. Malaysia)	*Epora subtilis* Walker
Genus *Elenchus* Curtis, 1831		
japonicus (Esaki & Hashimoto, 1931)	Japan, China	*Sogatella furcifera* (Horváth)
yasumatsui Kifune & Hirashima, 1975	W. Malaysia, Sarawak (E. Malaysia) Philippines, Thailand	*Nilaparvata lugens* (Stål) *Laodelphax striatallus* (Fallén) *Nilaparvata muiri* China *Sogatella vibix* (Haupt)
	Family **Myrmecolacidae** Saunders, 1872	
Genus *Lychnocolax* Bohart, 1951		
mindanao Bohart, 1951	Mindanao (Philippines) New Ireland, New Guinea, Palau Is.	unknown

Checklist of Strepsiptera from Southeast Asia (cont'd)

Taxa	Distribution	Hosts
mindoro Bohart, 1951	Mindoro, Busuanga, Culion (Philippines)	unknown
postorbis Bohart, 1951	Mindanao (Philippines)	unknown
	Ipoh (W. Malaysia), Kalabakan (Sabah)	unknown
ovatus Bohart, 1951	Mindanao (Philippines)	unknown
	Kalabakan (Sabah, E. Malaysia)	
palpalis Bohart, 1951	Mindanao (Philippines)	unknown
orientalis Kifune, 1981	Ipoh (W. Malaysia), Solomon Is.	unknown
aerius Kifune & Hirashima, 1989	K. Tahan to K. Tembeling (W. Malaysia)	unknown
vietnamicus Kifune & Hirashima, 1989	Vietnam	unknown
Genus *Myrmecolax* Westwood, 1861		
nietneri Westwood, 1861	Ramboddo, Sri Lanka	*Camponotus* group (host of male)
		maculatus-mitis group
Elenchus tenuicornis: Green, 1902	Peradeniya, Sri Lanka, Kuala Tembeling	
(nec Kirby, 1815)	(Pahang, W. Malaysia-Dover, 1927)	
flagellatus (de Meijere, 1908)	Java (Indonesia)	unknown
culionensis Bohart, 1951	Calamianes (Philippines)	unknown
furcatus Bohart, 1951	Mindanao, Busnanga (Philippines)	unknown
	Bau (Sarawak, E. Malaysia)	
philippinensis Bohart, 1941	Mindanao (Philippines)	unknown
rossi Bohart, 1951	Mindoro, Mindanao,	unknown
	Luzon, Busnanga (Philippines),	
	Ipoh (W. Malaysia), Sumatra (Indonesia),	
	Lantau (Hong Kong)	
odontognathus Kogan & Oliveira, 1964	New Guinea, Soloman Is., New Britain	unknown
	Luzon (Philippines),	
	Tawau (Sabah, E. Malaysia),	
	Tebang (Sarawak, E. Malaysia)	
chantaneeae Kifune & Hirashima, 1979	Sau Pa Tong (Thailand)	unknown
genitalis Kifune & Hirashima, 1989	Laos, Pahang (W.Malaysia)	unknown
Genus *Stichotrema* Hofeneder, 1910		
dallatorreanum Hofeneder, 1910	Admiralty Is., New Guinea	*Segestes decoratus* Redtenbacher,
	Australia, Sri Lanka	
	Tawau (Sabah, E. Malaysia)	*Sexava nubila* (Stål),
		Segestidea novaeguineae
		(host of female)
davao (Bohart, 1951)	Mindanao, Busnanga (Philippines)	unknown
(Rhipidocolax)		
retrorsum (Bohart, 1951)	Mindanao (Philippines)	unknown
Rhipidocolax retrosus	Ipoh (W. Malaysia)	
	Tawau (Sabah, E. Malaysia)	
acutipenis Kogan and Oliveira, 1964	New Guinea, Tawau (Sabah, E. Malaysia)	*Camponotus papua* Emery
	Northern Territory (Australia), Sri Lanka	

Checklist of Strepsiptera from Southeast Asia (cont'd)

Taxa	Distribution	Hosts
malayanum Kifune, 1981	Ipoh (W. Malaysia)	unknown
yasumatsui Kifune, 1983b	Thailand	*Euscyrtus* sp. (host of female)
silvaticum Kifune & Hirashima, 1989	Tawau (Sabah, E. Malaysia)	unknown
	Family **Stylopidae** Kirby, 1813	
Subfamily **Xeninae** Saunders, 1872		
Genus *Xenos* Rossi, 1793		
Xenos du Buysson, 1903		
Acroschismus Pierce, 1908		
Schistosiphon Pierce, 1908		
Vespaexenos Pierce, 1909		
Belonogastechthrus Pierce, 1911		
Clypoxenos Brèthes, 1923		
Brasixenos Kogan & Oliveira, 1966		
moutoni du Buysson, 1903	China, Taiwan, Japan	*Vespa mandarina noblis* Sonan
Vespaexenos crabronis Pierce, 1909		
V. buyssoni Pierce, 1909	Vietnam	*V. tropica pseudosorer*
V. matsumurai Székessy, 1965		
V. japonicum Matsumura, 1931		
ropalidiae (Kinzelbach, 1975)	New Guinea, Indonesia	*Ropalidia fulvopruinosa*
	Philippines, Pakistan	*R. ferruginea*, *R. varietata*
formosanus Kifune & Maeta, 1985	Puli, Taiwan	*Vespa velutina flavitarsus* Sonan
circularis Kifune & Maeta, 1985	Chunyang, Taiwan	*Polistes rothneyi gressitti* van der Vecht
yamaneorum Kifune & Maeta, 1985	Hengchun, Taiwan	*Polistes gigas* (Kirby)
provesparum Kifune, 1986b	Sumatra	*Provespa anomala* (Saussure)
		P. nocturna van der Vecht
Genus *Pseudoxenos* Saunders, 1872		
Leinotoxenos Pierce, 1909		
Monobiaphila Pierce, 1909		
Montezumiaphila Brèthes, 1923		
Macroxenos Schultze, 1925		
piercei (Schultze, 1925)	Luzon, Cebu,	*Rhynchium atrum atrum* Saussure
(*Macroxenos*)	Mindanao (Philippines)	*R. atrissimum* van der Vecht
schultzei Kifune & Maeta, 1965		
Genus *Paraxenos* Saunders, 1872		
abbotti (Pierce, 1909) (f)	Thailand	*Sphex* sp.
kurosawai Kifune, 1983	Palawan (Philippines)	*Sphex madasummae* van der Vecht
Subfamily **Stylopinae** Kirby, 1813		
Genus *Hylecthrus* Saunders, 1850		
taiwan Kinzelbach, 1971d	Shonorya, Taiwan	*Hylaeus* sp.

Checklist of Strepsiptera from Southeast Asia (cont'd)

Taxa	Distribution	Hosts
Genus *Halictoxenos* Pierce, 1908		
Apractelytra Pierce, 1908		
Halictostylops Pierce, 1909		
Halictoxenos (*Halictophilus*) Pierce, 1909		
Halictoxenos (*Augochlorophilus*) Pierce, 1911		
manilae Pierce, 1909	Manila (Philippines)	*Euylaeus manilae* (Ashmead)
robbii Pierce, 1909	Manila (Philippines)	*E. robbii* (Ashmead)

FAMILY CORIOXENIDAE KINZELBACH, 1970

Mengeidae Pierce, 1908: 75.
Callipharixenidae Blair, 1936: 116.
Corioxeninae Kinzelbach, 1970: 106; Miyamoto & Kifune (1984): 143; Kathirithamby (1989a): 71.

Nine species have been described from the Australian-Pacific Region (Kathirithamby, 1990), and three from Southeast Asia: two of which are noted as new records here. Only the subfamilies Corioxeninae and Triozocerinae have been recorded from Southeast Asia. Uniclavinae is endemic to the African region.

SUBFAMILY CORIOXENINAE KINZELBACH, 1970

Corioxeninae Kinzelbach, 1970: 106.
Corioxeninae - Kathirithamby (1989a): 71.
Blissoxeninae Miyamoto & Kifune, 1984: 142 (syn).

There are six genera in this subfamily. *Austrostylops* is endemic to the Australian region (Kathirithamby, 1989a), *Malayaxenos* to Asia, *Blissoxenos* to Japan, and there is one new genus from Florida (Kathirithamby & Peck, in press).

Genus *Malayaxenos* Kifune, 1981

Malayaxenos Kifune, 1981: 323.
Type species: *Malayaxenos kitaokai* Kifune, 1981.

Malayaxenos kitaokai Kifune, 1981

Malayaxenos kitaokai Kifune, 1981, *Kontyû* **49**(2): 323. Loc: WEST MALAYSIA: Ipoh, Perak.

Material. - 1 male (ZML), light trap, A1L, Mendolong, Sipitang, Sabah, coll. S.A., 26.xi.1987.

Distribution. - Ipoh, W. Malaysia; Sipitang, Sabah.

Remarks. - The subfamily Corioxeninae incorporates the genera *Blissoxenos*, *Loania*, *Corioxenos*, *Mufagaa*, *Malayaxenos* and *Australoxenos*. *A. yetmaniensis* Kathirithamby, 1990, is similar to *M. kitaokai* in the structure of the mandibles, and the Xth abdominal segment, but differs from it in the absence of the projections on the Ist and IInd tarsal segments, CuA_1 being longer than half of CuA_2, CuP being as long as CuA_1, and the smaller overall size.

SUBFAMILY TRIOZOCERINAE KINZELBACH, 1970

Triozocerinae Kinzelbach, 1970: 105.
Triozocerinae - Kathirithamby, 1989a: 71.

Genus *Triozocera* Pierce, 1909

Trioxocera Pierce, 1909: 89; 1911: 490.
Type species: *Triozocera mexicana* Pierce, 1909.

Triozocera siamensis Kifune & Hirashima, 1979

Triozocera siamensis Kifune & Hirashima, 1979, *Esakia*, **14**: 62. Loc. THAILAND: San Pa Tong. - Kifune, 1981, *Kontyû*, **49**(2): 322. Loc. W. MALAYSIA: Ipoh, Perak. - Kifune & Hirashima, 1989, *Esakia*, **28**: 13. Loc. SABAH: Tawau District, Kalabakan; LAOS: Luang Prabang.

Material. - male (ZML), light trap, A1L, Mendolong, Sipitang, Sabah, coll. S.A., 26.xi.1987; 1 male, 20.ii.1988, same data as above.

Distribution. - San Pa Tong, Thailand; Ipoh, W. Malaysia; Tawau District and Sipitang, Sabah; Luang Prabang, Laos.

FAMILY HALICTOPHAGIDAE PERKINS, 1905

Halictophaginae Perkins, 1905: 98.
Halictophagoidea - Pierce, 1908: 76.
Halictophagidae - Pierce, 1908: 76.
Dioxoceridae Pierce, 1908: 76.
Diozoceridae - Pierce, 1911: 504.

Kinzelbach (1971b) divided the Halictophagidae into three subfamilies, Coriophaginae Kinzelbach, 1971b, Tridactylophaginae Hofeneder & Fulmek, 1943, and Halictophaginae Perkins, 1905. But the characters he gave for the erection of Coriophaginae as a subfamily are not sufficient for its separation from the Halictophaginae. It is proposed that *Coriophagus*, *Stenocranophilus* and *Halictophagus* are three genera in the subfamily Halictophaginae.

Halictophagus, *Coriophagus* and *Tridactylophagus* have been recorded in Southeast Asia.

KEY TO THE SUBFAMILIES OF HALICTOPHAGIDAE

Adult males:

1. Antenna 6-segmented with flabellum only on IIIrd segment; parasites of Diptera (Tephritidae) ..... Dipterophaginae
   Antenna 7-segmented with flabellum on segments III, or III-VI 2

2. Antenna with flabellum only on segment III; parasites of Orthoptera (Tridactylidae) .... Tridactylophaginae
   Antenna with flabellum on segments II-IV, III-V or III-VI; parasites of Homoptera (Cicadellidae, Delphacidae, Eurybrachyidae, Fulgoridae, Tetttigometridae, Issidae, Tettigometridae, Flatidae, Cercopidae, and Membracidae) and Heteroptera (Pentatomidae) ..... Halictophaginae

SUBFAMILY HALICTOPHAGINAE PERKINS, 1905

Halictophaginae Perkins, 1905: 98.
Coriophaginae Kinzelbach, 1971b: 8.

KEY TO THE GENERA OF HALICTOPHAGINAE

Adult males:

1. Flabella of antennal joints broad and flattened 2
   Flabella of antennal joints round, and may be short on Vth and VIth segments .... *Stenocranophilus*

2. Head capsule with recognisable regions; larger species ..... *Coriophagus*
   Head capsule simplified; smaller species ..... *Halictophagus*

Genus *Coriophagus* Kinzelbach, 1971b

Halictophagus Bohart, 1962: 91 (partim).
Coriophagus Kinzelbach, 1971b: 8.

Type species: *zanzibarae* Bohart, 1962.

Seven species have been described from the Australian-Pacific Region (Kifune & Hirashima, 1989; Kathirithamby, 1992).

Coriophagus adebratti, new species

(Figs. 1-7)

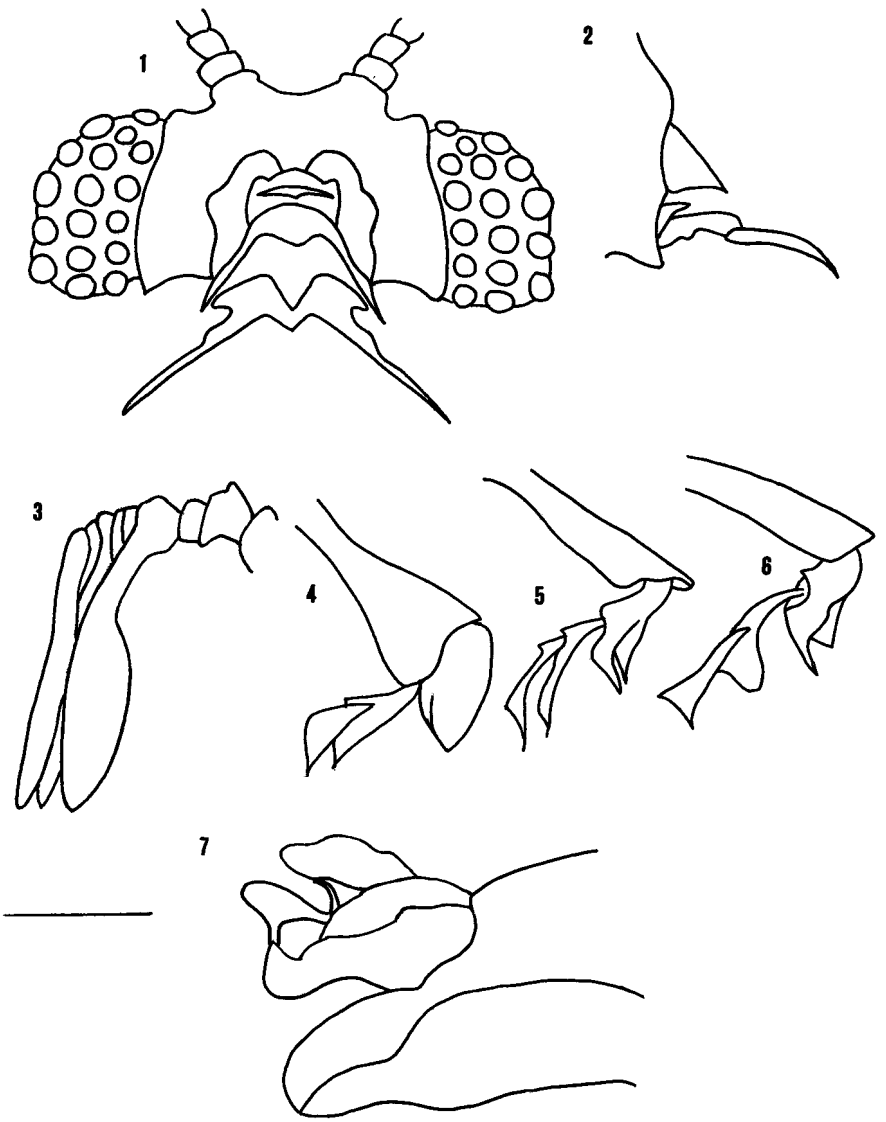
Material. - Holotype - male (ZML), A1L, Mendolong, Sipitang, Sabah, coll. S.A., 6.iv.1988.

Description. - Male. Ommatidia ± 25. Head width (including eyes) 0.97mm, (excluding eyes) 0.56mm (Fig. 1). Mandibles (0.09mm) almost the same length as basal segment of maxilla (1.00mm), maxillary palpi, 1.50mm (Fig. 2).

Ist antennal segment, 0.09mm, IInd, half as long (0.04mm), IIIrd, the longest, 0.64mm; IVth-VIIth almost the same lengths, (IVth, 0.58mm; Vth, 0.59mm; VIth, 0.58mm; VIIth, 0.54mm) (Fig. 3).

Wing span, 2.05mm.

Tarsi as in Figs 4-6.



Figs. 1-7. *Coriophagus adebratti*, new species. 1, head, dorsal view; 2, mandible and maxilla, right lateral view; 3, left antenna; 4, left fore tarsi; 5, left mid tarsi; 6, left hind tarsi; 7, right lateral view of IXth and Xth abdominal segment. Scale line: 1 & 3, 0.3mm; 2, 4, 5, 6 & 7, 0.2mm.

VIIIth abdominal segment large, aedeagus length, 0.11mm (Fig. 7).

Total body length, 3.47mm.

Etymology. - This species is named after the collector S. Adebratt.

Remarks.- Differs from *C. borneensis*, new species, by larger ommatidia, maxilla and aedeagus of different shape and size.

Smaller size than *C. rieki* Kinzelbach, 1971a, with larger ommatidia, and different shape and size of maxilla and aedeagus.

Differs from *C. lockerbiensis* Kathirithamby, 1992, from Australia by the larger and fewer ommatidia, shape and size of maxilla and aedeagus.

Differs from *C. monteithi* Kathirithamby, 1992, from Australia by the different shape and size of maxilla and aedeagus.

***Coriophagus borneensis*, new species**

(Figs. 8-15)

Material.- Holotype - male (ZML), P1, Mendolong, Sipitang, Sabah, coll. S.A., 10.iii.1989.

Description.- Male. Ommatidia ± 25. Head width (including eyes) 0.85mm (Fig. 8). Mandibles (0.09mm) longer than maxillary palpi (0.05mm); basal maxillary segment (0.02mm) (Fig. 9). Ist antennal segment (0.06mm) slightly longer than IInd (0.04mm); IIIrd, longest (0.55mm); IVth, 0.51mm; Vth, 0.53mm; VIth (0.48mm) almost as long as VIIth (0.47mm) (Fig. 10).

R_2 half the length of R_3. Wing span, 2.30mm.

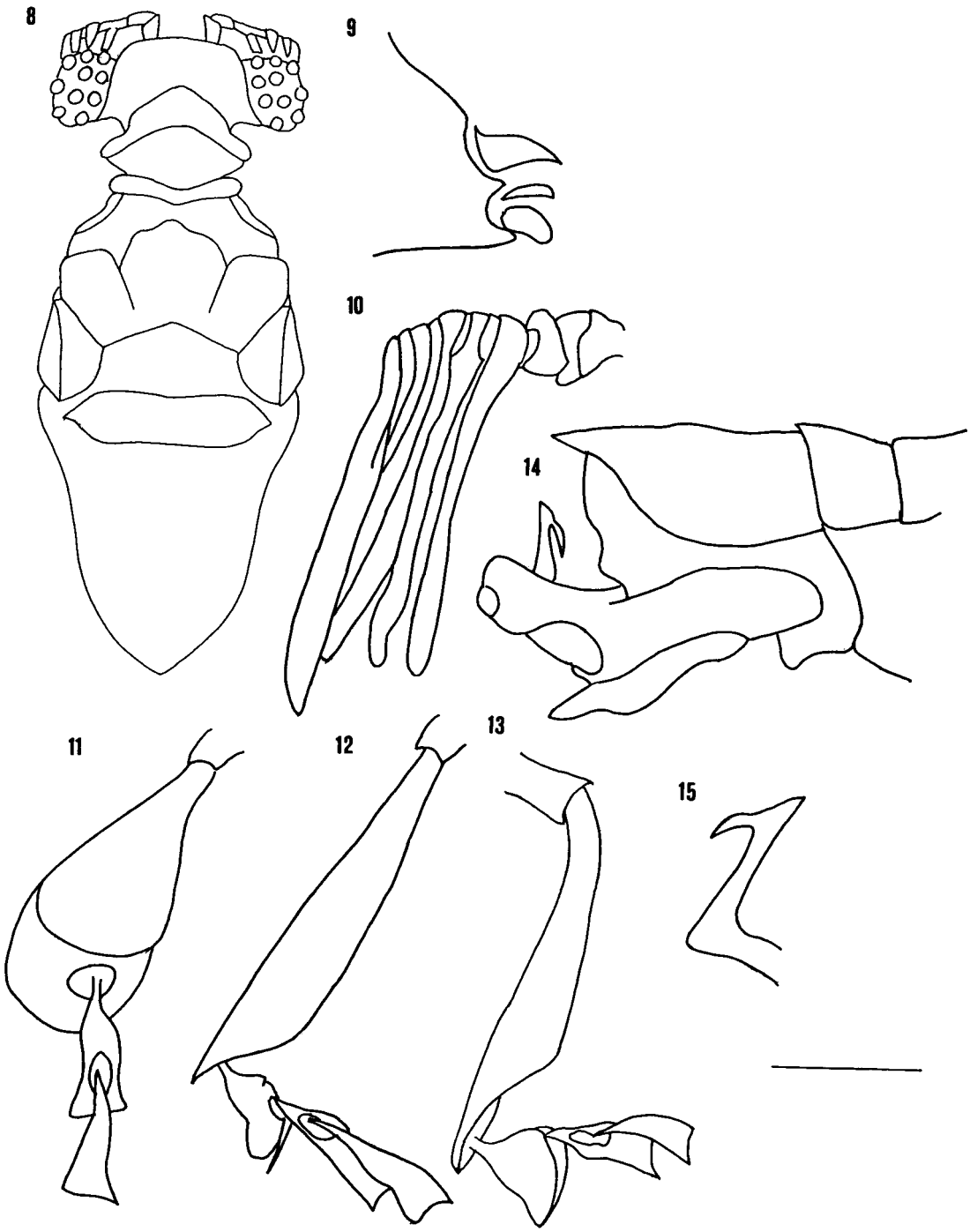
Ist tarsal segment on proleg rounded, Ist tarsal segment on mid- and hind legs with projections (Figs 11-13).

VIIIth abdominal sternite large (Fig. 14), IXth segment about half the size of VIIIth. Aedeagus length, 0.23mm (Fig. 15).

Total body length, 3.41mm.

Remarks.- These are the first Coriophaginae to be described from Southeast Asia, which have so far been recorded from the Australian-Pacific region and Africa (Kifune & Hirashima, 1989; Kathirithamby, 1992).

This new species differs from the Australian species *C. lockerbiensis* Kathirithamby, 1992, from Queensland by the smaller maxillary palpi, larger and fewer ommatidia and the shape of the aedeagus; from *C. rieki* Kinzelbach, 1971a, from Canberra and New South Wales by the smaller size, larger and fewer ommatidia, longer antennal segments, smaller 10th segment and shape of the aedeagus; and from *C. gressittorum* Kifune and Hirashima, 1989, from the Soloman Islands, by the larger size, longer wing span, and length of R_2 and R_3 of wing.



Figs. 8-15. *Coriophagus borneensis*, new species. 8, head and thorax, dorsal view; 9, mandible and maxilla, right lateral view; 10, left antenna; 11, right fore leg; 12, right mid leg; 13, right hind leg; 14, VIIIth, IXth and Xth abdominal segments, left lateral view; 15, aedeagus right lateral view. Scale line: 8, 0.05mm; 9, 10, 11, 12, 13 & 15, 0.2mm; 14, 0.3mm.

Genus *Halictophagus* Curtis, 1831

Halictophagus Curtis, 1831: 433.
Halictophaugs (*Bruesia*) Perkins, 1905: 102.
Megalechthrus Perkins, 1905: 105.
Pentacladocera Pierce, 1908: 80.
Pentoxocera Pierce, 1908: 80.
Anthericomma Pierce, 1908: 84.
Dioxocera Pierce, 1908: 81.
Agalliaphagus Pierce, 1908: 83.
Neocholax Pierce, 1909: 160.
Pentogrammaphila Pierce, 1909: 169.
Diozocera Pierce, 1911: 504.
Pentozocera Pierce, 1911: 504.
Pentozoe Pierce, 1911: 504.
Tettigoxenos Jeannel, 1913: 4.
Pyrilloxenos Pierce, 1914: 128.
Dacyrtocara Pierce, 1918: 473.
Cyrtocaraxenos Pierce, 1918: 475.
Indoxenos Subramanian, 1927: 132.
Oedicystis Hofeneder, 1927: 377.
Pseudopatella Bohart, 1937: 101.
Membracixenos Pierce, 1952: 5.

Fourteen Australian-Pacific species have been described so far (Kifune & Hirashima, 1989; Kathirithamby, 1992).

Halictophagus abdominalis, new species
(Figs. 16-23)

Material.- Holotype - male (ZML), A1L, Mendolong, Sipitang, Sabah, coll. S.A., 30.iv.1988.

Description.- Male. Ommatidia ± 20. Head width (including eyes), 0.55 mm wide, between eyes, 0.43mm (Fig. 16). Mandibles small (0.07mm). Maxillary palpi, 0.16mm; basal segment, 0.04mm (Fig. 17). Antennae as in fig. 18

Ist tarsal segment of proleg rounded (Fig. 19). Ist tarsal segment of mid- and hind leg with hooks (Figs. 20, 21).

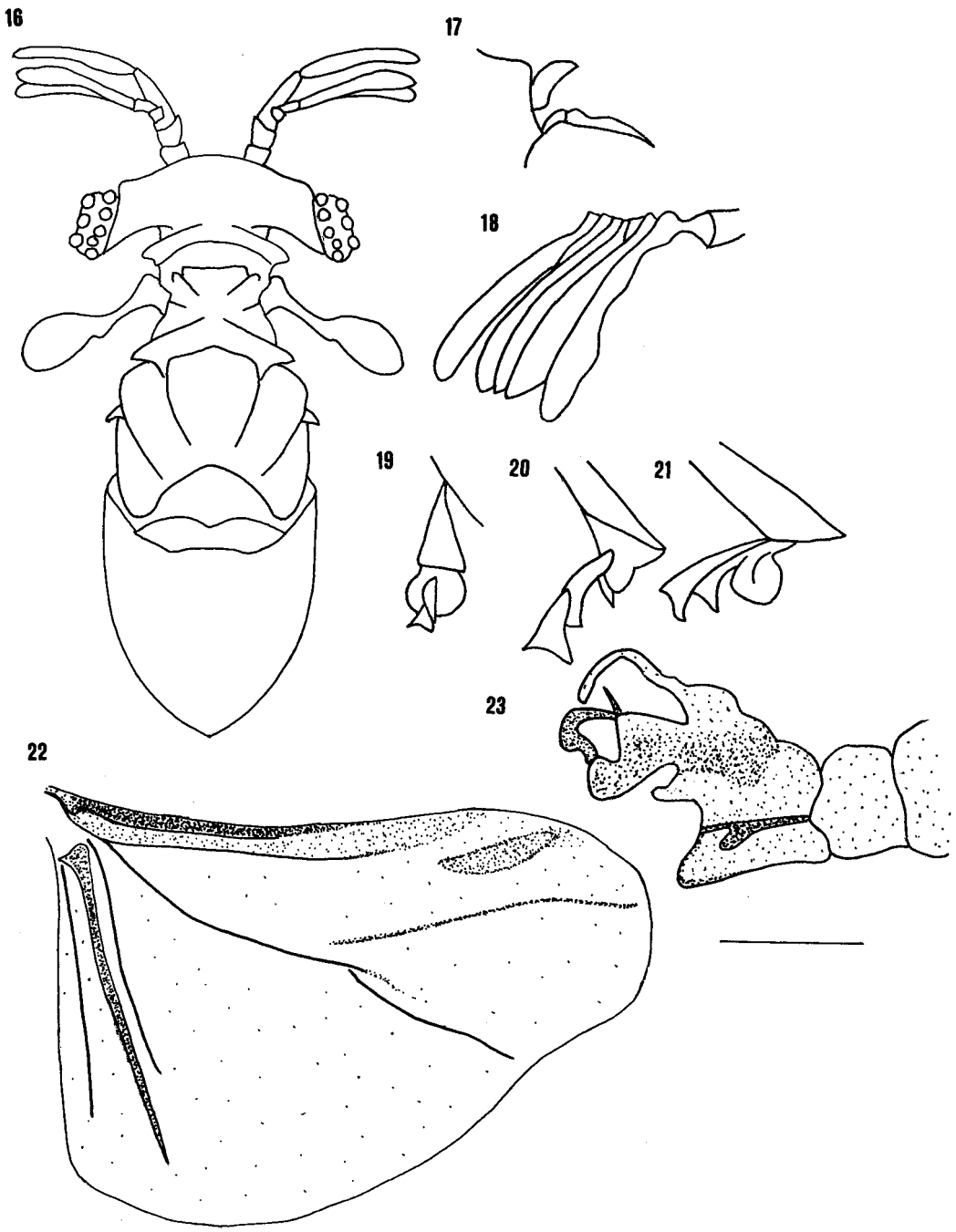
R_4 very long and two thirds the length of R_5 (Fig. 22). Wing expanse, 1.23mm.

Aedeagus length, 0.10mm. Xth abdominal segment very long and covers aedeagus (Fig. 15). VIIIth segment unusually shaped with projections (Fig. 23).

Total body length, 1.00mm.

Etymology.- This species is named *abdominalis* due to its peculiarly shaped abdominal segments.

Remarks.- This species is distinguished from all others by the elaborately shaped VIIIth and long Xth abdominal segments.



Figs. 16-23. *Halictophagus abdominalis*, new species. 16, head and thorax, dorsal view; 17, mandible and maxilla, right lateral view; 18, left antennae; 19, right fore tarsus; 20, right mid tarsus; 21, right hind tarsus; 22, right wing; 23, IXth and Xth abdominal segments, right lateral view. Scale line: 16 & 22, 0.03mm; 17, 18, 19, 20, 21 & 22, 0.2mm.

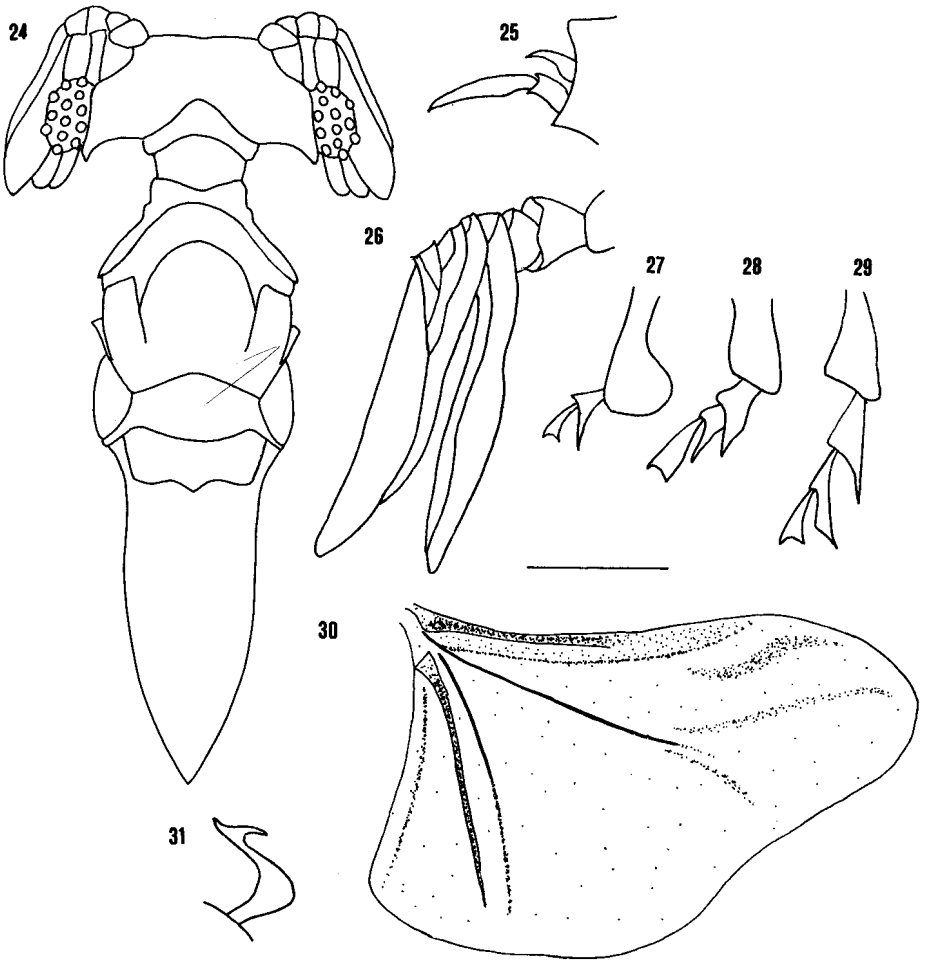
***Halictophagus antennalis*, new species**
(Figs. 24-31)

Material.- Holotype - male (ZLM), P1, Mendolong, Sipitang, Sabah, coll. S.A., 10.iii.1989.

Paratypes - 2 males, same data as above; 1 male (ZLM), W5L, light trap, coll. S. A., 19.iv.1988.

Description.- Number of ommatidia ± 25. Head width 0.66-0.69mm (Fig. 24). Mandibles 0.05-0.06mm. Maxillary palpi (0.11-0.12mm) twice that of basal segment (0.05-0.07mm) (Fig. 25).

Ist antennal segment 0.05mm; IInd, 0.04mm slightly shorter than Ist; IIIrd, 0.43-0.36mm; IVth, spoon-shaped and longest (0.45-0.47mm); Vth and VIth (0.37mm) short and hidden in VIIth; VIIth (0.38-0.41mm) more spoon-shaped than IVth (Fig. 26).



Figs. 24-31. *Halictophagus antennalis*, new species. 24, head and thorax, dorsal view; 25, left mandible and maxilla; 26, left antenna; 27, right fore tarsus; 28, right mid tarsus; 29, right hind tarsus; 30, right wing; 31, left lateral view of aedeagus. Scale line: 24, 0.3mm, 25, 26, 27, 28, 29 & 31, 0.2mm; 30, 0.5mm.

Tarsus on proleg circular (Fig. 27), mid- and hind tarsus as in figs. 28 and 29.

Wing span 1.84mm. R_2 very broad and half the length of R_3. R_3 ending close to wing margin (Fig. 30).

Aedeagus with small dorsal hump (length 0.08mm) (Fig. 31).

Total length, 2.41-2.47mm.

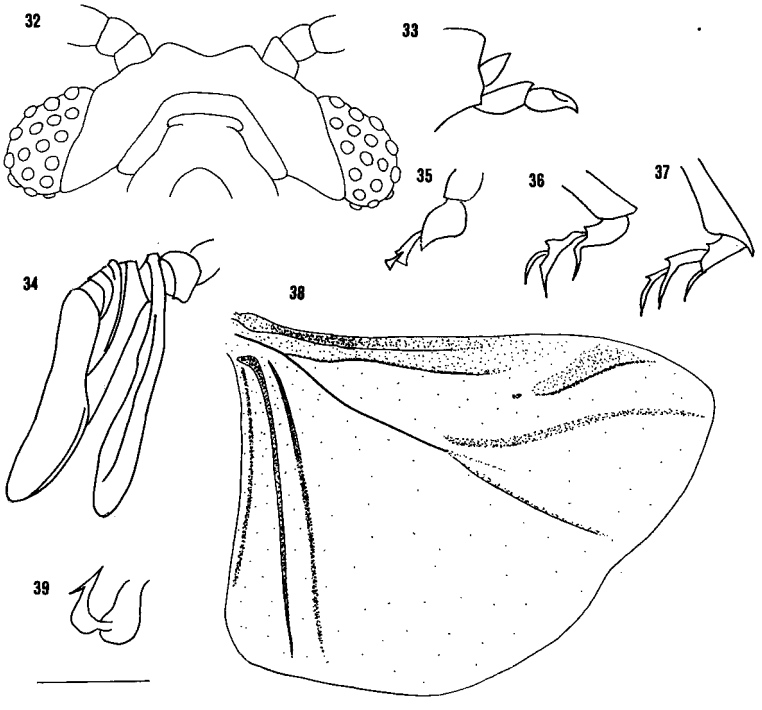
Etymology.- This species is named *antennalis* due to its eloborate antennal segments.

Remarks.- This species is distinguished from all others by the large spoon-shaped IVth and VIIth antennal segments, the maxillary palps and aedeagus.

Halictophagus hirashimai, new species
(Figs. 32-39)

Material.- Holotype - male (ZML), W5L, Mendolong, Sipitang, Sabah, coll. S. A., 19.iv.1988.

Paratypes - 1 male (ZML), A1L, Mendolong, Sipitang, Sabah, coll. S. A.: 29.xi.1987; 1 male, same data as above, 30.iv.1988; 1 male, same data as above, 1.v.1988; 1 male, sama data as above, 5.v.1988.



Figs. 32-39. *Halictophagus hirashimai*, new species. 32, head, dorsal view; 33, right mandible and maxilla; 34, right antenna; 35, right fore tarsus; 36, right mid tarsus; 37, right hind tarsus; 38, right wing; 39, right lateral view of aedeagus. Scale line: 32, 33, 34, 35, 36, 37 & 39, 0.2mm; 38, 0.3mm.

Description.- Number of ommatidia ± 20. Head width 0.57mm (including eyes) 0.39mm (excluding eyes) (Fig. 32). Mandibles 0.05mm. Maxillary palpi same length as basal segment (0.08mm) (Fig. 33).

Ist and IInd antennal segment same length (0.05mm); IIIrd, long and spoon-shaped, (0.39mm); 4th, 0.36mm; Vth, shortest and hidden (0.31mm); 6th, 0.36mm, VIIth longest and spoon-shaped (0.41mm) (Fig 34).

Tarsus of pro, mid and hind legs as in figs 35, 36, 37.

Wing span, 1.54mm (Fig 38)

Aedeagus length 0.12mm (Fig. 39).

Total length, 1.33mm.

Etymology. - This species is named after the Japanese Entomologist Yashihiro Hirashima who has described many Strepsiptera, particularly from Southeast Asia and Japan.

Remarks.- This species is similar to *H. antennalis*, new species, but differs from it by the smaller head width, the triangular shaped maxillary palpi that is the same size as the basal segment (whereas in *H. antennalis* the palpi is twice the size of the basal segment), differently shaped tarsus and is a smaller species.

Halictophagus sarawakensis, new species
(Figs. 40-45)

Material.- Holotype - male (CNC), Sematin, Sarawak, coll. A. T. Finnamore, 23.ii.1987.

Description.- Male. Ommatidia ± 20. Head width 0.27mm. Mandibles, 0.06mm, palpi of maxilla twice as long as basal segment (palpi, 0.27mm; basal, 0.09mm) (Fig. 40).

Ist and IInd antennal segments same length (0.03mm); IIIrd and IVth, longest (0.16mm); IVth, large and spoon-shaped; Vth, 0.11mm, VIth and VIIth, shortest (0.09mm) (Fig. 41).

Pro- and mid tarsus as in figs. 42 and 43.

Wing expanse, 0.72mm (Fig. 44).

VIIIth sternite with fork-like projections (Fig. 45), which is the distinguishing feature of this species.

Total length, 1.90mm.

Remarks.- Differs from *H. malayanus* Kifune, 1981, from W. Malaysia by the smaller size, antennal segments, venation on wings, and protarsus which are not rounded; from *H. minimus* Kifune & Hirashima, 1983b, from Sri Lanka, by the larger size, antennae, veination on wings; and from *H. peradenyia* Pierce, 1911, from Sri Lanka, by the venation on the wings. The chief distinguishing character of this species are the forked projections on the VIIIth sternite.

Family Elenchidae Perkins, 1905

Elenchidae Perkins, 1905: 98.
Elenchoidea - Pierce, 1908: 76.
Elenchinae - Ulrich, 1930: 7; Riek, 1970: 634.

SUBFAMILY ELENCHINAE PERKINS, 1905

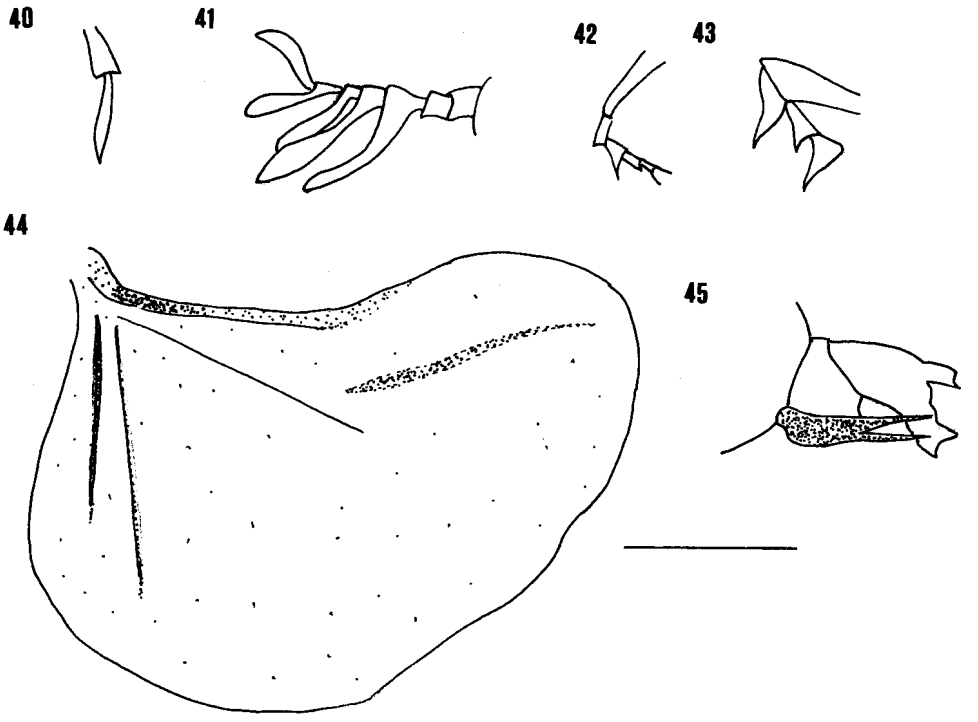
Elenchinae Perkins, 1905: 106.
Deinelenchinae Kinzelbach, 1971b: 9, syn. nov.

Genus *Deinelenchus* Perkins, 1905

Deinelenchus Perkins, 1905: 107.
Elenchus Bohart, 1941: 125.

Type species: *Deinelenchus australensis* Perkins, 1905.

Three Australian-Pacific species have been described.



Figs. 40-45. *Halictophgus sarawakensis*, new species. 40. right maxilla; 41, right antenna; 42, right pro tarsus; 43, right mid tarsus; 44, right wing; 45, left lateral view of VIIIth, IXth and Xth abdominal segments. Scale line: 40, 41, 42, 43, 44 & 45, 0.2mm.

Deinelenchus sabahensis, new species

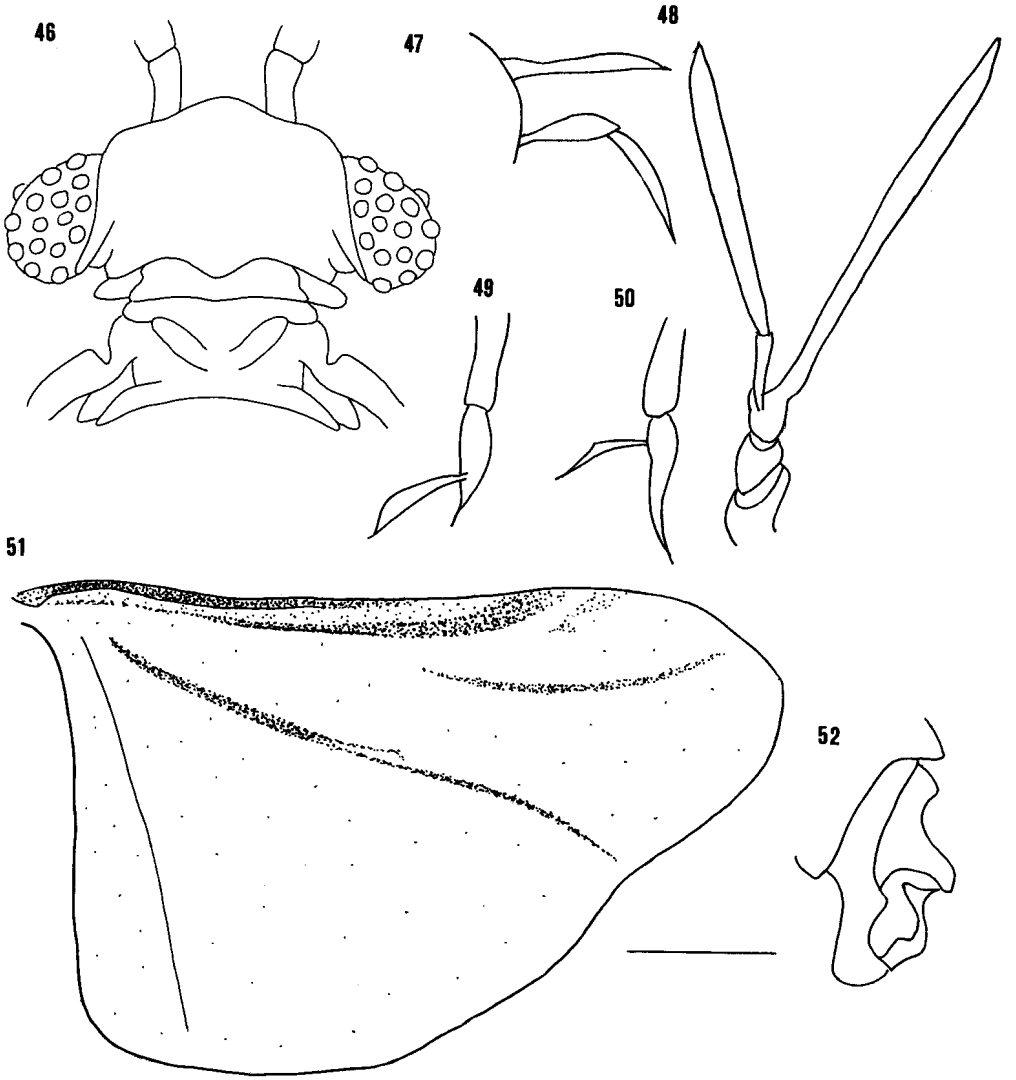
(Figs. 46-52)

Material. - Holotype - male (ZML), P1, Mendolong, Sipitang, Sabah, coll. S.A. 10.iii.1989.

Description.- Male. Ommatidia ± 25. Head width (including eyes). 0.45mm, and wide between eyes (0.34mm) (Fig. 46). Mandibles 0.10mm in length. Maxillary palpi (0.13mm) twice the length of basal segment (0.06mm) (Fig. 47).

Antennal segments I and II of same length (0.06mm); IIIrd with long flabellum (0.60mm); IVth, short (0.13mm); Vth, 0.42mm (Fig. 48).

Fore- and hind tarsus as in figs. 49 and 50.



Figs. 46-52. *Deinelenchus sabahensis*, new species. 46, dorsal view of head; 47, right mandible and maxilla; 48, right antenna; 49, right fore tarsus; 50, right hind tarsus; 51, right wing; 52, left lateral view of IXth abdominal segment and aedeagus. Scale line: 46, 47, 48, 49, 50 & 52, 0.2mm; 51, 0.3mm.

Wing expanse, 2.38mm (Fig. 51).

Aedeagus with hump basally (length, 0.10mm) (Fig. 52).

Total length, 1.76mm.

Remarks.- This is the first record of *Deinelenchus* from Southeast Asia. Previously they have only been recorded for Australia and Africa (Kathirithamby, 1989a; 1989b), and New Guinea (Kifune & Hirashima, 1989). *D. sabahensis* differs from the Australian species *D. australensis* Perkins, 1905, from Queensland, by the structure of the smaller and fewer ommatidia, antennal segments, maxillae, veination on wings, tarsi, thorax, aedeagus and the smaller size; from *D. berrimahensis*, Kathirithamby, 1989b, from Northern Territory, by the structure of the antennae, maxillae, venation on wings, Xth abdominal segment, shape of the aedeagus and the larger size; from *D. deviatus* Kinzelbach, 1971a, from New Guinea, by the structure of the antennae; from *D. hamifer* Kinzelbach, 1971a, from New Guinea, by the structure of the tarsi, wing venation and the antennal segments.

FAMILY MYRMECOLACIDAE SAUNDERS, 1872

Myrmecolacidae Saunders, 1872: 20.
Myrmecolacidae - Pierce, 1908: 76.
Stichotrematoidea Hofeneder, 1910: 49.
Stichotrematidae - Hofeneder, 1910: 49.

A key to this family is given by Kathirithamby (1993). Except for *Caenocholax* all the other three genera are found in Southeast Asia.

Genus *Lychnocolax* Bohart, 1951

Lychnocolax Bohart, 1951: 95.

Type species: *Lychnocolax mindoro* Bohart, 1951.

Lychnocolax mindanao Bohart, 1951

Lychnocolax mindanao Bohart, 1951, *Wasmann, J. Biol.* **9**(1): 98. Loc. PHILIPPINES: Maco Tagum, Davano, Mindanao. - Kinzelbach, 1971a, Zoologica (119): 157. - Kifune & Hirashima, 1989, *Esakia* **28**, 28. Loc. NEW IRELAND: "Camp Bishop"; NEW GUINEA: Neth, Waris S. of Holland; PALAU Isls., Koror.

Material.- 2 males (ZML), T4/R, Mendolong, Sipitang, Sabah, coll. S. A., 14.iii.1989. – 1 male (CNC), Malaise trap, 100m, 7km NW Kg. Ayer Puteh, Trengganu, Malaysia, coll. M. Sharkey, 28.ii-2.iii.1990.

Distribution.- Maco, Philippines; "Camp Bishop", New Ireland; Neth., New Guinea; Koror, Palau Isls; Sipitang, Sabah.

Lychnocolax ovatus Bohart, 1951

Lychnocolax ovatus Bohart, 1951, *Wasmann J. Biol.* **9**(1): 101. Loc. PHILIPPINES: Maco, Tagum, Davao, Mindanao. - Kinzelbach, 1971a, *Zoologica* (119): 157. - Kifune & Hirashima, 1989, *Esakia* **28**: 28. Loc: SABAH: Kalabakan, Tawau District.

Material. - (ZML), light trap, A1L, Mendolong, Sipitang, Sabah, coll. S. A.: 1 male, 8.xii.1987; 1 male, same data as above; 1 male, 7.iv.1988, same data as above; 1 male, coll. S.A, 9.iv.1988; 2 males, same data as above; 4 males, 11.iv.1988, same data as above; 2 males, 12.iv.1988, same data as above; 1 male, 13.iv.1988, sama data as above; 1 male, 2.v.1988, same data as above; 1 male, 5.v.1988, same data as above; 1 male, same data as above; 1 male, same data as above; 1 male, 2.iii.1989. INDONESIA: 2 males (OUM), Dumogo-Bone N.P., Sulawesi Utara, coll. Project Wallace, B.M. 1985-10, Roy. Ent. Soc. Lond., ix.1985; 1 male, same data as above .

Distribution.- Maco, Philippines; Tawau District and Sipitang, Sabah; Sulawesi, Indonesia.

Lychnocolax postorbis Bohart, 1951

Lychnocolax postrobis Bohart, 1951, *Wasmann. J. Biol.* **9**(1): 100. Loc. PHILIPPINES: Maco, Tagum, Davao, Mindonao. - Kinzelbach, 1971a, *Zoologica* (119), 157. - Kifune, 1981, *Kontyû* **49**(2): 328. Loc: W. MALAYSIA: Ipoh, Perak.

Material.- 7 males (CNC), Malaise trap, 100m, 7km NW Kg. Ayer Puteh, Trengganu, W. Malaysia, M. Sharkey, 27.ii-2.iii.90; 1 male (ZML), A1L, light trap, Mendolong, Sipitang, Sabah, coll. S.A., 8.iv.1988; 1 male, 13.iv.1988, same data as above; 1 male, 28.iii.1988, same data as above; 1 male, 26.iv.1988, same data as above; 2 males, 2.v.1988, same data as above.

Remarks.- This species was first described from the Philippines, and in 1981 Kifune recorded it for the first time in W. Malaysia.

Distribution.- Maco, Philippines; Ipoh, Perak and Ayer Puteh, Trengganu, W. Malaysia; Sipitang, Sabah.

Genus *Myrmecolax* Westwood, 1861

Myrmecolax Westwood, 1861: 418.
Parastylops de Meijere, 1908: 185.
Afrostylops Fox & Fox, 1964: 754, pro part.

Type species: *Myrmecolax nietneri* Westwood, 1861.

Myrmecolax chantaneeae Kifune & Hirashima, 1979

Myrmecolax chantaneeae Kifune & Hirashima, 1979, *Esakia* **14:** 65. Loc. THAILAND: San Pa Tong Rice Experiment Station, San Pa Tong.

Material.- male (ZML), A1L, Mendolong, Sipitang, Sabah , coll. S.A., 6.iv.1988; 1 male, 12.iv.1988, same data as above.

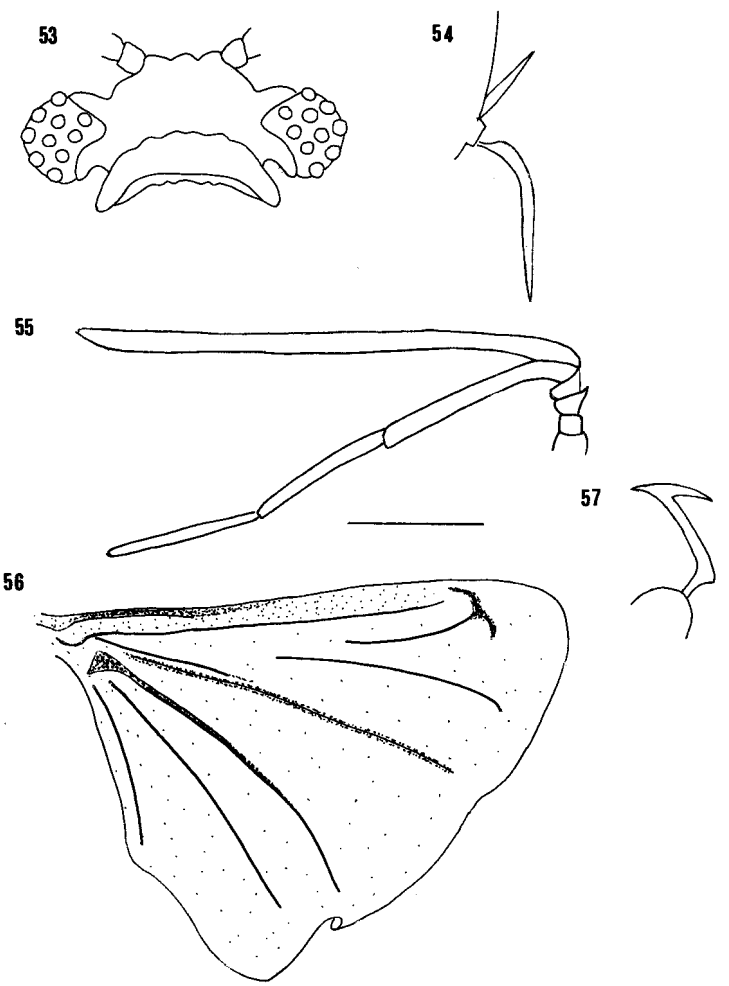
Distribution.- San Pa Tong, Thailand; Sipitang, Sabah.

Myrmecolax malayensis, new species
(Figs. 53-57)

Material.- Holotype - male (ZML), P1, Mendolong, Sipitang, Sabah, coll. S.A., 10.iii.1989.

Paratypes - 1 male, A1L, Mendolong, Sipitang, Sabah, coll. S.A. 20.iv.1988; 1 male, 9.iv.1988, same data as above (ZML).

Description.- Male. Ommatidia ± 22. Head width, (including eyes) 0.56mm, excluding eyes, 0.29mm (Fig. 53). Width of globular eyes, 0.29mm. Mandible length, 0.10mm; basal segment of maxilla, 0.04mm; palpi, 0.27-0.32mm (Fig. 54).



Figs. 53-57. *Myrmecolax malayensis*, new species. 53, head, dorsal view; 54, right maxilla; 55, right antenna; 56, right wing; 57, left lateral view of aedeagus. Scale line: 53 & 55, 0.3mm; 54, 57, 0.2mm; 56, 0.5mm.

Length of Ist antennal segment, 0.07mm; IInd, 0.04mm; IIIrd, 1.04-1.09mm; IVth, 0.04-0.46mm; Vth, 0.40-0.41mm; VIth, 0.26-0.29mm; VIIth, 0.40mm (Fig. 55).

Wing expanse, 1.01-1.03mm (Fig. 56).

Aedeagus length, 0.23-0.24mm (Fig. 57).

Total length, 1.17-1.28mm.

Remarks.- Similar to *M. chantaneeae*, but this new species has differently shaped maxillary palpi, smaller ommatidia, flabellum of IIIrd antennal segment reaching to tip of VIIth segment, and is a smaller species.

Distribution.- Sabah, Sipitang.

Genus *Stichotrema* Hofeneder, 1910

Stichotrema Hofeneder, 1910: 47.
Caenocholax Pierce, 1909: 88 pro parte.
Mantidoxenos Ogloblin, 1939: 1277.
Rhipidocolax Bohart, 1951: 94.

Type species: *Stichotrema dallatorreanum* Hofeneder, 1910

Stichotrema ceylonense Kifune & Hirashima, 1980

Stichotrema ceylonense Kifune & Hirashima, 1980, *Esakia*, **15**: 147. Loc. SRI LANKA: Olatithoduvai, 10 miles NW of Mannar.

Material.- male (ZML), P1,Mendolong, Sipitang, Sabah, coll. S.A. 10.iii.1989.

Distribution.- Koslanda, Sri Lanka; Sipitang, Sabah.

Stichotrema davao Bohart, 1951

Stichotrema davao Bohart, 1951, *Wasmann J. Biol.*, **9**: 93. Loc. PHILIPPINES: Maco, Tagum, Davao, Mindanao.

Material.- male (ZML), A1L, Mendolong, Sipitang, Sabah, coll. S.A., 5.iv.1988; 1 male, 8.iv.1988, same data as above; 1 male, 12.iv.1988, same data as above.

Distribution.- Maco, Philippines; Sipitang, Sabah.

Stichotrema krombeini Kifune & Hirashima, 1980

Stichotrema krombeini Kifune & Hirashima, 1980, *Esakia*, 15: 149. Loc. SRI LANKA: Diyaluma Falls, Koslanda, Bad, Dist.

Material.- male (ZML), A1L, Mendolong, Sipitang, Sabah, coll. S.A., 7.iv.1988; male, 14.iv.1988, same data as above.

Distribution.- Diyaluma Falls, Sri Lanka; Sipitang, Sabah.

Stichotrema malayanum Kifune, 1981

Stichotrema malayanum Kifune, 1981, *Kontyû* 49(2): 331. Loc: W. MALAYSIA: Ipoh, Perak.

Material.- male (ZML), Mendolong, Sipitang, Sabah, coll. S.A., 8.iv.1988; male, same data as above, 5.v.1988.

Distribution.- Ipoh, Perak, W. Malaysia; Siptang, Sabah.

Stichotrema retrorsum Bohart, 1951

Rhipidocolax retrorsus Bohart, 1951, *Wasmann J. Biol.* 9(1): 94. Loc. PHILIPPINES: Maco, Tagum, Davano, Mindanao.

Stichotrema retrorsum (Bohart, 1951): Kinzelbach, 1971a, *Zoologica* (119): 159. - Kifune, 1981, *Kontyû* 49(2): 330. Loc: W. MALAYSIA: Ipoh, Perak. - Kifune & Hirashima, 1989, *Esakia* 28: 40. Loc. SABAH: Tawau District, Kalabakan.

Material.- male (ZML), A1L, Mendolong, Sipitang, Sabah, coll. S.A., 20.ii.1988; 1 male, W5L, same data as above, 19.iv.1988; male, A1L, same data as above, 5.v.1988; male, P1, same data as above, 10.iii.1989.

Distribution.- Maco, Philippines; Ipoh, Perak, W. Malaysia; Tawau District and Sipitang, Sabah.

Stichotrema simile Kifune & Hirashima, 1980

Stichotrema simile Kifune & Hirashima, 1980, *Esakia*, 15: 150. Loc. SRI LANKA: Diyaluma Falls, Koslanda, Bad. District.

Material.- male (ZML), W5L, Mendolong, Sipitang, Sabah, coll. A.S., 19.iv.1988.

Distribution.- Diyaluma Falls, Sri Lanka; Sipitang, Sabah.

Stichotrema longiflagellatum, new species

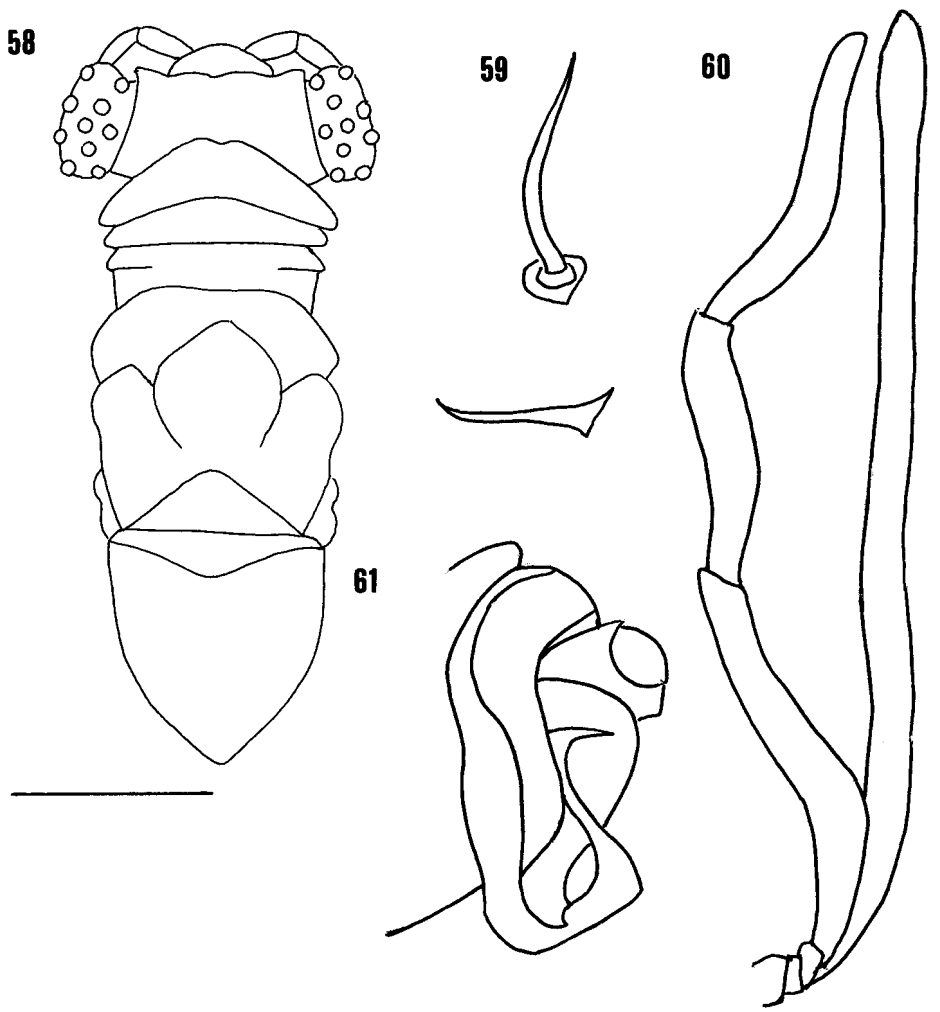
(Figs. 58-61)

Material.- Holotype - male (ZML), W5L, Mendolong, Sipitang, Sabah, coll. S.A. 19.iv.1988.

Description.- Male. Ommatidia ± 22. Head width, 0.47mm (Fig. 58). Mandibles, 0.07mm; maxillary palpi, 0.17mm (Fig. 59).

IIIrd antennal segment (1.00mm) very long and surpasses VIIth segment (0.29mm); Vth is two thirds the length of VIth (0.25mm) (Fig. 60).

Hind wing with one detached vein between radius and median.



Figs. 58-61. *Stichotrema longiflagellatum*, new species. 58, head and thorax, dorsal view; 59, right mandible and maxilla; 60, right antenna; 61, left lateral view of aedeagus. Scale line: 258, 0.3mm; 59, 60 & 61, 0.2mm.

Wing span, 1.30mm.

Aedeagus with no dorsal projection, length, 0.14mm (Fig. 61).

Total length, 1.60mm.

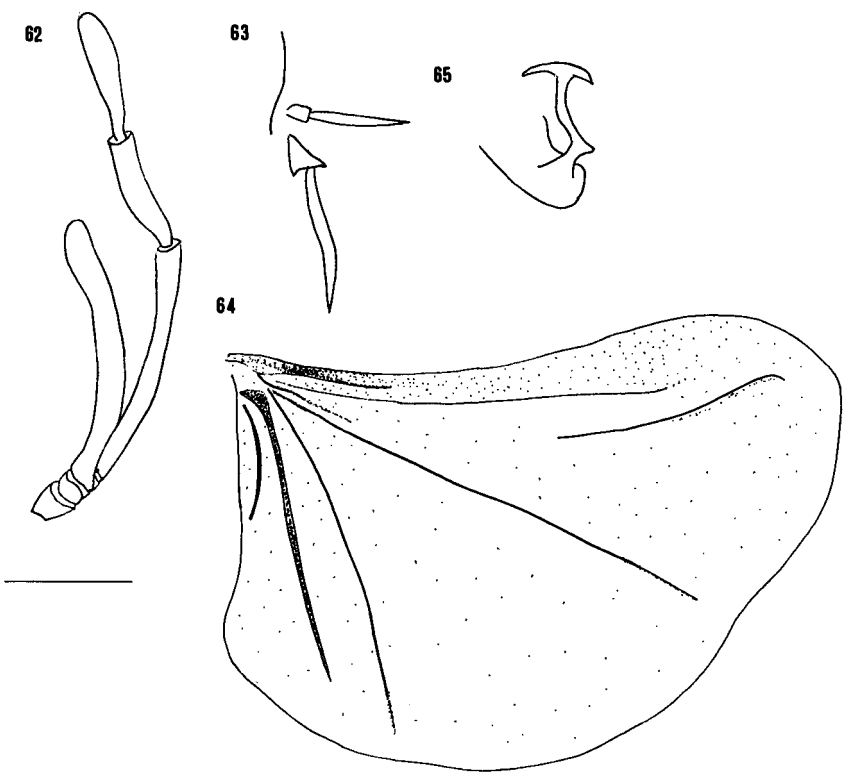
Etymology.- This species is named *longiflagellatum* due to its long flabellum on the IIIrd antennal segment.

Remarks.- Distinguished from all other species of *Stichotrema* by the long flabellum on IIIrd antennal segment that surpasses the VIIth segment, and its blunt apex. Similar to *S. krombeini* Kifune & Hirashima, 1980, from Sri Lanka, but differs from it by the VIth + VIIth segments longer than Vth, absence of dorsal projection on aedeagus, and the narrow postlumbium.

Distribution.- Sabah, Sipitang.

Stichotrema mendolong, new species
(Figs. 62-65)

Material. - Holotype - male (ZML), P1, Mendolong, Sipitang, Sabah, coll. S.A., 16.iii.1989.



Figs 62-65. *Stichotrema mendolong*, new species. 62, right mandible and maxilla; 63, right antenna; 64, right wing; 65, left lateral view of aedeagus. Scale line: 62, 63 & 64, 0.2mm; 64, 0.3mm.

Paratype - male (ZML), Mendolong, Sipitang, Sabah, coll. S.A. 8.iv.1988.

Description.- Male. Ommatidia ± 20. Head width, 0.51mm.

Mandibles, 0.11mm; maxillary palpi, 0.18mm (Fig. 62).

IIIrd antennal segment (0.44mm) not reaching to base of VIth; Vth (0.33mm) more than twice VIth (0.15mm), and VIth + VIIth (0.18mm) subequal to Vth (Fig. 63).

One detached vein between radius and median. R_5 very long and ends at wing margin (Fig. 64). Wing span, 1.35mm.

Aedeagus with hump basally, with anterior dorsal and ventral projections subequal. Length of aedeagus, 0.15mm (Fig. 65).

Total length, 1.47mm.

Etymology.- This species is named after the field site. Name used as a noun in apposition.

Remarks.- Similar to *S. vilhenai* (Luna de Carvalho, 1956), differs from it by the smaller size, maxilla, aedeagus and antennae. Similar to *S. silvaticum* Kifune & Hirashima, 1989, from Sabah, North Borneo, but differs from it by the smaller size, aedeagus and maxilla.

Acknowledgments. - I am greatful to Professor T. Kifune for his useful comments on the manuscript, to Professor S. B. Peck, Dr. R. Danielsson and the British Museum (Natural History) for the loan and gift of the specimens, and to the Leverhulme Trust for the Research Fellowship.

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